



Sustainable Blue Economy in the Norwegian Arctic

Part 1: Status



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Executive summary

Established in 2018, the Centre for the Ocean and the Arctic has requested DNV GL to develop an analysis on the sustainable blue economy of the Norwegian Arctic in two reports:

1. A status report entitled 'Sustainable Blue Economy in the Norwegian Arctic'.
2. A foresight study based on the report from part 1, which analyses the challenges and opportunities associated with further developing a sustainable blue economy in the Norwegian Arctic.

This first report provides a status on the sustainable blue economy in the Norwegian Arctic in relation to the 17 global Sustainable Development Goals (SDGs). It considers each of the SDGs and the targets that are most relevant to the region and brings together a broad overview of existing knowledge for a status review. To achieve this, a comprehensive document review combined with workshops and interviews with key experts and stakeholders were performed.

To analyse the current state, this report divides the SDGs into four main categories (biosphere, society, economy and partnerships). The key results from the work summarized in the four categories are:

Biosphere

- The global warming and climate change is a major threat to the Norwegian Arctic. The Arctic is currently experiencing warming that is two to three times higher than the global annual average. A warming beyond 1.5 ° will have significant impact on risks to marine biodiversity, fisheries, and ecosystems, and their functions and services to humans. Further, there will also be an increased probability of an ice-free Arctic Ocean during the summer.
- The ecological status today of the coastal waters in the Norwegian Arctic is very good. The main threats to the ecological status in the Norwegian Arctic are the human activities related to the oil and gas industry, fishing industry, ship traffic, industry along the coast (chemicals, metals), and discharge from cities, airports and landfills. The Norwegian Arctic also receives long range transported pollutants by air from the Northern Hemisphere. The large amounts of plastics and microplastics in the sea is an additional threat to the Norwegian Arctic which in many cases originates outside the region.
- The status of the natural habitats in the Norwegian Arctic varies. The Barents Sea area has fish populations in good condition, while most of the seabird populations have had a significant and rapid decline. The melting ice cover is a major threat for the polar bears and species they prey on, like the ringed seal and bearded seal.
- The fishing in the Norwegian Arctic is well managed and regulated by the authorities, with little overfishing and major fish stocks at sustainable levels.

Society

- There is limited poverty in the Norwegian Arctic, low income inequality and low unemployment, but the population on disability benefits in the Norwegian Arctic is slightly higher compared to the level in Norway as a whole.
- Health in Norwegian Arctic is generally good and life expectancy is high. There are however some challenges in the Norwegian Arctic particularly related to non-communicable diseases and obesity. Non-communicable diseases are related to higher rate of type-2 diabetes and higher levels of cardiovascular

disease than the national level, with Finnmark having the highest levels. A higher percentage of youth in the Norwegian Arctic are overweight or obese compared to the rest of the country.

- The school results in the Norwegian Arctic are lower than the national average, and there is a shortage of qualified teachers. High-school drop-out rates are high in Norway and even higher in the Norwegian Arctic than in the rest of the country. There is significant gender disparity in completion rates for general and vocational secondary school, with a significantly lower completion rate for boys. The Sami people in the Norwegian Arctic have lower levels of formal education than the rest of the population in Norway.
- Violence against women and girls is a challenge in the Norwegian Arctic. 49 % of Sami women report that they have been exposed to violence, compared to 35 % of non-Sami women in Norway.
- Basically, all the electricity production (96 %) in the Norwegian Arctic comes from renewables. Svalbard is a special case, where the energy supply is based on a power plant that produces power and heat based on locally extracted coal.
- The Norwegian Arctic has some of the best wind resources in the country and is often mentioned as an attractive place to invest in new wind power. However, without significant growth in consumption or increased network capacity, the Norwegian Arctic may appear less favourable for further wind power development.
- Transportation is in a phase where fossil fuels are being exchanged with zero emission/low emission fuels. Both Bodø and Tromsø aim to replace traditional fossil buses with electric buses. There has also been a rapidly increasing sale of electric cars in recent years. However, the Norwegian Arctic with long distances has had a much more moderate sale of electric cars.
- There are currently no electric planes in operation in Norway, but Avinor has recently claimed that Norwegian domestic air transport will be electric within 2040. The Norwegian Arctic is pinpointed as a suitable area to test out electric airplanes as the flight routes in the Norwegian Arctic are characterized by many, but short distances,
- About 50 % of the fish farms in Norway get electrical power from shore, while the rest use diesel generators to generate power. A recent report concludes that it is commercially profitable to electrify about 80 % of the production in Norway.

Economy

- The ocean and its resources are a key source of employment and income. For the Norwegian Arctic 20 % of the employment is directly related to the ocean industries, while it is 11 % on Norwegian national level.
- The Norwegian Arctic has some complicating factors with respect to achieving higher levels of productivity, there is a much lower population growth and a lower educational level and higher sick leave in the region. In addition, there region has a lack of healthcare and educational workers and a lack of resources with higher academic education in the cities.
- The key ocean industries in the Norwegian Arctic are the fisheries, aquaculture, shipping and ports (maritime industry), oil and gas and tourism. For some destinations the tremendous growth of tourism has become a challenge due to lack of infrastructure. Further, the mining industry is of importance (struggling with public acceptance) and bioprospecting which is an industry under development, still mainly at the research level today.

- The Norwegian Arctic (like the rest of Norway) has a high level of consumption, this poses challenges with respect to sustainable consumption and production. The amount of waste has increased with over 50 % since 1995 in Norway.

Partnerships

- To secure continuous development and economic growth, the Norwegian Arctic is dependent on peace and stability, that development and conservation go hand in hand and that due regard is taken to the local society and indigenous rights. This requires multi-stakeholder partnerships at several levels – from international co-operation to local community partnerships. At international level and national level there are already several co-operations, at local level there are less and this should be further encouraged.

Introduction

The Norwegian Arctic, constituting the three northernmost counties Nordland, Troms, Finnmark and Svalbard, and vast ocean areas in the Barents Sea, the northern parts of the Norwegian Sea and further into polar waters, is an area of significant importance nationally and internationally. There are several reasons for this, in particular the vulnerability of the region to the impacts of climate change, the availability of rich natural resources and the important sea routes that are becoming available, and how this impacts the societies and activities of the region.

This report aims to map the current state of the blue economy in the Norwegian Arctic and its contribution towards the Global Sustainable Development Goals. A second report will subsequently explore the future of a sustainable blue economy in the Norwegian Arctic. Three important elements are covered in this report:

Sustainable: taking a long term and systemic perspective that balances use, protection, value creation and fair sharing of the gains

Blue economy: focusing on the ocean-based industries and local communities that utilize the resources and the ocean for activities such as shipping, oil and gas, tourism, fisheries and aquaculture

Norwegian Arctic: focusing on the people and societies of the north and their role as inhabitants, workers and guardians of this region.

The Global Sustainable Development Goals (SDGs) were agreed in 2015 by United Nations General Assembly and are described as 'the blueprint to achieve a better and more sustainable future for all'. They address the global challenges we face, including those related to poverty, inequality, climate, environmental degradation, prosperity, peace and justice. The SDGs need to be considered as a whole.

The goals represent a global set of prioritised topics with a list of 169 SDG targets. In this report, analysing a specific region and the blue economy in relation to the SDGs, the goals have been translated to a regional setting. The targets which are most relevant to the Norwegian Arctic under each SDG have been selected and the key topics of relevance have been described. It has not been within the scope of this report to cover all topics with the same level of detail.

A global framework of 232 unique indicators has been developed to monitor progress for the SDG targets. Statistics Norway has mapped available statistics which can be used at national level to monitor progress towards the targets (/1/). However, not all the indicators in the global framework are developed such that they can be monitored statistically at national level. In this report, indicators and statistics that can be used to monitor progress in relation to the SDGs within the Norwegian Arctic are suggested. The indicators are generally linked to the nationally proposed indicators and statistics from SSB (/1/). In some cases, other indicators and statistics are suggested which are related to specific topics of relevance for the region and a local context.

To analyse the current state, this report is using the following categorization of the sustainable development goals to provide a structure to the report (see figure 1):

- **Biosphere:** The world will fail to achieve the remaining goals unless we achieve the goals related to clean water and sanitation, life below water, life on land and climate action.
- **Society:** Calls for eradication of poverty, improvement of social justice, peace and good health.
- **Economy:** Attention towards industry, innovation and infrastructure, reduced inequalities, responsible consumption and production, decent work and economic growth decoupled from environmental degradation.

- **Partnerships:** Strengthening global solidarity. An integrated approach is crucial for progress across the multiple goals.

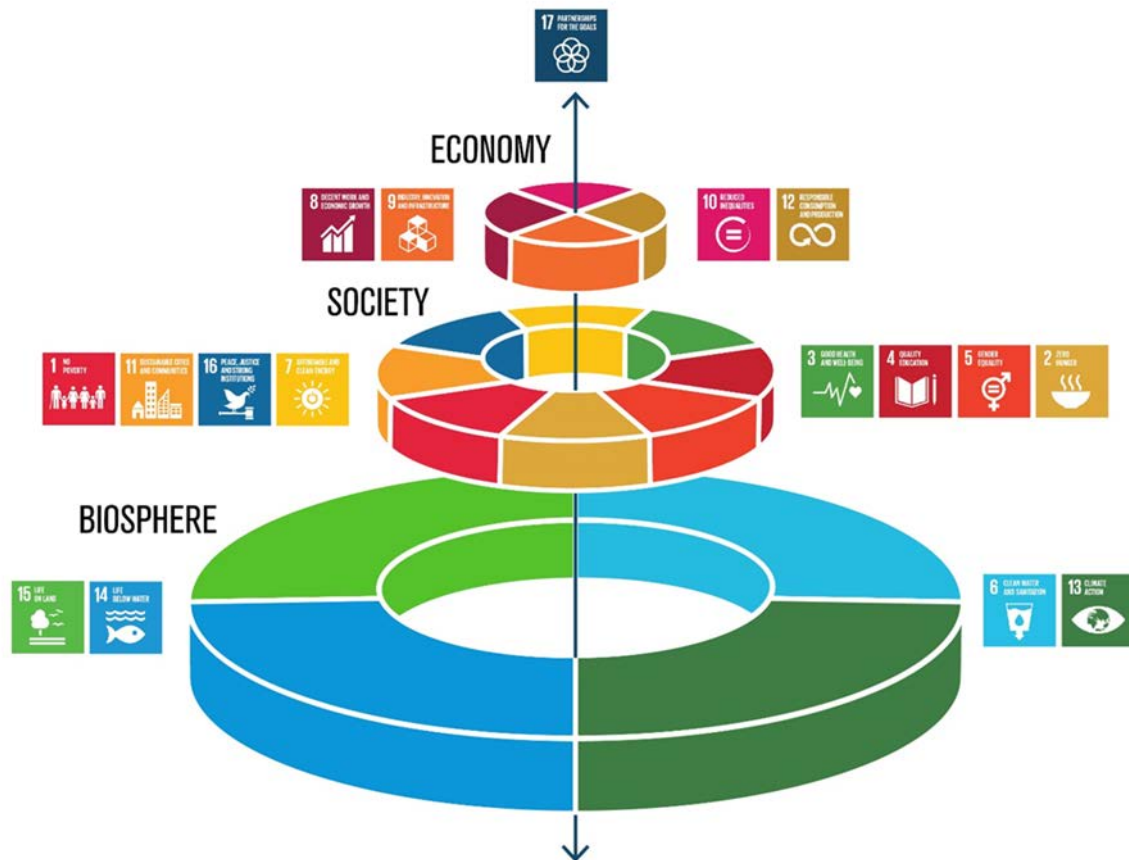


Figure 1 The SDGs organized in four main categories. The picture illustrates that economies and societies are seen as embedded parts of the biosphere. (Azote Images for Stockholm Resilience Centre)

Method and process

The report is written with the Sustainable Development Goals (SDGs) as a base. The Centre for the Ocean and the Arctic had beforehand selected relevant SDG Targets and Topics to give guidance for describing the state of a sustainable blue economy in the Norwegian Arctic.

DNV GL in co-operation with the Centre, have further evaluated the SDG Targets and Topics and their Arctic relevance. The evaluation concludes that all the 17 SDGs are important but different levels of attention are required. Therefore, three levels are used in the report to indicate the level of attention for the SDGs in each of the categories; Biosphere, Society, Economy and Partnerships. The categorization was developed in a workshop with the experts of The Centre for the Ocean and the Arctic and DNV GL's core project team. Less discussions and details are included in the lower end of the priority scale.

Level 1: Very important, high attention is required for this SDG in the Norwegian Arctic

Level 2: Important, attention is required for this SDG in the Norwegian Arctic

Level 3: Less important, there are already good conditions for this SDG in the Norwegian Arctic

It has also to be stated that the SDGs have not been written specifically for the Arctic; they are written for the whole world. An important part in the report has been to interpret the SDGs as far as relevant and possible to issues that are important for the Arctic.

The statements presented in the report are based on desktop studies and research reviews, and information from a high number of sources have been used. Most of them are research papers, governmental white papers, and official statistics such as from Statistics Norway, the Directorate of Fisheries statistics, Norwegian Maritime Authorities statistics and Norwegian Labour and Welfare Administration. In some cases, other information such as personal communication with experts or media clips has been used.

To build background and give direction for the analysis work, two main workshops were arranged early in the project phase:

- Executive workshop 17th of November in Tromsø 2018, with top level leaders and experts from organisations such as The Norwegian Oil and Gas Association, Equinor, The University of Bergen, The University of Oslo, The Norwegian Shipowners' Association, REV Ocean, World Wildlife Foundation, The Norwegian Fishermens' Organisation, The Norwegian Fishermen's Sales Organization, and UiT The Arctic University of Norway. All participants were challenged to share their view on challenges in their industries in the Arctic, technology development needs and view on the future within their fields.
- Workshop regarding the state of the blue economy, 27th of November 2018 in Bodø, with experts and representatives from organisations such as Sparebanken Nord-Norge, NHO Reiseliv, Centre for Oil Spill Recovery and Marine Pollution, the mayor of Bodø, DNV GL, The Ministry of Trade and Fisheries, University of Bergen, Nord University, UiT The Arctic University of Norway and Nordlandsforskning. The agenda consisted of introduction to the Centre and the project, perspectives from three experts from the participant lists, and two work sessions regarding the state of the biosphere, society and economy.

These workshops were facilitated and documented by DNV GL, and with the Centre's resources as participants and observers. In addition, the process also has included meetings with The Norwegian Seafood Federation and The

Norwegian Oil and Gas Association and a series of meetings and workshops between the Centre for the Ocean and the Arctic and DNV GL.

Biosphere

The biosphere is the base for a sustainable blue Arctic. If the goals related to clean water and sanitation, life below water, life on land and climate action are not addressed, the remaining goals will not be achieved.

In this chapter the status of the oceans and coastal zones in the relevant geography are briefly assessed and discussed. Key figures and indicators for the oceans for clean water and sanitation, life below water, life on land and climate action are described.

Climate change is identified as a clear and overarching threat to ocean health. The over-exploitation of natural resources, habitat destruction and pollution are reinforced by the climate change.

SDG 6 – Clean water and sanitation



Level 3: Less important, there are already good conditions for this SDG in the Norwegian Arctic

The following SDG 6 target is discussed in this chapter:

Target 6.3. By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Clean water

The quality of drinking water in Norway, including the Norwegian Arctic, is generally good and safe, but nonetheless, cases with illness related to drinking water are discovered. More recently, more knowledge has been gained that the pipeline network can be a source of pollution and contamination of drinking water (/2/).

Recently there has been focus on microplastic in drinking water. In a recent study the drinking water in Norway was mapped with respect to microplastic. The mapping showed very low levels of microplastic in Norwegian drinking water, also in the waterworks that potentially have the most polluted drinking water sources. The Norwegian Institute of Public Health concluded that based on available knowledge, and the low levels of microplastic in drinking water that were found, that this does not pose a health risk (/3/).

Land-based pollution harmful to the ocean

The ecological status of Norway's coastal waters is generally good, with little deviation from natural conditions. The Norwegian Environment Agency therefore expect the target of good ecological and chemical status defined by the EU Water Framework Directive to be achieved by 2021 for most coastal water bodies.

In Nordland, Troms and Finnmark the status is very good, with very few coastal waters (< 3 %) at risk of not achieving the target of good ecological and chemical status.

PROPORTION OF COASTAL WATERS AT RISK OF NOT ACHIEVING TARGET

Figures from 25. may 2016

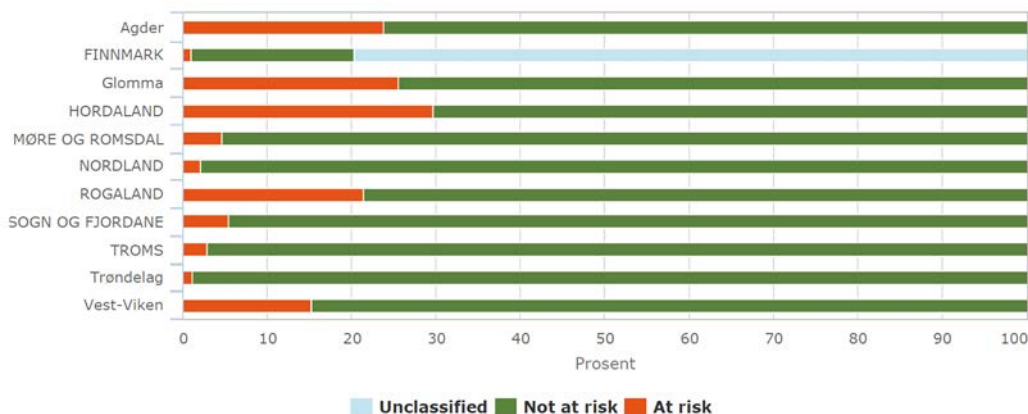


Figure 2. (www.environment.no)

There are different types of land-based pollution that can be harmful to the oceans' ecosystem, both in general and in the Arctic:

- The major industrial areas of the Northern Hemisphere are a source for long range transport of pollutants. They are being transported by air and ocean currents causing an increase of pollutants in the biosphere of the Arctic.
- Petroleum and gas activities with land bases in the Arctic (tank farms etc.).
- Fishing industry (spill from fish processing, cleaning of fishing gear etc.).
- Industry (spills from production, for example metallurgical industry).
- Spills from cities and airports (mainly run-off water).
- Landfills that are leaking contaminants to the sea.

The most relevant documents on pollution sources are the data on Norwegian discharges and the JAMP data collected by the OSPAR countries:

www.norskeutslipp.no

www.ospar.org/work-areas/cross-cutting-issues/jamp

These data have been collected for many years and have long time series.

There still is scarce information regarding emerging pollutants. Examples of emerging pollutants are per- and polyfluoroalkyl substances, brominated and chlorinated flame retardants, phthalates, short-chain chlorinated paraffins, siloxanes and plastics and microplastics. AMAP (Arctic Monitoring and Assessment Programme) has over many years been following the effects of contaminants on arctic wildlife and fish. In a recent assessment they conclude that the Arctic has elevated levels of environmental pollutants, and most of these originate from the industrialized centres and agricultural regions of lower latitudes. Further chemical pollutants are transported via the atmosphere, oceans and rivers and deposited in Arctic ecosystems. The chemicals bioaccumulate in organisms and

biomagnify through food webs with effects on animals and the indigenous communities that rely on them as part of a traditional diet (/5/).

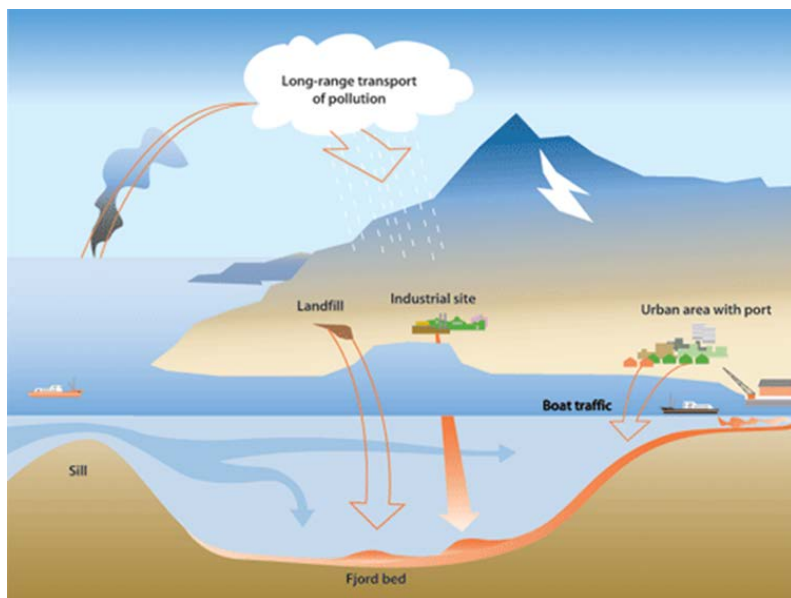


Figure 3 Illustration of land-based pollution sources. (/4/)

There is little detailed knowledge about what increasing ground and air temperatures due to climate change will do to landfills/dumpsites in the Arctic. Frozen ground will be melting which can cause increased leaking of contaminants.

Dumping of hazardous substances

Dumping of hazardous substances along the coastline is forbidden by Norwegian law (Norwegian Pollution Control Act and regulations) and also at sea in the London Convention where Norway is a party. A number of IMO (International Maritime Organization) conventions also addresses pollution at sea by vessels. Acute pollution has to be given notice of to the Norwegian Coastal Administration (NCA). The NCA publishes a yearly report on pollution incidents (/6/).

The most important threats from activities along the northern coastline and at sea are:

- Oil and gas activities at sea including from bases along the coast: spills from produced water, drill cuttings and residues from chemicals and cement from drilling operations.
- Fish farming: spills from nutrient salts and sludge.
- Industry along the coast: spills from production (chemicals, metals).
- Ship traffic: spills from ballast water, oil spills, wastewater spills, bilge water, dumped waste.

In addition to the known sources, there is probably a substantial amount of discharge of hazardous substances that are not reported. Further there is little information of the environmental impacts from dumping of hazardous substances from activities along the coastline and at sea, especially from those that are difficult to detect.

There is an increased focus on marine pollution from the Norwegian Government. In December 2018 the Ministry of Transport and Communications opened the Norwegian Centre for Oil Spill Preparedness and Marine Environment in Svolvær. The task of the centre is to be 'a national competence centre for the promotion of knowledge, cost-effective

and environmentally friendly technologies and methods for oil recovery operations and reduction of marine plastics' (/7/).

Indicators

- Statistics from Norske utslipp (Norwegian discharges) gives an overview of discharges. The database that is administrated by the Norwegian Environment Agency where all discharges are reported from enterprises in Norway that have a discharge permit. A discharge permit is needed from the pollution control authority for any activity that may lead to pollution.
- Data from OSPAR's Joint Assessment & Monitoring Programme (JAMP). JAMP prepares environmental assessments of the status of the marine environment of the OSPAR maritime area or its regions (including the Arctic). Norway has collected environmental data since the 1980s and these long-time environmental data series can be used as indicators for the assessment of the pollution in the Arctic.
- Statistics of reported incidents of spills in the Arctic gives an overview of hazardous substances which have been discharged. Such incidents are reported to the Norwegian Coastal Administration (NCA).
- Indicators based on water quality data from 'Vannportalen.no'.

SDG 13 – Climate action



Level 1: Very important, high attention is required for this SDG in the Norwegian Arctic

The following SDG 13 targets are discussed in this chapter:

Target 13.1. Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Target 13.2. Integrate climate change measures into national policies, strategies and planning

Target 13.3. Improve education, awareness- raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

The UNFCCC and the Paris agreement

The Parties of the United Nations Framework Convention on Climate Change (UNFCCC) which is the primary international, intergovernmental forum for negotiating the global response to climate change, reached the Paris agreement in 2015. The central aim of this agreement is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius (/8/). In addition, the agreement aims to strengthen the ability of countries to deal with the impacts of climate change.

Both aims are reflected in SDG 13 on climate action which focuses on the need for urgent action to combat climate change and its impact. Based on the vulnerability of the Norwegian Arctic to the impacts of climate change, SDG 13 is considered to be very important and high attention is required for this SDG in the Norwegian Arctic.

The targets under SDG 13 of specific relevance to the Norwegian Arctic relate to the need to strengthen resilience and build capacity to adapt to the impacts of climate change and the integration of climate change measures into national and local policies and plans. In addition, the target focusing on education and knowledge building is of vital importance to ensure sound and robust decision-making processes for climate action among all stakeholders.

Resilience and adaptive capacity of the Norwegian Arctic

In 2018, the Intergovernmental Panel on Climate Change (IPCC) published a special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways (/9/). The report highlights that the Arctic on average is currently experiencing warming which is two to three times greater than the global annual average. Warming beyond 1.5 °C will have significant impact on risks to marine, aquatic and terrestrial biodiversity and ecosystems, and their functions and services to humans. There will also be an increased probability of a sea ice-free Arctic Ocean during the summer¹. In a recent report titled 'Climate in Svalbard 2100', climate change

¹ Ice free is defined for the Special Report as when the sea ice extent is less than 106 km². Ice coverage less than this is considered to be equivalent to an ice-free Arctic Ocean for practical purposes in all recent studies.

in the atmosphere and land surface are projected up to the year 2100 and in the ocean up to the year 2070 medium to high scenarios for future climate gas emissions (/10/). The report estimates changes in for example heavy rainfall, frost days, snow cover, permafrost and glaciers.

The national adaptation report to the Storting (Meld. St. 33) for Norway (/11/) focuses on the challenges associated with climate change and how Norway can become more resilient in the face of climate change. The white paper gives an account of what the authorities are doing to enable everyone to take their share of the responsibility for climate change adaptation as effectively as possible and sets out a common framework for climate change adaptation across sectors and administrative levels. The adaptation topics specifically relevant for the Norwegian Arctic include:

- Many Arctic species which are adapted to a cold and harsh climate are already established as far north as possible and there is no alternative habitat for them to move to (/11/). Unless greenhouse gas emissions are cut, some species will be lost as a result of climate change and associated changes in their natural habitats².
- Higher temperatures and the retreat of the sea ice will allow more southerly species to move into Arctic areas. Arctic species will meet growing competition, greater predation pressure and a higher risk of disease and parasites.
- Communities that depend on the living resources of the Arctic become vulnerable to climate change as a result of the above threats to Arctic species and ecosystems.
- Climate change will pose considerable challenges for nature management in Svalbard: it will have major impacts on the species, ecosystems and landscapes, and may result in more traffic and pressure on the islands. The protected areas cover 65 % of the land area of the islands and 87 % of the territorial waters.
- As a result of melting sea ice, the Arctic is becoming more accessible for new activities such as oil and gas extraction, mining, shipping, fisheries and tourism. This can open up new opportunities but may also worsen the negative impacts on the environment and on traditional ways of using the living resources of the Arctic. Changes in activity patterns may also make it necessary to upgrade fisheries inspection, maritime safety, oil spill preparedness and response, and search and rescue capacity in the region.
- Coastal cities and communities in the Norwegian Arctic are faced with the impacts of climate change resulting in more frequent and more severe extreme weather events, sea level rise and storm surges. Infrastructure such as roads, buildings and port facilities will be vulnerable to such climate-related events.

Many of the above effects are already being observed and building resilience and adapting to climate change are thus crucial for the people and ecosystems of the Norwegian Arctic. The national adaptation report of Norway specifically addresses these issues and emphasises the importance of Arctic cooperation and the continued need to strengthen the knowledge base for climate change adaptation in the Arctic (/11/). One flagship report covering the topic is the 'Arctic Resilience Report' (/12/). The report does an effort to better understand the nature of Arctic change, including critical tipping points, as well as the factors that support resilience, and the kinds of choices that strengthen adaptive capacity.

In the report 'Climate risk and the Norwegian economy' (/13/), the impact of climate risks in the Norwegian Arctic are also highlighted. The report provides a balanced view of both the negative impacts as listed above as well as potential positive effects such as the opening of new sea routes. It also stresses that it is necessary to adopt a global perspective in addition to the national one.

The contribution of the Norwegian Arctic region towards SDG 13 can be measured through:

² A discussion on species that live in the Norwegian Arctic can be found in more detail under SDG 14 and 15.

- a) Implementation and enforcement of relevant policies, strategies and plans.
- b) Continuous monitoring and reporting of status and progress.
- c) Efforts targeted at education, research and awareness raising.

Relevant policies, strategies and plans

In September 2018, the Norwegian government adopted new State guidelines for climate and energy planning and climate adaptation (/14/). These make climate adaptation an essential part of public planning to build resilience towards the impacts of future climate change. It is stressed that climate adaptation and emission reductions must be seen in context where relevant. Hence it is important to plan for solutions that both reduce emissions and reduce risk and vulnerability as a result of climate change. The purposes of the guidelines are to:

- ensure that the municipalities and county municipalities prioritize efforts to reduce greenhouse gas emissions, and contribute to ensuring that climate adaptation is taken into account in planning according to the Planning and Building Act.
- ensure more efficient energy use and environmentally friendly energy conversion in the municipalities.
- ensure that the municipalities consider a wide range of measures in their efforts to reduce greenhouse gas emissions and adapting to climate change, and that they coordinate and contribute to finding the right balance when emission reductions and climate adaptation measures may affect, or come into conflict with, other considerations or interests.

The municipalities are also responsible for stormwater management and will have to deal with increasing volumes of stormwater as a result of climate change. The Government is evaluating current legislation with the aim to provide a better framework for the municipalities on this topic.

Extensive guidance for how to consider the potential impacts of Climate change in the regional and municipal planning processes are provided through the Norwegian Climate Change Adaptation Portal (www.klimatilpasning.no). The portal provides specific guidance for both the private and public sector planning and comprehensive information about ongoing work on climate change adaptation in Norway, lessons learned and relevant research, developments and publications. It is also closely connected to the Norwegian Centre for Climate Service's web-portal (www.klimaservicesenter.no) where past, present and future climate data are available.

The overall framework for management of Norwegian Sea areas has been laid down in the integrated management plans for the North Sea, the Norwegian Sea and the Barents Sea and Lofoten area. The latest update of the Norwegian integrated management plans for the Barents Sea-Lofoten area (BSMP) also included an update of the delimitation of the marginal ice zone (/15/). The integrated management plans incorporate climate change considerations and have adopted a number of measures to for example protect particularly valuable areas, reduce pressure on the environment and consider the risk of accidents and pollution resulting from increased level of activity in the region. The actual management of the oceans and activities there is based on the legislation governing the various sectors, such as petroleum, fisheries, aquaculture, biodiversity, pollution, etc.

Holistic and ecosystem-based approaches underpin the management plans for Norwegian sea areas, the Svalbard Environmental Protection Act and the Nature Diversity Act. The Marine Resources Act also takes an ecosystem-based approach and integrates conservation and sustainable use as basic principles for the management of Norwegian fisheries.

Monitoring and reporting

The *Integrated management plan* aims to ensure that monitoring in the Barents Sea is coordinated and expanded as needed. At all times, it should be possible to say something about the current state and progress for key indicators. Two advisory groups follow up the management plans;

- a professional forum which is responsible for the ecosystem-based assessment of developments in the sea areas, whether the goals set in the management plans have been reached and whether we have a good enough knowledge base to assess the state of the environment and what affects it.
- a monitoring group which ensures good coordination and development of environmental monitoring in Norwegian marine areas, and contribute to an overall assessment of the state and development of the marine ecosystems; including both environmental condition and man-made influences and effects.

The Monitoring group is coordinated by the Institute of Marine research (IMR) and results from the monitoring of the Barents Sea are publicly available on, amongst other places, the web site "State of the Environment Norway" (www.environment.no). This site presents the latest information about the state and development of the environment for a number of different topics.

Monitoring related to climate change and its impacts in the Arctic takes place under the auspices of several Norwegian institutions as well as international organisations such as the Arctic Council (AMAP). For example, the Norwegian Meteorological Institute together with the Nansen Environmental and Remote Sensing Centre and the Institute of Marine Research have the responsibility of monitoring and measuring the ocean and sea ice conditions in the High North and the Arctic, including plankton blooms. While the impacts of climate change on terrestrial ecosystems are observed by COAT (Climate-ecological Observatory for Arctic Tundra). This initiative, launched by the Fram Centre, is implemented at two sites representing the Norwegian sector of the tundra biome – Varanger peninsula in the low-arctic and Svalbard in the high-arctic³.

Extensive research, monitoring and mapping of species and ecosystems also takes place in Svalbard. Results are reported among other things through the environmental monitoring programme for Svalbard and Jan Mayen (MOSJ), which includes several indicators of impacts of climate change.

Research, education and awareness raising

As a result of the rapid climatic changes in the Norwegian Arctic, the Norwegian Research Council has revised its strategy for the region to ensure that the most central challenges and opportunities are addressed (/16/). In this context, the Research Council emphasises the need for research and innovation linked to:

- Climate, environment and resource management.
- Geopolitics and security.
- Living conditions and community life.
- Indigenous people's rights, culture, language and land use.
- Increased R&D efforts in the business sector to strengthen competitiveness in global markets.

Knowledge on the above is essential for developing informed and effective climate change adaptation and mitigation strategies for the region. Continued involvement of research communities throughout the country is needed, and research and knowledge communities in the north are especially well positioned to develop targeted knowledge for growth and development (/14/). Amongst others, a specific strategy for research and higher education in Svalbard has been developed (/17/). The research strategies respond to one of the key priority areas in the Norwegian Arctic

³ <https://coat.no/>.

strategy (/18/) which focuses on the need for building knowledge on amongst others the topics of Ocean and Climate. The Research Council of Norway have ongoing calls for funds for communication and dissemination of climate research to children and young students.

Integration of Climate Action knowledge into primary, secondary and tertiary curricula is the responsibility of the counties for upper-secondary education and the municipalities for primary and lower secondary education (/18/).

Indicators

- Number of local governments (municipalities) that have adopted and implemented local disaster risk reduction strategies in line with the national disaster risk reduction strategies of Norway.
- Number of deaths, missing persons and persons affected by disaster per 100,000 people.
- Evidence that mitigation, adaptation, impact reduction and early warning have been integrated into primary, secondary and tertiary curricula.
- Implementation of programs to strengthen institutional, systemic and individual capacity to implement adaptation and mitigation actions.

SDG 14 – Life below water



Level 1: Very important, high attention is required for this SDG in the Norwegian Arctic

The following SDG 14 targets are discussed in this chapter:

Target 14.1. By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

Target 14.2. By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

Target 14.3. Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

Target 14.4. By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

Target 14.5. By 2020, conserve at least 10 % of coastal and marine areas, consistent with national and international law and based on the best available scientific information

Target 14.8. Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries

Target 14.9. Provide access for small-scale fishers to marine resources and markets

Reduce marine pollution of all kinds

Reduction and prevention of marine pollution from land-based sources (e.g. through drains, sewage outfalls, industrial outfalls, direct littering) or from marine-based activities such as illegal dumping and shipping for transport, tourism and fishing of all kinds, are a key part of SDG 14. Plastics represent the largest part of the total marine debris, and there is a growing understanding, attention and concern to this topic. Recent reports show that about 90 % of the plastic in the sea is found in the sediments on the seabed, the rest is in the water column or floating on the water surface.

In Norway, consumers and the maritime industries including fishing are important sources of plastic waste in the sea⁴. In addition, Norway receives significant amounts of plastic waste transported by ocean currents from northern

⁴ Waste from the fishing industry and the aquaculture industry are further discussed in the chapter considering SDG 12 Circular economy.

European countries and sea areas, especially from the North Sea and the Baltic Sea (/19/). Globally, most plastic in the ocean comes from land-based activities. Researchers estimate that just 10 river systems carry 90 % of the plastic that ends up in the ocean and eight of the rivers are in Asia (/20/).

To reduce and prevent marine pollution, a number of measures are being implemented at all levels. From the strengthening of Norway's development programme to combat marine litter, to local communities cleaning beaches and to companies pledging to stop using single use plastic. There are several international conventions that oblige us to combat marine litter; like the United Nations Convention on the Law of the Sea (UNCLOS), the London Convention, the MARPOL Convention and the Basel Convention.

The extent of plastic is massive. Samples of the sediments taken on the Norwegian Continental Shelf in 2017 all contained microplastics (particles <5 mm). The samples from the northern North Sea and the Barents Sea contained less microplastics than from the central North Sea (/21/). An assessment from a joint Norwegian-Russian Ecosystem survey calls for concern; 80 % of debris found were plastic (/22/).

There is a substantial amount of research going on in this field and one of the main issues is trying to establish the effects of microplastics on the marine life and on human beings, which also is a sign of current knowledge gaps.

Waste management in the Norwegian Arctic is normally organized by private and intermunicipal companies. All communities, large and small, have waste collection and there are few problems with waste management on land in the Norwegian Arctic. In addition, the latest status reports on eutrophication classify Norwegian offshore and outer coastal areas as non-problem areas (/23/).

Sustainably manage and protect marine and coastal ecosystems

Marine ecosystems are under pressure from human activities and demands for marine space and resources are expected to increase.

In 2014, Norway's sea areas had the natural index value of 0.70 for the seabed and 0.71 for the sea water masses. The Nature Index summarize assessments and measurements, made by experts on the state of a selection of 67 indicators in the marine environment, reported by the Institute of Marine Research, which, together, represent biodiversity (/24/). The value 1 corresponds to the condition of an ecosystem with little human influence. The status varies between the different sea areas: 0.66 in the Barents Sea, where the cod stock is on high levels, and 0.72 in the Norwegian Sea, where the condition has been stable since the 2000s, with a high natural index value (/25/).

The Ocean Health Index (OHI) tracks the current status and expected future condition of human benefits (expressed as goals and sub-goals) from ocean ecosystems. The Index assesses the cumulative stressors on ecosystem services and tracks the resulting status of the sustainable delivery of services to people. The overall OHI score for Norway is 77 and Norway ranks as #29 out of 221 countries (/26/). The OHI is a considered a valuable tool that allows countries to evaluate the health of their waters. However, the simple mathematic averages of the scores for the ten categories used for the index have been criticized. For example, a good score in one category can compensate for a low score in another and middle score in same categories gives same result, the scoring system does not explain the actual differences. Since its release in 2012 the OHI has been improved and updated. Today, the Index includes the Arctic and Antarctica along with the High Seas in addition to the Exclusive Economic Zones (/27/).

Two key measures for protecting the oceans are to target overfishing through solid fisheries management, and to establish marine protected areas.

Fishing

The overall objective of Norwegian marine resource management is sustainable utilization (/28/). In the Marine Resources Act, the first article states the following: *The purpose of this Act is to ensure sustainable and economically*

profitable management of wild living marine resources and genetic material derived from them, and to promote employment and settlement in coastal communities (/29/). This also gives the resource management a social aspect.

Over the last few decades, the fishing industry in Norway has grown into a regulated industry with quotas and licensing requirements. The scientific basis for establishing fish quotas are the recommendations by the International Council for the Exploration of the Sea (ICES). Approximately 90 % of Norway's fish stocks are shared with other countries and international cooperation is an important part of the Norwegian fisheries management. Quota levels for the most important fish stocks, are decided in cooperation with other countries, including Iceland, Russia, Faroe Islands and Greenland and the EU. Based on Norway's quota shares resulting from international negotiations, domestic quota regulations are then established together with technical regulations governing how, where, and when to fish for specific stocks and species. Following the United Nations Convention on the Law of the Sea, the coastal states have a duty to cooperate on joint management of wild marine resources (/30/).



Figure 4 Both Norwegian and foreign fishing vessels are under strict control in all Norwegian fishing waters.

In international waters, regional fisheries commissions play an important role in regulating marine areas. In the international waters of the Northeast Atlantic, fishing is regulated by the NEAFC – the Northeast Atlantic Fisheries Commission. The responsibilities of such commissions include the distribution of resources based on negotiation

outcomes, management of international waters and undertaking measures against illegal, unreported and unregulated fishing. Marine scientists provide important input also to the international fisheries negotiations.

Both Norwegian and foreign fishing vessels are under strict control in Norwegian waters. Vessels are required to keep logbooks recording catches, and more than 2,000 inspections (/30/) are performed by the Coast Guard annually. In addition, the Directorate of Fisheries also carry out inspections at sea. Vessels over 15 m are subject to satellite-based vessel monitoring systems. There are also comprehensive reporting requirements when landing catches. Norway is compliant with the FAO flag state enforcement guidelines.

According to the IUU⁵ Fishing Index is Norway number 93 of 152 countries (/31/) in overall world ranking. The IUU Fishing Index includes 40 indicators that are applied to 152 countries with a maritime coastline. The scores can be used for comparison between countries, regions, and oceans, and help to identify where action to fight IUU fishing is needed. A score for each country is given, between 1 (as good/strong), and 5 (as a bad/weak), including weighted indicators belonging to different indicator groups. Norway's relatively low score is related to the long coastline and many ports where fish can be landed. Of more importance is the OECD analysis on IUU where Norway is given the highest overall score among all OECD-countries in *leading efforts against IUU fishing, in particular in terms of advanced enforcement and well-established international co-operation procedures* (/32/).

Improving results for biodiversity in marine ecosystems has been associated with better fisheries management during the last three decades. Today measures are implemented to protect vulnerable stocks and avoid harvesting of fish under specific sizes. A recent study assessing 85 stocks in ICES' area shows that most of them were at their lowest levels around year 2000 while they now, due to improved management practices, are at good levels similar to the 1970s (/33/). In the north-east part of this area, i.e. the Norwegian Arctic, fisheries management improvements were implemented before most other areas and the stocks have recovered earlier.

A market-related measure in improving the value of sustainable fisheries, is certification schemes informing the consumers on the sustainability of their food. One key example of such schemes is the Marine Stewardship Council (MSC) fisheries standard, based on three main principles: sustainable fish stocks, minimizing environmental impact, and efficient fisheries management. From January 2018, more than 90 % of all Norwegian wild fish landed annually is certified as sustainable. Fisheries that obtain MSCs certification need to achieve certain improvements within a certain time to keep their certificate. In this way, MSC certification contributes to continuous improvement. (/34/)

Marine Protected Areas

As one of 15 parties, Norway works with Marine Protected Areas (MPAs) through the OSPAR Convention (the Convention for the Protection of the marine Environment of the North-East Atlantic). OSPAR has through its members nominated MPAs and in OSPAR Region 1, the Arctic Waters, there is a total of approximately 107,000 km² marine protected areas (/35/). Most of these are Norwegian (Svalbard including Bjørnøya and Jan Mayen cover approximately 82,500 km²) and these are the same as Norway has as national marine protected areas. This is almost half of the total area nominated by individual countries for the OSPAR network. In addition, there is an area called the "North East Faroe-Shetland Channel" covering approximately 23 700 km² that belongs to the United Kingdom and some smaller around Iceland that cover approximately 80 km² of Marine Protected Areas in Region 1 (/04/).

Marine protected areas (MPAs) have been implemented for conservation and protection of vulnerable marine species and habitats, specifically where marine environment habitats are vulnerable, or animals or plants need special protection (Marine Resources Act).

⁵ Illegal, unreported and unregulated fishing.

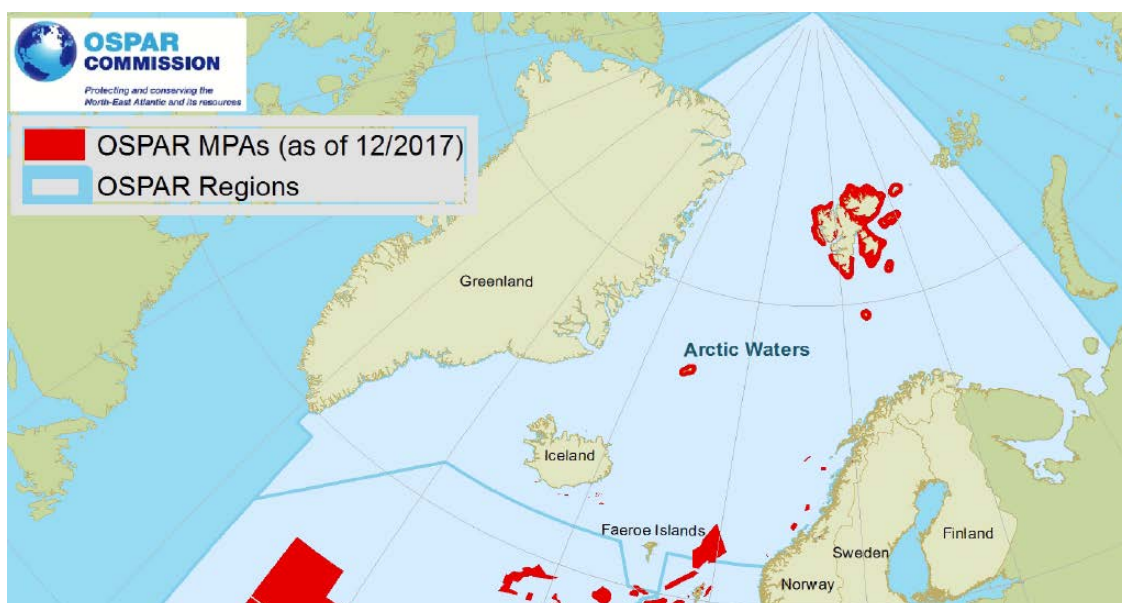


Figure 5 OSPAR Marine protected areas (MPAs) in the Arctic (Region 1). (/36/)

Protection of coral reefs is central in the MPA discussions. The largest known coral reef formed by the cold-water coral *Lophelia pertusa*, in the world, is found in Norwegian waters. The largest one, Røst Reef (Røstrevet), is located west of the Lofoten Islands, and three others (Selligrunnen, Iverryggen and Sulrevet) with a total area of 1 923 km², have been nominated as four of Norway's OSPAR Marine Protected Areas. In the near future, additionally four coral reef complexes, as part of the OSPAR network, will be nominated. They have already been protected, under the national Marine Resources Act, against damage from fisheries activities.

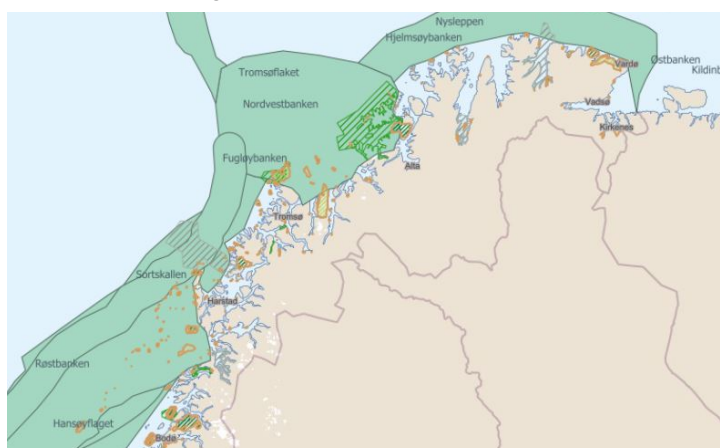


Figure 6 Protected areas in the 3 northern most counties in Norway.

Mainland (coastal) Norway has one marine protected area (Saltstraumen) which is situated in the southern Arctic and has an area of 25 km². When including all marine protected areas in mainland Norway, also those that are not in the Arctic, there are 6 marine protected areas with a total area of 243 km². These are all founded on the Nature Conservation Act (/37/).



Figure 7 Marine protected areas Svalbard and Jan Mayen. (/04/)



Figure 8 Marine protected area Saltstraumen (/04/)

An area-based method in the management plans is to identify predominantly valuable and vulnerable areas. These are areas that are important for biodiversity and its biological production in the sea area and surrounding areas. These are; The Arctic Front, the Coastal Zone and Norwegian Sea including: Remman, Froan with Sularevet, Mørebanken, Haltenbanken and Sklinnabanken, Ivryruggen, Vestfjorden, Jan Mayen and Vesterisen, Eggakanten. The knowledge about the seabed in the particularly valuable and vulnerable areas in the Norwegian Sea have been strengthened and the environmental values confirmed through MAREANO. (/38/39/)

Regarding allocation of coastal zone areas there are indications that some levels of management are struggling to follow up their commitments regarding updating of coastal zone management plans, and that the use of data such as marine geodata is challenging (/40/).

Mesopelagic fisheries and harvesting in the lower end of the food web

As traditional fishing stock catches are perceived to be relatively fully utilised in Norwegian waters, resources on lower trophic levels are of increasing interest (/41/). Key discussions here are harvesting of mesopelagic fish and copepods such as *Calanus Finmarchicus*. The latter was recently opened for experimental fishing (/42/).

Mesopelagic fish is mostly smaller fishes living in the depth between 200 and 1000 meters, including species such as *Maurolicus muelleri* and northern lantern fish. On a global scale, estimates of this resource indicates a massive biomass of perhaps 10,000 million tonnes. There are currently several projects ongoing regarding consequences of harvesting and methods for catch and use of these resources, which due to the challenges on conservation is expected to primarily be used as fish feed in the aquaculture industry. Many of the species in question, such as copepods, have attractive levels of fatty acids. The effects on the ecosystems of harvesting in these levels are not known, more scientific research is required to manage a commercial fishery (/43/).

The Norwegian Environmental Agency have pointed out the need for better monitoring data for currently non-commercial species, not least for invertebrates and algae. It will probably be technological and economic challenges by studying and not least by monitoring invertebrate species, many of which are very small.

Minimize and address the impacts of ocean acidification

The ocean in the Norwegian Arctic is believed to be particularly vulnerable for increased ocean carbon dioxide concentrations referred as ocean acidification (/44/). Due to lack of long-term monitoring there is still large uncertainty about the fate processes and effect of ocean acidification in the Arctic Ocean. Long term monitoring is needed to assess change and to understand the processes that control the carbon dioxide variability.

The sea ice is important for ocean acidification since it has the potential to concentrate alkalinity. When the ice melts, the alkalinity becomes released into the surface water and the potential for uptake of CO₂ increases. When more CO₂ is taken up in the surface water, the CaCO₃ saturation state is reduced, which results in less carbonate ions being available for marine organisms to build calcareous skeletons. Cold water corals are assumed to be particularly exposed (/45/).

Research partnerships between the Fram Centre, IMR and the Norwegian Polar Institute have established time series in the Arctic to measure and monitor changes in ocean chemistry to follow the fate and effect of increased ocean CO₂. There are only a of few such time series and more are needed (/45/).

Increase scientific knowledge, develop research capacity in and transfer marine technology to developing countries.

Common challenges in developing countries are related to management of marine resources such as, unsustainable fisheries, illegal, unreported and unregulated fishing, uneven access to fishery resources, that weaken living conditions and food security. Developing countries have substantial opportunities to improve within these areas.

Norway has cooperated in fisheries development since the 1950s. Since then, a range of development projects and initiatives have been launched. Currently, the 'Fish for Development programme' (FfD) is operational and manages most of the fish-related projects in Norway's development cooperation. (/46/). It was launched in 2015 by Norad who is responsible for managing most development projects in the field of fisheries and aquaculture supported by Norway so that developing countries can benefit from Norwegian competence and expertise. (/46/)

In the Arctic region, it is UiT The Arctic University of Norway that has a leading role in development cooperation related to the oceans. It has been involved in projects in various countries including Vietnam, Sri Lanka and several African countries. The work has mainly focused on expertise and capacity building in the fisheries and aquaculture sector, and is in line with several sustainability targets, including 1, 2, 8, 13 and 14 (/47/). An important part of this is a master program in International Fisheries Management which has been running for more than 20 years.



Figure 9 Norwegian fishing vessel.

Provide access for small-scale fishers to marine resources and markets

Norway has a differentiated fishing fleet structure, both in terms of different length of fishing vessels and various fishing gear groups. Small scale fisheries take several forms such as:

- **Small scale fisheries as profession:** Smaller fishing vessels, e.g. up to 11 meters length, are in numbers the main part of the registered Norwegian fishing fleet. In 2012, 79 % of the fishing vessels were under 11 meters, 13 % were vessels between 11 and 15 meters, while the remaining 8 % were vessels over 15 meters. In Norway, people who fulfil the criteria of being full time or part time fisherman and have a certified vessel may participate without license in most fisheries but on most species, there are caps on quota they can catch. The quota on cod has in recent years been reduced, which is typically a large share of the yearly income for smaller vessels in the region. Licenses with larger quotas can be bought, but due to good access to fish and low interest rates, prices on such licenses have increased. Over the last few years, due to the many accidents with small fishing vessels new safety certification requirements such as stability calculations, safety management systems and more safety equipment has been enforced to the smaller fishing vessel size groups. This has led to increase in cost of running a small-scale fishing entity.
- **Tourist fishing:** The rich Norwegian coast draws many tourists who are seeking unique fishing experiences. The growth of this industry has led to debates both on the tourists' safety and the volumes they are catching. New regulations have been implemented such as registering and reporting schemes for companies providing such fishing experience services and updated personal quotas on 10 kg and 20 kg depending on whether the tourist is fishing privately or through a registered company. Sales of catch from these activities are not allowed (/48/). Volumes of catch from tourists are uncertain. Some studies indicate that the fisheries exceed the reserved quota for coastal cod, 7,000 tonnes in 2016, and that the impacts of

this fishing may be significant in some waters (/49/). There are also indications of high numbers of catch-and-release (/50/).

- **Leisure fishing:** The right to catch your own fish dinner is important in Norway. There are some regulations related to leisure fishing regarding fishing gear and minimum sizes of fish. If the catch caught from leisure fishing is to be sold, there is a current limit of yearly sales value of NOK 50,000. The fish must then be sold through the regular fishermen's sales organisations.

A large share of the vessels fishing with conventional gears participate in the cod fisheries in the Norwegian Arctic. There are a large number of landing sites and fish processing plants, and the infrastructure for bringing products to markets is relatively well developed. There may be challenges in the pelagic fisheries, where the reduction in number of processing factories on land is larger than in the whitefish sector, and the economies of scale may challenge smaller catches competitiveness (/51/).

An additional perspective of small-scale fisheries is the rights and activities of the Sámi people. According to Norwegian Official Report from 2008, the Sea Sámi living on the coast of Norway have sea fishing rights (/52/). New legislation, protecting the rights of Sámi and other population residing along the coast of Finnmark county, has been proposed by the governmental commission. Fishing is an important part of sea Sámi culture.

The Sea Sámi people have experienced a decline in the population and in fishing activities. Subsequently, the proposals of the commission have not been adopted by the Ministry Trade, Industry and Fisheries due to the lack of clarity distinguishing between the state's international law responsibilities and the state's policy goals for coastal fishing in the Norwegian Arctic. According to the Ministry, the future of settlements in these areas will depend on other factors other than fisheries. The rights of the Sea Sámi, together with the issue of finding a compromise between small-scale coastal fisheries and large-scale marine fisheries, are of concern for Sea Sámi people and culture (/53/).

Indicators

Reduce marine pollution of all kinds

- Use indicator based on the 'riverfeed' program which measures input of nutrients and selected pollutants to Norwegian coastal areas (/54/).
- New monitoring programs need to be established to measure the amount and location of plastics in the sea.
- Monitoring of beach litter is done at 4 stations along the coast of Norway and 2 stations on Svalbard since 2011 under the OSPAR 'Beach Litter' programme (/55/).

Sustainably manage and protect marine and coastal ecosystems

- Proportion of national exclusive economic zones managed using ecosystem-based approaches (indicator not finalized).

Minimize and address the impacts of ocean acidification

- In Norway, the Institute of Marine Research, NIVA, and Uni Research monitor ocean acidification of Norwegian marine areas on behalf of the Environment Agency (/56/).

Effectively regulate harvesting and end overfishing

- Proportion of fish stocks within biologically sustainable levels. Assessments are made of the fish stocks that have a high commercial value in the Norwegian Arctic. This is done by the International Council for the Exploration of the Sea (ICES) on the basis of data from the IMR and PINRO (Russia).

Conserve at least 10 % of coastal and marine areas

The number and size of marine protected areas (MPAs) can be used as an indicator. This is data that are available both from the Norwegian Environment Agency and OSPAR.

Another possible indicator is to monitor the change of species before and after areas are being designated as marine protected areas.

Increase scientific knowledge, develop research capacity and transfer marine technology

- Proportion of total research budget allocated to research in the Norwegian Arctic in the field of marine technology. Statistics are available from Statistics Norway (SSB) and the Nordic Institute for Studies in Innovation, Research and Education (NIFU).

Provide access for small-scale fishers to marine resources and markets

- The presence of local strategies that recognizes and protects access rights for small-scale fisheries.
- Provide statistics on number of small-scale fishers that have access to marine resources and markets.
- Size of open group cod fisheries quota.

SDG 15 – Life on land



Level 2: Important, attention is required for this SDG in the Norwegian Arctic

The following SDG 15 targets are discussed in this chapter:

Target 15.5. Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

Target 15.6. Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed

Reduce the degradation of natural habitats, halt the loss of biodiversity

On 31 March 2006, the Ministry of the Environment presented an integrated management plan for the Barents Sea–Lofoten area (/57/). It was based on several years of work, including surveys of resources and studies to identify particularly vulnerable and valuable areas and endangered and vulnerable species. In March 2011, an updated plan was presented that confirms the valuable and vulnerable status of the areas and species (/58/). A new update will be finalised by June 2019.

The management plan provides a framework for commercial and other activities in the area and a basis for a management regime designed to prevent pressures on ecosystems from exceeding sustainable levels. For this to be successful, natural resources and the environment need to be closely monitored. A set of environmental indicators have been established to describe the state of each sea area and the last report from this monitoring group was published in 2017 (/59/).

The Barents Sea area has fish populations in good condition, while most of the seabird populations have had a significant and rapid decline. This includes indicator species like Black-legged Kittiwake (Endangered on red list), Atlantic Puffin (Vulnerable), Brünnich’s Guillemot (Vulnerable) and Common Guillemot (Critically endangered). The cause for the decline is not fully known but seems to be related to failing food supply. This could be due to secondary effects of climate change, lower production of prey or commercial harvesting of fish resources. It has been measured high levels of pollutants in seabird eggs and the results give reason to worry for environmental pollutants for seabirds in Norwegian waters (/60/).

There has been pointed out knowledge gaps on several areas like:

- Knowledge on the causes for changes in seabird populations.
- The effect of changes in predators for seabird colonies and synergy effects between food supply and predation.
- Condition of sandeel and its relation to changes for seabird populations.
- How the changes in kelp forest influences the food conditions for coastal seabirds.

- How climate change changes the availability of fish larvae around the huge seabird colonies.
- How migrating seabirds is affected by changes in the marine environment in their wintering areas.
- How climate change affects the distribution of the Arctic and sub-arctic food web in the Barents Sea and how this affects the seabird populations.

Polar bears (*Ursus maritimus*) are found throughout the Arctic, including the Svalbard archipelago and the surrounding sea ice in the Barents Sea. Polar bears are highly dependent on ice cover, since they hunt mainly from the ice. Their most important prey species, the ringed seal and bearded seal, are perhaps even more strongly associated with the sea ice. The polar bear is at the top of the Arctic food chain and will therefore be rapidly affected by changes in the populations of prey species.

It has been documented that polar bears have high loads of persistent organic pollutants (POPs), and that these pollutants affect bear health. Concentrations of new types of pollutants, such as brominated flame retardants and fluorinated compounds, are rising in polar bears, whereas there is a general decline in levels of 'old' POPs such as PCBs and DDT in most parts of the Arctic. The levels of pollutants measured in polar bears on Svalbard are so high that they have been linked to several health defects, such as reduced immune response and disturbed hormone balance. However, it is not yet possible to say how seriously pollutants will affect the polar bear's ability to reproduce and what impact this will have on the population itself (/61/).



Figure 10 Polar bears are highly dependent on ice cover, since they hunt mainly from the ice.

Promote fair and equitable sharing of the benefits

The Norwegian Government views marine bioprospecting as a means to innovative, sustainable value creation. The potential for value creation is substantial, and Norway is in a good position to make its mark in international competition. The Government considers that Norway's long coastline and extensive sea areas offer rich opportunities for access to resources and high species diversity. In combination with the national expertise that has already been built up in the marine sector and biotechnology, this gives Norway a good starting point for a national initiative for

marine bioprospecting (/62/). Bioprospecting with regards to employment and economic growth is also discussed in SDG 8.

Indicators

Reduce the degradation of natural habitats, halt the loss of biodiversity

Use Artsdatabanken (Norwegian Biodiversity Information Centre) to establish number of red listed species in the Norwegian Arctic. It is necessary to develop an index to monitor changes in number of species.

Promote fair and equitable sharing of the benefits

Number of interesting and unique genes, molecules and organisms from the marine environment registered in Marbank (Institute of Marine Research) which may have features that could be useful to society and/or have potential for commercial development.

Society

In this chapter the status of the Norwegian Arctic society is described with respect to poverty, hunger, health, education, gender balance, energy and sustainable cities and communities. None of the development goals here are rated as of highest importance category, due to the fact that Norway in general performs quite well in this category and there are not large differences to the Norwegian Arctic.

Still, there are important challenges to address when it comes to the societies of the region in question. In the previous chapter changes in the biosphere were discussed. To be able to cope with these, it is important to build resilience in the societies. Combined with the purpose of leaving no one behind, this underlines the overall priority of understanding the current status of sustainability.

SDG 1 – No poverty



Level 3: Less important, there are already good conditions for this SDG in the Norwegian Arctic

The following SDG 1 target is discussed in this chapter:

Target 1.2. By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions

There is limited poverty in Norway and the Norwegian Arctic from an international perspective. Norway has universal and free access to healthcare, education and welfare.

While there is no national poverty line in Norway, income distribution and the proportion of the population with a low income can be used as a measure of relative poverty (SSB, 2018).

Income levels

The median income after taxation is slightly lower in the Norwegian Arctic than in Norway, however the difference is small. The median incomes in Nordland, Troms and Finnmark are 422,000, 422,000 and 430,000 NOK, respectively, while the median income in Norway is 431,000 NOK (/63/).

Income inequality in Norway is low, measured as the relationship between average incomes of the 20 % in the population with the highest income and the 20 % with the lowest income (/64/). Nordland, Troms and Finnmark are some of the counties in Norway with the lowest income inequality levels⁶.

⁶ Further discussed in SDG 10 Reduced inequality.

Low-income households

Challenges in Norway related to relative poverty include children living in low-income households. Low-income is defined by SSB as income 60 % below the national median income. The percentage of children living in low-income households in the Norwegian Arctic is, however, slightly lower than in the rest of the country. While 12 % of children grow up in low-income households in Norway, the numbers for Nordland, Troms and Finnmark are 11 %, 10 % and 11 % respectively (/65/).

Disability benefits

Poverty in Norway is largely related to participation in the labour market. Unemployment rates in Norway and in the Norwegian Arctic are low. In the Norwegian Arctic, there is a slightly higher percentage of the population on disability benefits compared to the level in Norway as a whole. In Nordland, 12.9 % of the population receive disability benefits, in Troms 10.5 % and in Finnmark 11.0 %, while in Norway the level is 9.8 % (/66/).

Looking at the age group 18-24 years, a slightly lower percentage of the age group receive disability benefits in Troms (4.1 %) and Finnmark (4 %) compared to Norway (4.3 %). In Nordland, however, 5 % of the youth in this age group receive disability benefits (/67/, /68/ and /69/).

Indicators

Monitor statistics for income level and disability levels for the Norwegian Arctic.

SDG 2 – Zero hunger



Level 3: Less important, there are already good conditions for this SDG in the Norwegian Arctic

The following SDG 2 target is discussed in this chapter:

Target 2.3. By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

Norway and the Norwegian Arctic generally performs well on this Goal.

Food production

Norway exports 37 million seafood dinners every day, and a large part of catch and production takes place in the Norwegian Arctic with fisheries on large stocks such as cod and herring, and aquaculture with salmon as the main products⁷.

Reindeer is an important part of the traditional food production in the region. The last decade production volume is reduced, but in a longer perspective there is quite high numbers of reindeer in current production: approximately 211,000 compared with 60,000 – 70,000 in the 1950s and 80,000 – 90,000 in the 1960s⁸. (/70/).

In agriculture, the Norwegian Arctic is not the most productive region (/71/):

- The region is noted as not suitable for fine grain production but for feed and rough grains.
- 10 % of the milk production and 10 % of livestock production is in the Norwegian Arctic.
- 15 % of sheep and 6 % of pork production is in the Norwegian Arctic.

Indicators

Monitor statistics for productivity and income of fisheries, aquaculture, agricultural production and reindeer herding in the Norwegian Arctic.

⁷ See SDG 8 for more details.

⁸ This is the entire Sami reindeer production, including the Trøndelag county south of what's normally been referred to as the Norwegian Arctic in this report.

SDG 3 – Good health and well-being



Level 3: Less important, there are already good conditions for this SDG in the Norwegian Arctic

The following SDG 3 targets are discussed in this chapter:

Target 3.4. By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being

Target 3.5. Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol

Life expectancy in the Norwegian Arctic is high, with Nordland and Troms close to the national level of 79.8 years for men and 83.7 years for women. Life expectancy in Finnmark is lower, with 77.4 years for men and 82.6 years for women (/72/). While health in Norway and the Norwegian Arctic is generally good, there are challenges particularly related to non-communicable diseases and substance abuse.

Non-communicable diseases

While Nordland (36 per 1000 people) and Troms (37 per 1000 people) are at or close to the national level for type-2 diabetes (36 per 1000 people), Finnmark has a higher rate of type-2 diabetes (41 per 1000 people). The counties in the Norwegian Arctic also have higher levels of cardiovascular disease than the national level, with Finnmark having the highest levels.

A higher percentage of youth in the Norwegian Arctic are overweight or obese compared to the rest of the country. 28 % of seventeen-year olds in Nordland and Troms, and 31 % of seventeen-year olds in Finnmark are overweight or obese, compared to 23 % at the national level.

Regarding mental health in the age group 15-29 years, Finnmark is at the same level as Norway, while Nordland and Troms have a slightly higher number of people per 1000 who receive support through public health care services (/67/, /68/ and /69/).

Substance abuse

Consumption of alcohol purchased is slightly higher in Nordland and Troms (5.4 litres per person) compared to Norway (5 litres), while Finnmark has a lower consumption level (4.8 litres). There is not enough data on the use of narcotics to compare the Norwegian Arctic to the rest of the country (/67/, /68/ and /69/).

Indicators

Monitor statistics for non-communicable diseases and substance abuse in the Norwegian Arctic. Data from the Norwegian Institute of Public Health and Statistics Norway (SSB) can be used.

SDG 4 – Quality education



Level 2: Important, attention is required for this SDG in the Norwegian Arctic

The following SDG 4 targets are discussed in this chapter:

Target 4.4. By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

Target 4.5. By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations

Increase the number of youth and adults who have relevant skills

In the Norwegian Arctic the school results are lower than the national average, with low completion rates in upper secondary schools, and there is a shortage of qualified teachers (/18/).

Participation in secondary education is a general challenge in Norway, with 15 % of students dropping out of high school. As illustrated in Figure 11, high-school drop-out rates⁹ are even higher in the Norwegian Arctic than in the rest of the country, with 16 % dropping out of high school in Troms, 18 % in Nordland and 21 % in Finnmark (/73/). In Norway, high school drop-out rates differ considerably between vocational education and education preparing for higher education, being 24 % and 5 % respectively. The trend is similar for the Norwegian Arctic, where the drop-out rate within vocational education is 29 %, while the drop-out rate for education preparing for higher education is 6 %.

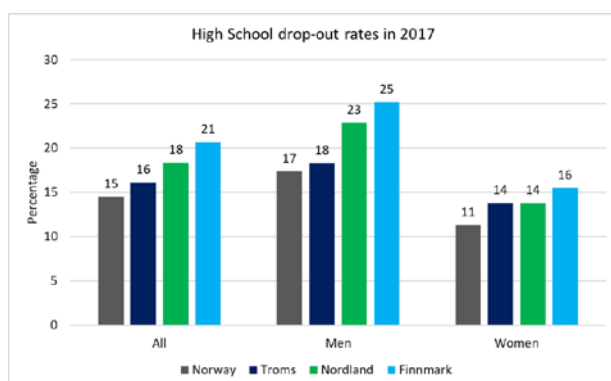


Figure 11 High School drop-out rates in 2017. (/73/)

Trainee programmes as part of vocational training are an important part of secondary education. Around 70 % of applicants in the Norwegian Arctic receive a trainee contract, on par with the national level in Norway. However,

⁹ Students who started high school in 2012 and did not complete within five years.

trainee completion rates are lower compared to the rest of the country (80 % in Nordland, 70 % in Troms and 76 % in Finnmark compared to 82 % for the whole country) (/74/).

In the Norwegian Government strategy for the Norwegian Arctic (/18/) one of the priority areas is to improve the quality of education from primary school to university and increase completion rates.

In addition, the Norwegian Government will follow up the Norwegian Strategy for Skills Policy by promoting more Sami projects, and by implementing measures to encourage companies to improve their employees' skills and knowledge by providing further training and education opportunities. As discussed in SDG 13, knowledge on the ocean and climate change is also a priority.

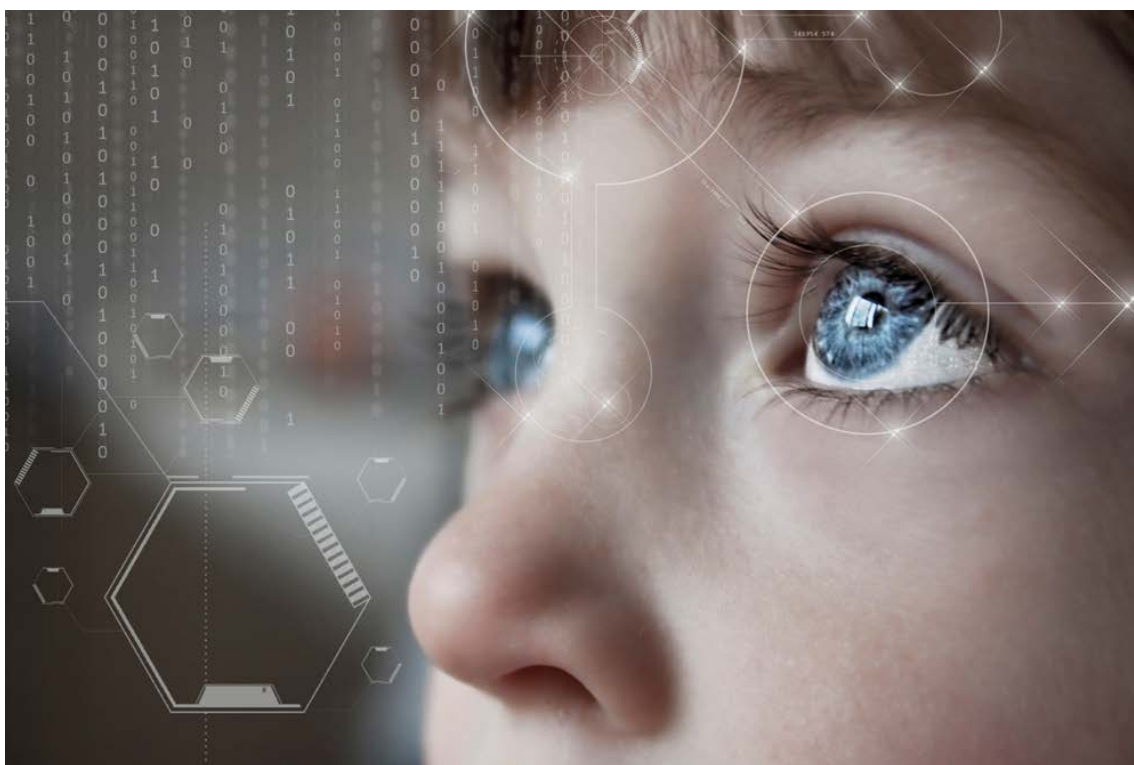


Figure 12 High-school drop-out rates are higher in the Norwegian Arctic than in the rest of the country.

Gender disparity in education

As shown in Figure 11, there is significant gender disparity in completion rates for high school programmes in Norway, including in the Norwegian Arctic. While 14 % of the girls in Nordland, 14 % of the girls in Troms and 16 % of the girls in Finnmark who started high school in 2012 did not complete high school within five years, the respective numbers for boys are 23 %, 18 % and 25 % (/73/).

Education and vocational training for indigenous people

The Sámi people in the Norwegian Arctic have lower levels of formal education than the rest of the population in Norway. 38.3 % of the Sami population in the region have primary school as the highest level of education (26.5 % in Norway), 40.2 % have secondary school as the highest level (40.6 % in Norway), 17.7 % have a short higher education (up to 4 years) as the highest level (23.4 % in Norway) and 3.8 % of the Sami population have higher education more than four years (9.5 % in Norway). There are also gender differences within the Sami population. For example, 23.8 % of the women have short higher education compared to 12.2 % of the men (/75/).

Indicators

- Education strategy in place for improving primary, secondary and tertiary education and completion rates in the counties and municipalities in the Norwegian Arctic.
- Use statistics for completion rates and gender disparity to monitor the implementation of education strategy by county councils and municipalities.

SDG 5 – Gender equality



Level 2: Important, attention is required for this SDG in the Norwegian Arctic

The following SDG 5 targets are discussed in this chapter:

Target 5.2. Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation

Target 5.5. Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life

Violence against women and girls

Violence against women and girls is a challenge in the Norwegian Arctic. The Sami population is more exposed to violence than the rest of the population in Norway. 49 % of Sami women report that they have been exposed to violence, compared to 35 % of non-Sami women in Norway. 22 % of Sami women also report that they have been exposed to sexual violence, compared to 16 % of non-Sami women (/76/).

Women in leadership

The counties in the Norwegian Arctic perform better compared to the rest of the country in terms of women in leadership in business. While 18 % of board members in private companies are women at the national level, the numbers are 20 % for Nordland and Troms, and 23 % for Finnmark. For public companies, the percentage of female board members are even higher, with 44 % in Nordland, 50 % in Troms and 67 % in Finnmark, compared to 42 % at the national level. There are also more female managing directors in private companies in the Norwegian Arctic compared to the rest of the country, with 18 % female managing directors in Nordland, 18 % in Troms and 19 % in Finnmark, compared to 16 % in Norway. However, in 2017 there were no female managing directors in public listed companies in the Norwegian Arctic (/77/), but several leaders of governmental organisations are female.

Looking at the private sector and public sector together, there are more women in management in the Norwegian Arctic compared to Norway. While 35.7 % of managers in Norway are women, the numbers for Nordland, Troms and Finnmark are 39.5 %, 38.8 % and 38.8 % respectively (/77/).

In Nordland (39.5 %) and Finnmark (39.6 %), there are slightly more female representatives in municipal councils compared to Norway as a whole (38.9 %). Troms has 36.8 % female representatives in municipal councils (/78/). In 2017, 44 % of the members of the Sami Parliament were women.

Indicators

Monitor statistics for violence against women and girls in the Norwegian Arctic. Data from Norwegian Centre for Violence and Traumatic Stress Studies (NKVTS) and the Norwegian National Human Rights Institution (NIM) can be used.

Monitor statistics for women in private and public leadership positions in the Norwegian Arctic. Data from Statistics Norway (SSB) can be used.

SDG 7 – Affordable and clean energy



Level 2: Important, attention is required for this SDG in the Norwegian Arctic

The following SDG 7 targets are discussed in this chapter:

Target 7.1. By 2030, ensure universal access to affordable, reliable and modern energy services

Target 7.2. By 2030, increase substantially the share of renewable energy in the global energy mix

Target 7.3. By 2030, double the global rate of improvement in energy efficiency

On-grid connected power generation

Mainland Norway has come a long way in terms of securing affordable and clean energy for everyone. 96 % of the electricity production in the Norwegian Arctic comes from renewables. Hydropower plays a key role in the Norwegian power system, and the Norwegian Arctic is no exception. Wind power is also growing and is expected to take a larger share in the coming years. The sources of electricity in the Norwegian Arctic are illustrated in Figure 13 (/79/ and /80/).

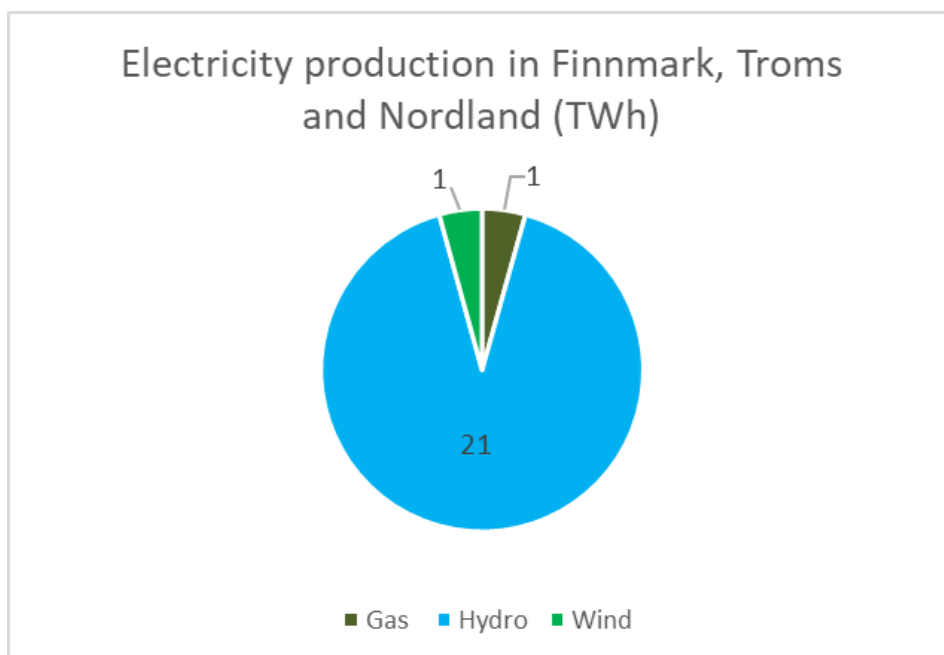


Figure 13 Electricity production in the Norwegian Arctic.

The Norwegian Arctic has a power surplus. If the region is to expand its production capacity it is either because of increased demand or with an intention to export electricity to other parts of Norway or Europe. The use of hydro, wind and gas in power generation in Finnmark, Troms and Nordland is discussed below.

Hydropower

Thanks to natural resources and geography, Norway has been able to take advantage of the potential energy stored in reservoirs located high-up in mountain areas. A special feature of the Norwegian hydropower system is its high storage capacity; production can be increased and decreased as needed at low cost. Hydropower stands for about 91 % of the electricity production in the Norwegian Arctic. Figure 14 shows the yearly production of hydropower in Nordland, Troms and Finnmark (/79/).

78 % of the hydropower capacity in the Norwegian Arctic is in Nordland. The biggest hydropower plants in the Norwegian Arctic (Svartisen, Rana and Nedre Røssåga) are also all located in Nordland.

According to NVE (/81/), several hydropower plants will be built or upgraded/expanded in the Norwegian Arctic in the coming years:

- Increased capacity of 27 GWh in Finnmark.
- Increased capacity of 832 GWh in Nordland.
- Increased capacity of 312 GWh in Troms.

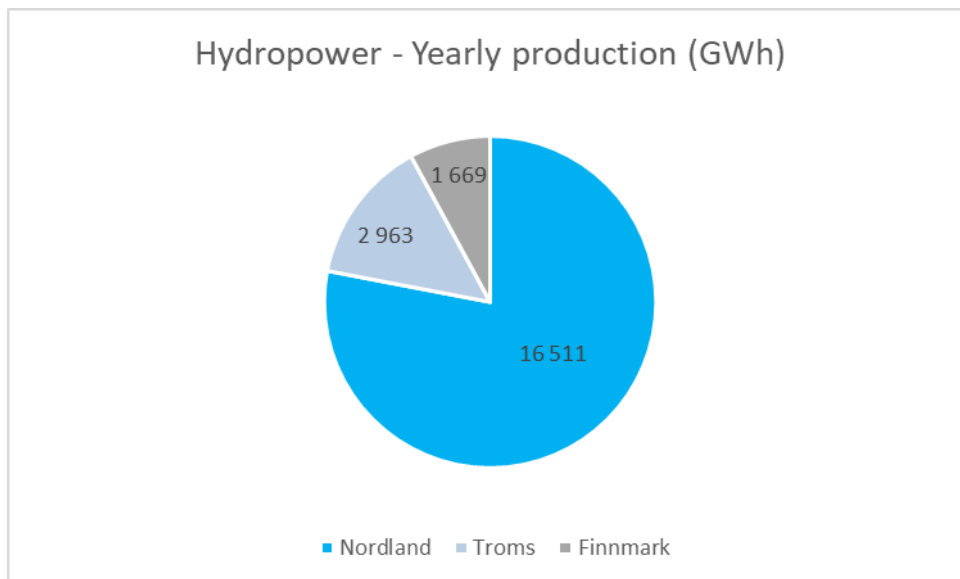


Figure 14 Electricity production from hydropower.

Wind

The Norwegian Arctic has some of the best wind resources in the country. Today there are seven wind power plants in operation. Figure 15 below shows the yearly production and share between Nordland, Troms and Finnmark (/80/).

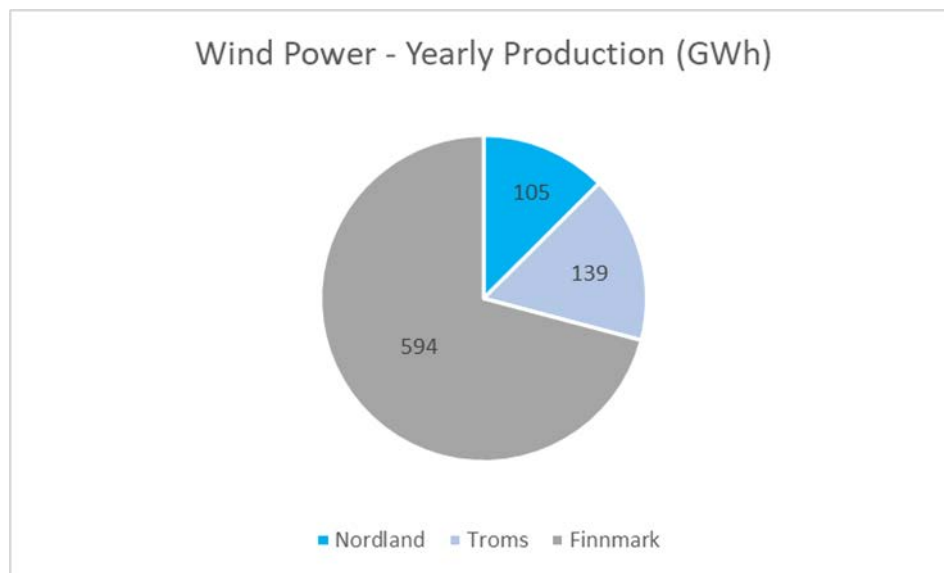


Figure 14 Electricity production from wind power.

Due to its good wind resources, the Norwegian Arctic is often mentioned as an attractive place to invest in new wind power. However, new power production will lead to an increase in power surplus. Since the transmission capacity out of the Norwegian Arctic is limited, new power production will result in lower power prices compared to the rest of Norway. NVE expects that the power price in the Norwegian Arctic is 2 øre/kWh lower than in the south in 2020, and 7 øre/kWh lower in 2030 (/82/).

In a recent report, Statnett indicates that the region will soon reach the point where further investments in wind power is unprofitable (/83/). Despite that many of the best wind resources are in the Norwegian Arctic, Statnett's report concludes that without significant growth in consumption and/or increased network capacity, the Norwegian Arctic appears less favourable for further wind power development due to three reasons:

- Expected development in the power system will lead to lower power prices in the north.
- Development in these areas will meet bottlenecks that further reduce prices.
- More of the new production disappears in transmission losses compared to new production in the south.

As highlighted by Statnett, there are two measures that can make the power prices in the north and south of Norway more aligned: building more grid or increasing the local use of power. Building more grid to avoid the bottleneck will imply substantial investments in the grid all the way from Finnmark throughout Norway and Sweden.

Gas

The only on-grid connected power production from non-renewable sources in the north of Norway is located at Melkøya outside Hammerfest. Melkøya is a facility that processes natural gas from the Snøhvit field in the Barents Sea. The facility is also connected to the grid and does deliver some electricity to the power system.

Svalbard

Compared to the Norwegian mainland, Svalbard is a special case in many ways, also in terms of energy supply. Longyearbyen is the largest settlement, with about 2 100 inhabitants. The winter is long, with a dark period of almost 4 months and low temperatures both summer and winter. Private houses and commercial buildings need heating all year around. Sun conditions are on the other hand good during the summer with a long period of midnight sun. The Arctic nature in Svalbard is vulnerable and special precautions are necessary when planning for new infrastructure. The average temperature is low, and all infrastructure must be built for operations under arctic conditions (/84/).



Figure 15 The core of today's energy supply at Svalbard is a power plant that uses locally extracted coal

The core of today's energy supply is based on a power plant that produces power and heat based on locally extracted coal. The plant, built in 1982, is located in the outskirts of Longyearbyen and a maintenance plan has indicated that the plant can be operated until 2038. There is ongoing work to identify alternative solutions for energy supply on Svalbard; not only to find alternative solutions for 2038 and onwards, but also as a vital part to meet Norway's climate ambitions and goals. The Ministry of Petroleum and Energy has recently published a study that highlight the following solutions for future energy supply on Svalbard (/84/):

- LNG power plant without CCS.
- Heat power plant based on pellets.
- Solar power in combination with LNG.

District heating covers most of the demand for heating in Longyearbyen; electricity accounts for 40,000 MWh and district heating for 70,000 MWh each year (both use coal as energy source). District heating is mainly supplied to households and municipal services, while business activities take a greater part of the electricity consumption (/84/).

Oil and gas production

The Goliat oil field, located 50 km southeast of Snøhvit and 85 km northwest of Hammerfest is developed with 8 subsea templates and a Sevan cylindrical FPSO. Production started in 2016 and the oil is shuttled to market.

The Barents Sea has several oil and gas discoveries and the Johan Castberg field is under development and will start producing in 2022. The Norwegian Petroleum Directorate estimates that the Barents Sea have more than 2/3 of undiscovered oil and gas resources on the Norwegian Shelf and there is currently high exploration activity in the area by companies like Equinor, Lundin and Aker BP.

The Barents Sea is frequently described as a high-risk Arctic area. Oil projects there are often seen as profitable, but the financial viability of gas production in this area is questioned. While oil developments have a short payback time – often only a few years – repayment usually takes longer for gas projects. On the other hand, gas yields lower emissions and is therefore expected to be less vulnerable to climate measures. A recent paper that addresses this, identifies gas as a low-carbon alternative to coal in power generation and finds that Arctic output of gas will be higher than today even in a two-degree scenario (/85/).

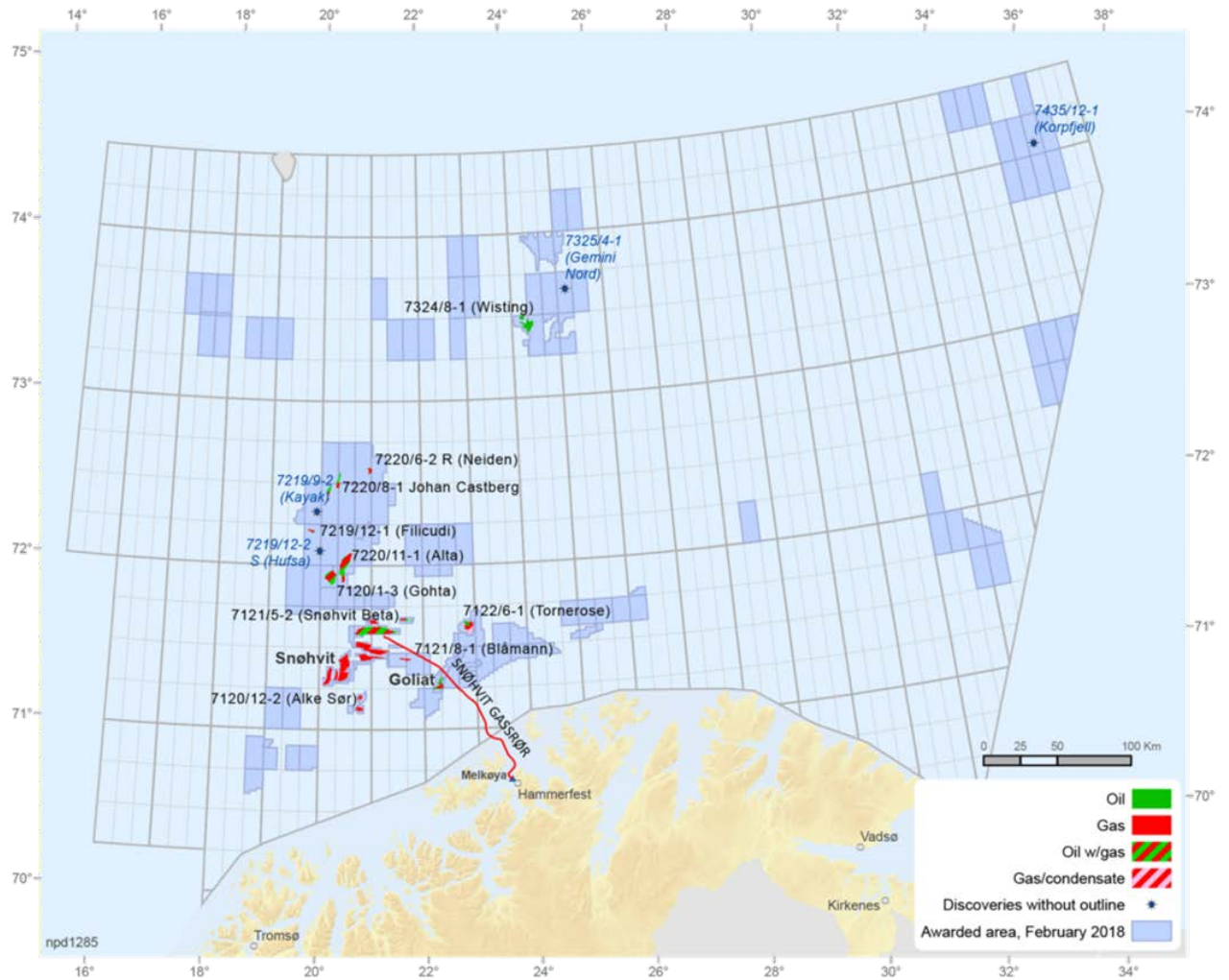


Figure 16 Oil and gas fields outside Hammerfest. (/86/)

The Norwegian Petroleum Directorate (NPD) acquired seismic in the Barents Sea in the period from 2012 to 2017. This work will continue in 2019, and the Norwegian Parliament has allocated funds for mapping an area in the north-eastern part of the Barents Sea, near the Russian border.

Energy consumption

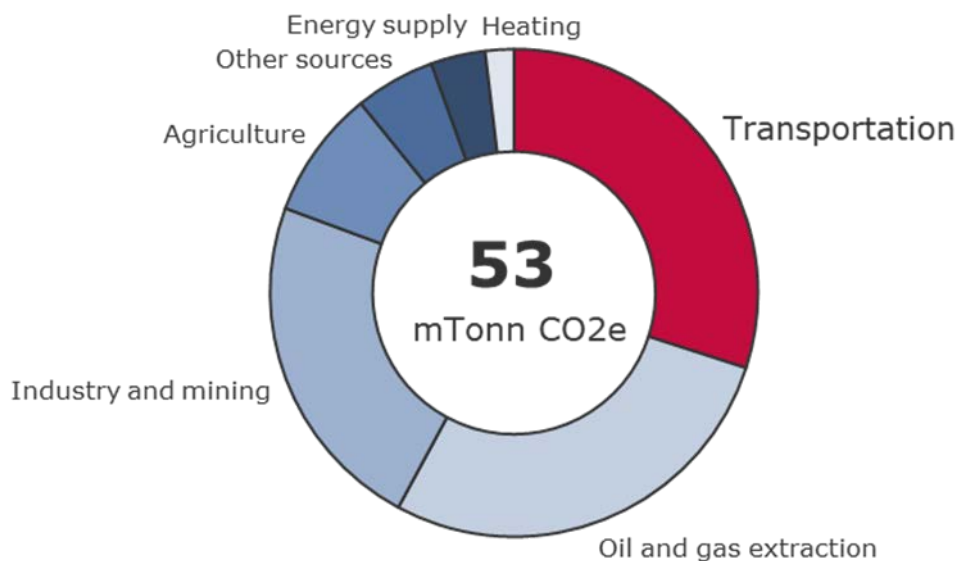


Figure 17 Greenhouse Gas Emissions. (SSB, illustration by DNV GL)

The power system in Norway is based primarily on renewable energy sources and it is hence the consumption side that will play the key role towards a low emission society. This section aims to summarize how emissions are distributed across sectors in Norway, and what sectors that will play a key role towards a low-emission future.

Figure 18 shows how greenhouse gas emissions were distributed across sectors in Norway in 2017 (/87/). Transportation makes up the biggest share, followed by industry and mining, and oil and gas extraction. There is limited statistics for emissions and energy consumption per sector for the Norwegian Arctic, but overall statistics for Norway is assumed to be representative also for the Norwegian Arctic.

Norway's participation in the EUs Emissions Trading Systems (EU ETS) will be important to reduce emissions from sectors covered by the trading system¹⁰. Norway is committed to reduce 43 % of emissions from these sectors within 2030 compared to 2005. In addition, a reduction is also needed in the sectors that are not covered by the system¹¹. Norway will most likely soon commit to the EUs Effort Sharing legislation that establishes binding annual greenhouse gas emissions targets for most sectors not included in the EU ETS (/87/).

¹⁰ The Norwegian ETS applies to the following energy and industrial sectors: energy production; refining of mineral oil; coke production; production and processing of iron and steel; production of cement, lime, glass, glass fibre, and ceramic products; and production of paper, board, and pulp from timber or other fibrous materials.

¹¹ Emissions that are not included in the EU ETS system are emissions from transportation (excluding airborne), agriculture, construction and waste, as well as a small part of the emissions from industry and petroleum industry.

Transportation

In Norway, the energy consumption in the transport sector was 54 TWh in 2017. The figure below shows the split between the different transportation modes (/88/).

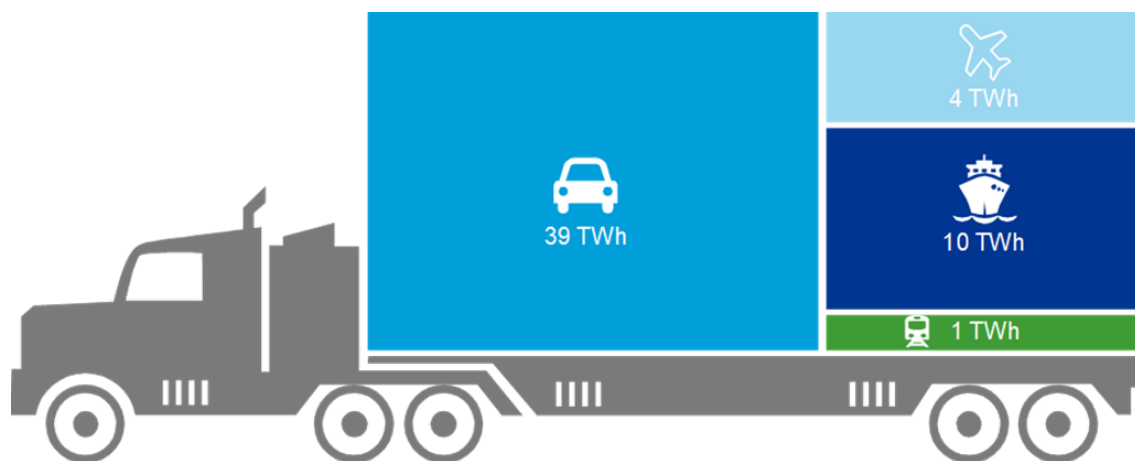


Figure 18 Energy consumption in road-, air-, marine- and rail transport in 2017. (SSB, illustration by DNV GL)

As illustrated in figure 18, transportation makes up 30 % of the green house gas emissions in Norway. Accounting only for emissions not included in the EU ETS, the sector accounts for about 60 % (/89/). The transport sector will therefore play a key role in the energy transition in Norway as a large part of reductions in non-quota related emissions must be handled in this sector. The Government has set a target to reduce emissions in the sector with 35-40 % by 2030 compared to 2005 (/89/), and will likely also soon commit to the EUs Effort Sharing legislation¹² (/87/). In practical terms, reducing emissions in the transport sector implies replacing fossil fuel with electricity, bio fuel and hydrogen. As electric motors are more efficient than their fossil counterparts, replacing the fuel from fossil to electricity will also reduce the necessary energy to move a car, ship or airplane from A to B.

For the four transport modes pictured in Figure 19, electrification will take place at a highly different pace. Technology for electric passenger cars, vans and buses is available and gets more cost competitive every year. The growth in sale of electric cars has increased rapidly the recent years. The number of electric vehicles in Norway was 142 490 at the beginning of 2018, which is an increase of 40 % from the previous year (/90/). Still, the Norwegian Arctic with long distances and low temperatures have a quite low uptake with Finnmark on less than 1 % of the new electric cars, Troms with 2.2 % and Nordland with 3.3 % (/91/). Electrification for long-range trucks remains a matter of further research (/92/), although some pilots will soon be tested out in Norway.

For marine operations, zero emission vessels using battery instead of diesel engines, will likely be limited to smaller vessels or vessels with short distance operations such as car ferries (/92/). The number of such zero emission vessels has increased rapidly in Norway the last years, subsidised by Enova. Port operations ships will increasingly plug into the grid. Supported by Enova, many Norwegian ports are currently building infrastructure to supply ships with power from shore. For long range large ships, electrification is more complicated and alternative fuels will be the likely solution to reduce GHG emissions.



Figure 19 The short and frequent flight routes in the Norwegian Arctic could be a good fit for electric air transport.

¹² Through the EUs Effort Sharing legislation, member states establish binding annual greenhouse gas emissions targets for sectors not included in the EU ETS.

In aeronautics, electrification will likely not go beyond short range small aircraft for the next decades (/92/). There are currently no electric planes in operation in Norway, but Avinor has recently claimed that Norwegian domestic air transport will be electric within 2040. The company, which owns and operates airports in Norway, has also promoted a goal to make Norway the first market in which electric aviation shall take a significant market share (/93/). The Norwegian Arctic is pinpointed as a suitable area to test out electric airplanes as the flight routes in the Norwegian Arctic are characterized by many, but short distances (/94/), which limits the required battery size and ensures adequate charging possibilities.

Industry and oil and gas

As illustrated in figure 18, emissions from industry and oil and gas production accounts for 50 % of the total emissions in Norway. Most of the emissions are counted for in the EU ETS system.

Large part of the industry segment is already electrified, and the remainder, which is currently covered by fossil fuels, mainly covers the energy consumption of high-temperature processes and various heating purposes where electricity is to a small extent applicable. In the coming decades, the use of electricity in such processes will likely stay limited. Measures will rather involve the use of biocarbon, replacing natural gas with hydrogen and efforts to improve energy efficiency.

The oil and gas sector utilize gas as energy source offshore. In the future, more and more offshore platforms will be supplied with clean electricity, either from shore or from offshore wind turbines. This is already planned for some Norwegian platforms. The Goliat platform outside Hammerfest in Finnmark is partly supplied with electricity from shore.

Construction sites is a part of the industry sector that has received attention recently. In the most recent political platform, *Granavolden Platform*, the Norwegian government states that they aim for construction sites to be fossil-free within 2025 (/95/). The platform highlights that the public sector should be a frontrunner in this work as they often are in lead of major construction projects. A guide for arranging fossil- and emission-free solutions on building sites was developed in 2018 (/96/). At the beginning of 2019, there are only a few examples of fossil-free construction sites in Norway. Neither Finnmark, Nordland or Troms have any examples of such climate friendly construction sites (/97/).

Agriculture including fish farming

Energy use in agriculture is related to plant propagation and growth, animal husbandry and cultivation. The agriculture sector had an energy consumption of 3.4 TWh in 2017; electricity accounted for 52 % and the remaining part was covered by different oil products. Important steps to cut emissions within agriculture will be to make processes more energy efficient, replace fossil fuel with electricity and to increase the use of sustainable biomass.

Fish farming is a growing sector in Norway and used about 1.5 TWh of power in 2017. Important steps to cut emissions in fish farming are generally the same as for agriculture, and electricity will play a key role. About 50 % of the fish farms in Norway get power from shore, while the rest use diesel generators to generate power. In a recently published report, DNV GL has estimated that it is commercially profitable to electrify about 80 % of the production in Norway (/98/).

There are several fish farms in the Norwegian Arctic that utilize power from shore. Nordlaks is currently in a process of electrifying 12 fish farms in Nordland and in the southern part of Troms. In total, the project will ensure that 14.9 kilometers of power cables will replace one million litres of diesel every year (/99/).



Figure 20 About 50 % of fish farms in Norway get power from shore. It is commercially profitable to electrify 80 % of the Norwegian production.

Heating

Building standards have a long history in Norway and the first energy requirement for buildings was introduced in 1949. Today, technical regulations apply to new buildings and large-scale renovation projects. As new buildings correspond to about 1-2 % of the building stock per year, this is a continuous but slow process that eventually will make the building stock in Norway more energy efficient (/100/).

Longyearbyen in Svalbard has a relatively high energy consumption per capita compared to the Norwegian mainland, also when taking the outside temperature into account. The need for heating is high. Part of the reason could be that technical regulations were not enforced in Svalbard before 2010, and above 90 % of the building stock was built before 2010 (/84/).

Green investments

There is currently a rapid development in low- and zero emission technologies. There is ongoing work, also in the Norwegian Arctic, to increase the use of clean energy instead of fossil fuel. According to Enova, million NOK 1720 has been awarded the last twelve months¹³ in support to businesses who want to take use of climate-friendly technologies. Figure 22 shows how the support is divided between counties. Troms is well represented, receiving 120 million NOK for green investments, while Finnmark and Nordland received 30 million NOK and 60 million NOK respectively (/101/).

¹³ Downloaded on the 29th of January 2019.

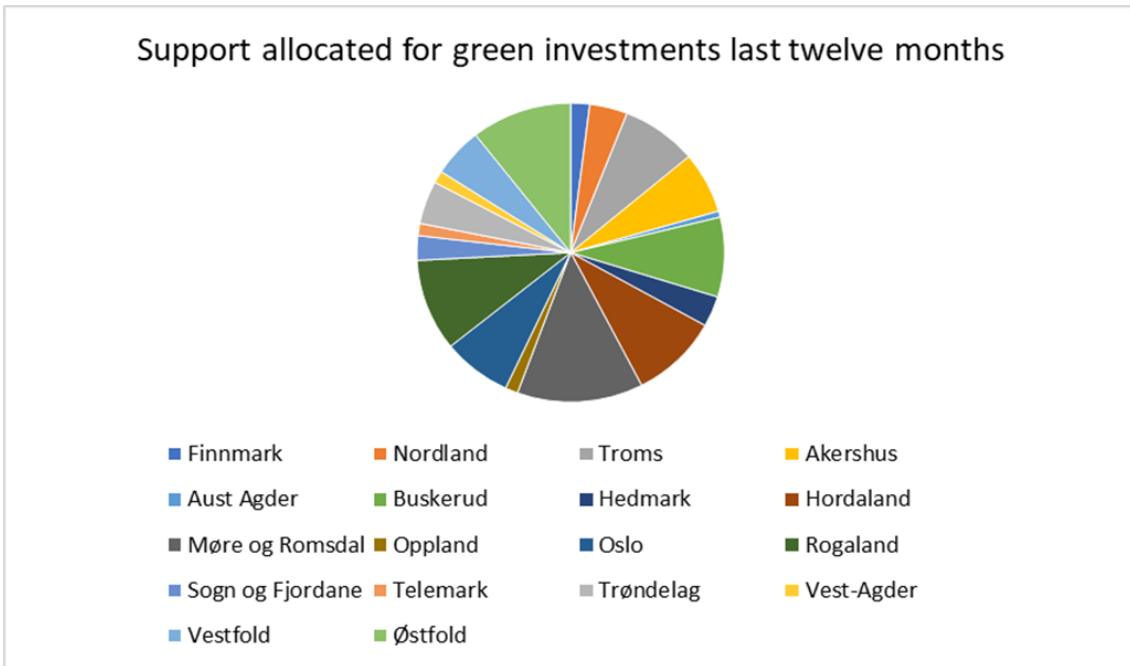


Figure 21 Allocation of support for green investments.

Below are three examples of ongoing or planned investments in energy infrastructure in the Norwegian Arctic. To a certain extent, the examples are representative of what type of investments that are currently being made to facilitate a green energy transition in the Norwegian Arctic and in the country in general:

- Hammerfest Harbour and Mosjøen Harbour are building infrastructure to supply ships with power from shore to avoid ships from running their diesel engines to produce power at dock (/102/).
- Nordland Fylkeskommune has received a substantial amount of support from Enova to electrify the ferry connection Tjøtta-Forvik (/101/).
- Cermaq has received support to invest in infrastructure to supply one of their fish farms, Veggfjell, with power from shore (/101/).

Indicators

- Proportion of population with primary reliance on clean fuels and technology.
- Renewable energy share in the total final energy consumption.
- Energy intensity measured in terms of primary energy and GDP.

SDG 11 – Sustainable cities and communities



Level 2: Important, attention is required for this SDG in the Norwegian Arctic

The following SDG 11 targets are discussed in this chapter:

Target 11.2. Affordable and sustainable transport systems.

Target 11.4. Protect the world's cultural and natural heritage

Transport systems

According to a study from 2018, the Norwegian Arctic is a quite urbanised part of the country with more than 70 % of the population living in proximity to a city centre, though many of these centres are of smaller size (/103/). In Norway 80 % of the population lives in or near city centres (/104/). Most municipalities in the Norwegian Arctic scores low on an index measuring how centralized they are (/104/). The urbanisation is strongest in the two biggest cities, Tromsø and Bodø, with 76,000 and 52,000 inhabitants respectively and a growing population (/105/ and /106/). An important step to ensure a sustainable city while at the same time handling a growing population, is to ensure a safe and efficient public transport system. Both cities have plans for how to ensure a better and more efficient transport system for all (/107/ and /108/) and both cities aim to replace traditional fossil buses with electric buses (/109/ and /110/).

The plan for Bodø ('Bypakke Bodø') is a joint effort to provide Bodø with a more forward-looking and safer transport system for those who drive, travel by bus, bicycle or walk. The plan was approved by the city council in June 2010 (/111/). 2.9 billion NOK is allocated to the project, of which a significant share will be used on public transportation and pedestrian- and bicycle paths. The ambition is to make Bodø a city where public transportation is the preferred choice. The extended bus service is first and foremost aimed at school- and work travellers, with more frequent routes during the morning and afternoon (/107/).



Figure 22 Both Bodø and Tromsø have ambitious plans for their urban transport system

Tromsø has a similar project called 'Tenk Tromsø' which also focuses on how to make it easier for people to utilize public transport in their daily life. The plan also includes building more pedestrian- and bicycle paths, as well as more bus lanes (/108/) and the goal is to make the offer so good that Tromsø's residents will choose to use public transportation, walk or bicycle in 50 % of their daily trips (/112/). To include people in urban planning, 'Tenk Tromsø' has recently sent out a travel study to 10 % of the city's inhabitants to map how they drive, walk, bike and travel. The results will be ready in November 2019.

Information is not readily available on what is being done to make the transport system more convenient for vulnerable groups in the two cities, such as for children, old people and people with disabilities.

Air quality

Tromsø has two permanent air quality monitoring stations; one of them is located in Hansjordnesbukta and the other one in Rambergan. Hansjordnesbukta is an area with heavy traffic, while Rambergan is less exposed to traffic. Tromsø sometimes has challenges with high amounts of particulate matters. The government has set an upper limit to the amount of particulate matter and Tromsø is not allowed to exceed the value of 50 µg/m³ for more than 30 days during a year. In 2016, Tromsø exceeded the limit 42 times (/113/). As a result, Tromsø has been asked to develop an action plan to decrease the level of particulate matter.

Bodø does not have permanent air quality monitoring. In 2015, the Norwegian Environment Agency hired a consulting company to monitor the air quality in Bodø every hour from the summer of 2015 to 2016. The results showed nitrogen dioxide levels above allowed limit and also a level of particulate matter that was too high in some periods (/114/). The Norwegian Environment Agency requested Bodø to initiate temporary measurements in February 2018 and based on the results the city was asked to measure the air quality for two additional years.

Air quality in some of the other cities and locations in the region is being measured by NILU and published on the webpage www.luftkvalitet.info.

Cultural heritage and natural heritage

Norway has set a national goal to reduce the loss of cultural heritage. The ambition is that within 2020, 90 % of all municipalities in Norway should have documented plans for how to take care of their cultural heritage (/115/). The status for the different parts of Norway is illustrated in Figure 24.

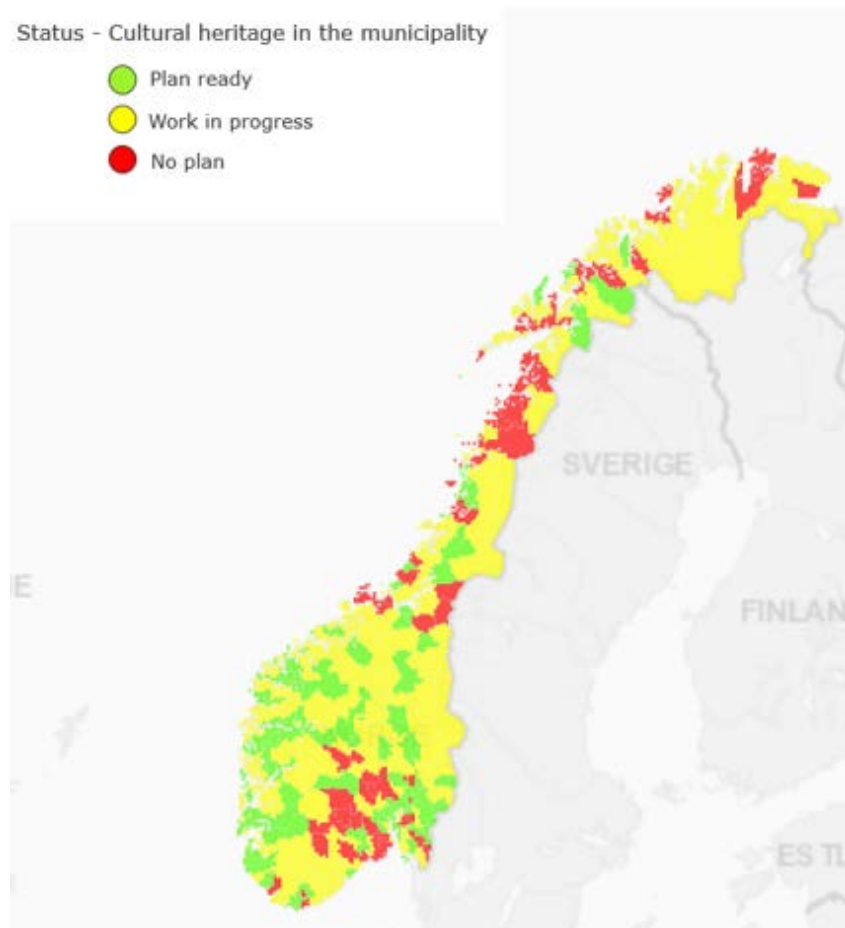


Figure 23 Status of Norwegian municipalities' work with cultural heritage plans

Tromsø is currently working on their cultural heritage plan that is expected to be completed in 2019. Tromsø municipality states that the cultural heritage plan will lay the foundation for the preservation of important cultural-historical values for future generation (/116/). Tromsø has planned to involve their inhabitants in this work, by travelling and asking people about their stories and what cultural heritage they want to take care of. They also want to investigate possible measures to increase the access for people with disabilities to cultural heritage sites (/117/). Bodø does not yet have a plan, but will start up the work in 2019 and finish within 2020 (/115/).

Norway has 31 marine protected areas in the Arctic covering an area of approximately 82,500 km²; most of them are around Svalbard. A more detailed description of the protected areas is given under SDG 14 Life below water.



Figure 24 Awareness of the consequences of marine litter is growing and it has become popular to engage the local community in cleaning up coastal areas.

Indicators

- Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities.
- Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10)¹⁴ in cities (population weighted).
- In the Norwegian Arctic, total expenditure (public and private) per capita spent on the preservation, protection and conservation of all cultural and natural heritage, by type of heritage (cultural, natural, mixed and World Heritage Centre designation), level of government (national, regional and local/municipal), type of expenditure (operating expenditure/investment) and type of private funding (donations in kind, private non-profit sector and sponsorship).

¹⁴ Coarse dust particles (PM10) are 2.5 to 10 µm in diameter and fine particles (PM2.5) are 2.5 µm in diameter or smaller.

SDG 16 – Peace, justice and strong institutions



Level 3: Less important, there are already good conditions for this SDG in the Norwegian Arctic

The following SDG 16 targets are discussed in this chapter:

Target 16.1. Significantly reduce all forms of violence and related death rates everywhere

Target 16.7. Ensure responsive, inclusive, participatory and representative decision-making at all levels

In the Norwegian Arctic the social complexity differs from southern parts of Norway with sparsely distributed population, long distances between communities and living under harsh weather conditions. The society is multi-cultural, housing not only Norwegians but also the indigenous Sami people, Norwegian Finns (Kvens) and Russian populations (mostly in Kirkenes). Within the area there are also large variations, from urban Tromsø to small villages hours away from neighbours. The purpose of the SDG 16 targets are to 'foster peaceful and just societies, inclusive and accountable institutions'¹⁵.

The Norwegian police performs a yearly survey on how the people perceive and trust them (/118/). In the Norwegian Arctic, the police in Finnmark scores significantly lower than average on four of six scales within the two main categories of efficiency and justice and respect. Looking at crimes such as violence, Nordland and Troms counties are on national average while Finnmark is considerable higher with 9.7 reports per 1000 inhabitants (/119/). In addition, as discussed in SDG 5 there are clear signs that the Sami population and specially the women are more exposed to violence and abuse than others, and that public services do not understand well enough the Sami culture, language and society to intervene (/76/).

Homicide statistics (/120/) indicate that compared to population in the region, there may be a slightly higher homicide rate in Troms than the national average. The overall rate for the Norwegian Arctic, however, is on par with the rest of the country.

Trust to institutions will from time to time be challenged. One example is the merger of the two northernmost counties, Troms and Finnmark, in the new governmental regional reform has led to fierce discussions and conflicts between politicians and people in the area. The reform is reorganising public services and decision making locally, regionally and on national level. The ongoing debate and decision on allowing copper mining with disposal of tailings in a fjord and assessment of consequences for the local environment and Sami activities in the area is another. Looking at 2017 electoral turnout statistics, in the last parliament election the counties in the region had according to Statistics Norway a lower rate than the national average with Finnmark lowest in the country.

Indicators

- Statistics can be made of violence and related death rates in the Norwegian Arctic with help of data from Statistics Norway (SSB).

¹⁵ Quote from UNDP/PRI0 expert meeting on measuring SDG 16, Oslo 28th-29th of January, Oslo.

- Proportion of population who believe decision-making is inclusive and responsive, by sex, age, disability and population group can be established with help from 'Innbyggerundersøkelsen' that's has been done by the Agency for Public Management and eGovernment (DIFI) (/121/).

Economy

For more than a thousand years, the ocean and the coastline has been of vital importance for Norwegian development, growth, resources and employment. Ocean-based industries continue to have a central role in Norway and in the current governmental policies. In 2017 the Norwegian Government issued their Ocean Strategy, focusing on new opportunities from the ocean and increased synergies between the maritime industries such as shipping, aquaculture and offshore oil and gas (/41/).

This focus is further strengthened in the new political platform for the extended Solberg-government in 2019, which states that the government will facilitate further development of existing and new jobs based on the resources in the ocean (/122/).

For the Norwegian Arctic, the ocean and its resources are a key source of employment and income. While on a national level 11 % of employment is directly related to the ocean industries, the corresponding share in the Norwegian Arctic is 20 % (/123/). This dependence on the blue economy is varying within the region's municipalities. In general, most of the coastal communities of the Norwegian Arctic have a close relationship to the ocean and its opportunities.



Figure 25 Happy fisherman

SDG 8 – Decent work and economic growth



Level 1: Very important, high attention is required for this SDG in the Norwegian Arctic

The following SDG 13 targets are discussed in this chapter:

Target 8.2. Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors

Target 8.5. By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

Target 8.6. By 2020, substantially reduce the proportion of youth not in employment, education or training

Target 8.9. By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products

Employment and decent work for all are key elements of SDG 8. The goal reflects the need for development of new jobs due to an increase in labour productivity, and has a specific focus on young people, job safety and security.

Decent work, employment, productivity and economic growth

According to a European Commission study, the term blue economy covers *all economic activities related to oceans, seas and coasts* and it *covers a wide range of interlinked established and emerging sectors* (/124/). For the Arctic blue economy, the World Wildlife Foundation (WWF) cluster Arctic marine based resources and opportunities into the categories: extractive, renewable, biological, connective and experiential (/125/). Several studies point to the large growth potential of ocean-based industries. To be able to take advantage of the opportunities and develop the coastal communities in the Norwegian Arctic, however, findings indicate that there may be constraints on the human resource side. Five unbalances of the labour market are presented in a study from 2017 (/126/):

- Lack of healthcare and educational workers.
- Surplus of factory workers
- Increase in unemployed engineers and IT-resources in the sparsely populated areas.
- Lack of resources with higher academic education in the cities.
- Mobility challenges with regards to resources for the construction sector.

In addition, Business Index North (/127/) describes the population development in the Arctic, where some of the key aspects are a much lower population growth and aging population compared to Norway in average. Young people between 16-29 are moving out of the region (/128/). Immigration is reducing the effects of the negative development on population growth.

Other factors affecting the available work force, is lower educational level and higher sick leave in the region, the latter analysed by SINTEF (/129/). When it comes to youth unemployment, this seems not to be a large current challenge in the Norwegian Arctic. In the Nordland and Troms counties the latest numbers are on and below the national average, while the northernmost county Finnmark have a higher share (/130/). The same picture can be observed for total unemployment.

The key ocean-based industries in the Norwegian Arctic are vital for growth and employment. Status in the most important ones are discussed below.

Aquaculture

Aquaculture in the Norwegian Arctic has grown rapidly over the last 25 years with salmon as the main product. According to SINTEF (/131/), the cold waters of the Norwegian Arctic are preferable locations for production due to less challenges with lice and diseases, and that the region holds 39 % of the slaughtered and sold salmon in Norway. The traffic light system for sustainable growth control in the industry, implemented in 2017, shows a green status for all areas in the region (/132/). In 1994, there were 34 licences in Finnmark, 66 in Troms and 133 in Nordland, compared to respectively 99, 109 and 185 in 2018. Employment in the industry has in the same period grown from approximately 1 300 to 3,000, with a 16 % female share (/133/). In addition to the jobs created in the industry, there was in 2015 approximately 5,500 additional jobs created in service and supplies (/134/).

Workers in the industry are exposed to risks, and the industry is trying to develop the safety practises together with the growth and implement safety management systems. Still, there is research (/135/) indicating that employees in the aquaculture have higher probabilities for serious accidents than all other industries except fishing and agriculture. In the period 1982-2015, 34 fatal accident were registered.

SINTEF's analysis of the value created from the aquaculture industry in the Norwegian Arctic shows a value creation of 13.2 billion NOK in 2016 (/131/), a year which had approximately the same average price level for fresh salmon as the consecutive years (/133/). This is a highly profitable industry and contributor to a blue economy. On the other page, there are ongoing discussions on whether it generates sufficient employment and if the environmental impact is under control, culminating with the decision of Tromsø Municipality in the fall of 2018 that they will only accept land-based fish farming concepts for new applicants.

The aquaculture industry has historically invested heavily in biology and feed and is now ramping up the investments in technology. As a part of a Government white paper on sustainable growth in the aquaculture industry (/136/), a system for issuing new licences for innovative concepts that will increase the production capacity in sustainable ways are established by the Ministry of Fisheries and Trade in 2015. This has led to a massive amount of concepts development. Examples of this is fish farming in more exposed locations, expected to reduce the challenges with regards to sea lice and diseases. In the southern part of the Norwegian Arctic, the company Salmar have started production in their unit Ocean Farming, and further north Nordlaks will in 2020 start production with their unit Havfarm. These concepts are taking advantages of marine construction technology developed in the offshore oil and gas industry and the maritime industry, morphing with aquaculture technology and developing units for scalable salmon production in more exposed locations.

Energy transition into electrification is also present in the aquaculture. A study from 2018 (/98/) shows that a large share of existing aquaculture installations in Norway has a potential for electrification. In addition, there are examples of work boats and service vessels with hybrid electric energy storage and propulsion.

Bioprospecting and other emerging bio marine industries

Bioprospecting is the search for genes, molecules and organisms that could improve health through medicines, better food and more sustainable products for other use such as alternatives for plastics or cleaning detergents. The Norwegian Arctic with its rich oceans and fjords has a nature given advantage, and the fishing and aquaculture industry provides opportunities for exploration of these resources. Examples is use of by-products from fisheries and aquaculture in the related bio-marine industry and farming of seaweed, development of new sources and properties of fish feed, and search for valuable chemistry in organisms adapted to extreme environment not found elsewhere.

The industry requires specialist research knowledge, and several high-competence organisations in the region like UiT The Arctic University of Norway, Nofima and others are investing in bioprospecting knowledge. Combination of proximity to the marine industry, research expertise and the oceans, gives opportunities for developing high-value products in the region. To facilitate this, the cluster organisation Biotech North is established (/137/). With its 39 members and partners, a broad spectre of competence and investors are available for developing new products and companies. There are long lead times for such development, which generates employment for researchers and other types of profiles that differs from the other ocean industries.

Fisheries

The Norwegian Arctic is home to some of the largest and most valuable fishing stocks in the world, such as the northeast arctic cod and the Norwegian spring spawning herring. In addition, other large stocks are available, including saithe, haddock, capelin and more recently also mackerel, which was previously not common in the Norwegian Arctic. Red king crab and snow crab are also establishing presence in the area (/138/). Management of the latter have lately caused some diplomatic disputes with the EU.

With such rich stocks in the Norwegian Arctic, fisheries have always been an important part of the coastal communities of this region. Still, the contribution registered¹⁶ to gross domestic product from this industry was only 3.7 % in 2002 (/53/). In 2015, fisheries and aquaculture combined had 7.0 % of gross domestic product in Nordland, and 6.1 % in Troms and Finnmark, contributing to the annual growth at 2.8 % and 2.6 % in the period 2010-2015 (/104/). Traditionally, the industry has been a labour-intensive employing men of all ages on the vessels and many women and youth on the shore side. Trough technology development and economies of scale, the efficiency in the industry has increased dramatically. With fish stocks in general harvested to a maximum sustainable level, this productivity increase reduces the need for a high number of fishermen and fishing vessels.

In the fishing fleet, according to the Norwegian Directorate of Fisheries statistics service (/133/), the three northernmost counties had in 1984 registered over 12,000 full-time employed fishermen, this is reduced to less than 4 300 in 2019. Part-time fishermen in the same period is reduced from around 3,000 to less than 1,000. In terms of gender balance, this has improved from around 1 % female workers in the start of the mentioned time period, to just below 4 % in the end. On a national level, the fishing fleet is reduced from over 40,000 vessels in the 1960s (/139/) to around 6,000 currently. Approximately 3 300 of these are registered in the Norwegian Arctic, and general estimates indicates three jobs created ashore for each fisherman. The massive reduction of fishermen is probably contributing to an aging workforce in the industry, with lack of opportunities for young people to enter the profession. In addition, the structural changes in the industry with implementation of transferrable quotas have increased entry barriers for establishing new fishing entities.

The fishing fleet, and especially the small coastal vessels, is often denoted as the most dangerous profession in Norway. In the years 2009-2017, there was on average 6.7 fatalities in Norway, and reported injuries where around 80 (/140/). Despite working in conditions that might for most people be perceived as rough and dangerous, most fishermen seem to enjoy their profession, especially the social aspects, the independence and that they perceive

¹⁶ The source 'Economy of the North' describes possible underestimating of the contribution due to fishing activities taking place in the north, but with companies registered in the south.

their work as meaningful (/141/). The industry also pays a competitive salary, from just above society average in the coastal fleet, to high above in the larger, ocean going fleet.

Processing of fish, crabs and shrimps has also been an important part of the culture and work life, traditionally employing women. According to the Norwegian Labour Inspectorate, in 2016 the food industry employed 6 627 workers (/142/). This is not limited to the fish processing industry, but 16 of the 20 companies in Norway employing more than 100 workers were in the category of processing and conservation of fish and shellfish, probably including processing of farmed fish. Employment has fluctuated heavily throughout the years, depending on availability for cod. This industry has a long tradition of employing young people in the busiest season and is perceived as a part of the local culture in the smaller coastal communities. The shore side of fisheries has also been important employment for women in the region.

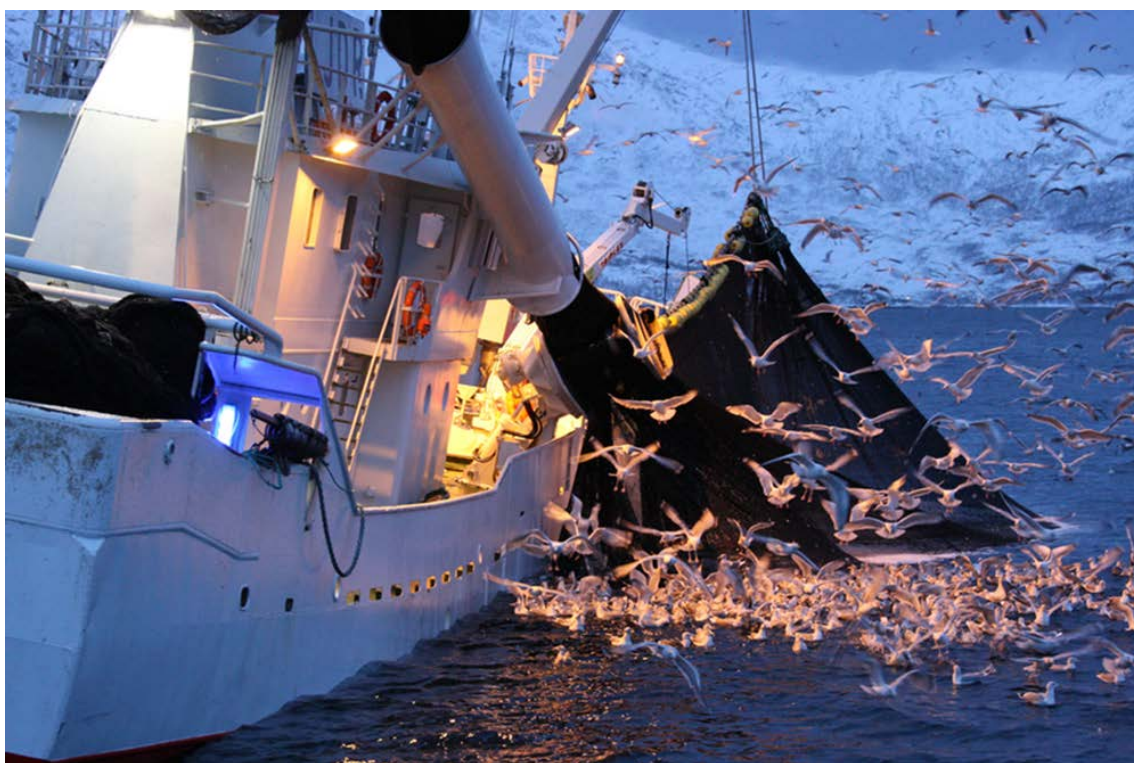


Figure 26 Fisheries have always been an important part of the coastal communities of the Norwegian Arctic.

Trade and export of dried fish from especially the cod fisheries in the Lofoten area has played a vital role in the history of Norway due to its attractiveness for consumers on the European continent. The more recent history contains governmental efforts of supporting a build-up of production of fish filet for building the regions labour market and utilising the expected comparative advantage of rich fish stocks nearby, in most cases these efforts have failed (/143/). There are also discussions on the historical obligations for some of the large trawlers to land their fish in specific municipalities or fish factories, with potential jobs in the processing industry held up against profitability as key elements.

Mining

The mainland in the Norwegian Arctic has substantial amounts of ore deposits and traditionally this region has been a main point for production of ores and industrial minerals. In 2013 about 75 % of the Norwegian ore sales were from Finnmark and Nordland. (/144/). When the mining company Sydvaranger Gruve AS went bankrupt in 2015 the share of the ore production from The Norwegian Arctic was reduced and today there are only two producers of metallic ore left in Norway, one in Nordland and one in Rogaland (/145/).

There has recently been given permit for copper mining in Kvalsund (Finnmark) with disposal of the tailings in the nearby Repparfjorden.

The project exemplifies some of the challenges with mining in Norway. The project in Finnmark has a substantial opposition in the population against disposal of the tailings in the local fjord. The local Sami population also opposes the project with regards to negative effects on fishing in the fjord and the land they use for reindeer herding.

Another complicating factor is that the mineral industry in Norway consists of mainly small businesses with some large foreign companies that have activities at a few places in Norway. The main research in this area is not done in Norway and the Norwegian companies have not been very research-oriented (/146/).

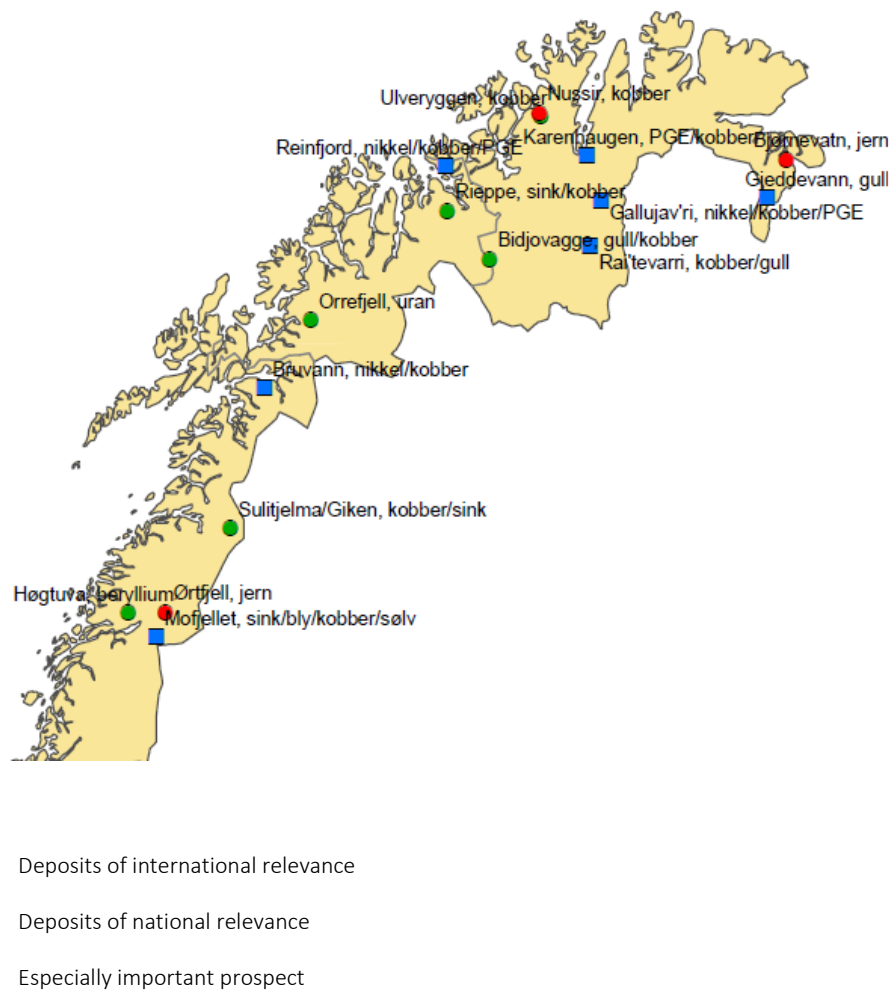


Figure 27 Deposits of metal ores in the Norwegian Arctic. (/146/)

Oil and gas

As discussed in SDG 7, the Norwegian oil and gas industry have considerable presence in the Norwegian Arctic with large estimated shares of undiscovered resources.

Offshore exploration and production give significant activities on land in selected locations. Gas from Snøhvit is transported by pipeline to Melkøya near Hammerfest where it is exported as LNG on ships. Sandnessjøen and Brønnøysund has supply and personnel transport activities, and there are several other locations where heavy

investments are made or planned to support offshore activities. Harstad holds a large Equinor office, where among other activities the planned Johan Castberg and Aasta Hansteen fields will be managed.

SINTEF has estimated the total employment in the oil and gas industry in the Norwegian Arctic to be around 3 700 and based on a general assumption regarding values created per direct employee in the industry a value creation of approximately 16.3 billion NOK in 2017 (/131/). The annual study of the oil and gas service and supplier industry, 'Levertrappen' (/147/), describes annual deliveries in the value range of 3.5-5.5 billion NOK over the years 2010-2017. According to media reports, Equinor is employing a third of their apprentices in the Norwegian Arctic. This indicates that the industry generates opportunities for youth.



Figure 28 The Norwegian oil and gas industry have considerable presence in the Norwegian Arctic.

The recent year fluctuations and reductions in oil prices has challenged the industry to be more cost effective. In the Arctic area, one example of this is the Johan Castberg project that according to Equinor halved the costs from the original concept to the current FPSO+ solution. Other concepts that enhances efficiency and reduces costs the industry is working on is more unmanned units, central control rooms and more subsea and tie-in concepts.

Shipping and ports

The maritime industry has significant activity in the Norwegian Arctic. From the oil and gas extraction in Russia and Finnmark large tankers are sailing outside the coast in traffic separation lanes, bulkers and other deep sea vessels are calling destinations such as Narvik and Mo i Rana, coastal traffic including cruise and passenger vessels is distributed throughout the fairways, fishing vessels are working on the fishing grounds, and offshore service vessels serving the oil fields at Haltenbanken and the Barents sea. In the ocean between mainland and Svalbard, fishing vessels and cruise traffic is common.

Currently the traffic from Europe to Asia and vice versa is limited along the Northern Sea Route (NSR), but due to the shorter distance from Asia and the melting sea ice, this traffic is expected to grow in the future and make the ports of the region important service providers. The destination shipping into polar areas, especially into the Russian areas

has increased significantly the last ten years. The construction of infrastructure primarily related to Russian oil and gas projects, but also mining, represents the major part of this increase. Russian destination shipping includes transport from both Europe and Asia. A key destination is Yamal LNG, an integrated project encompassing natural gas production, liquefaction and shipping with a production capacity of 16.5 million tonnes per year. Phase II that is underway, will more than double this figure if implemented as expected. The export is provided by heavy ice strengthened vessels designed for year around operation. From a small camp built in 1980 to accommodate the geological survey team, Sabetta has become a city that at the peak during construction accommodated 30,000 persons. Now the construction for a similar production facility has started on the other side of the Ob Bay managed by Novatek. These two projects illustrate Russia's plans and willingness to invest in the Arctic.

Development of ports and support hubs for new projects in the Arctic located in Norway will contribute to development of the local infrastructure, local employment and attract a diversity of new supporting businesses. The expected decrease in future sea ice coverage and thickness will attract more transpolar shipping. However, also in the future there will be ice in the Arctic during the winter season that will require vessels built with ice strengthening and enough power. These vessels are more expensive and are not competitive with regular vessel outside the Arctic, and hence these vessels should only operate in polar waters. Consequently, there is expected to be a need for ship to ship transfer or transfer via ports from the ice strengthened vessel to regular vessels.

The IMO Polar Code¹⁷ is the main regulatory framework for all ships operating in polar areas. In addition, there are some national and local requirements. One example is the general ban on heavy fuel oil (HFO) around Svalbard, except from vessels calling Longyearbyen and Svea. A proposal for the ban of HFO was introduced in IMO during the development of the Polar Code, but due to the large number of existing vessels especially built for trade in ice-covered waters, several countries were against and threatened to withdraw from the negotiations if this was implemented. Now the question is brought up again in IMO at MEPC73 and it is expected that the work for a future ban now will continue. The Polar Code also bans all discharges of oily mixtures in polar waters and put strict limitations on discharge of sewage in polar waters. Both emission to air and discharge to water are discussed now that we see a significant increase in number of both large and expedition cruise vessels calling ports in the Arctic. In that industry, several of the new vessels under design and construction are implementing alternative environmentally friendly fuels like hybrid/batteries, LNG, hydrogen etc., but so far, the capacity for some of these alternatives are limited. Possible local sailing restrictions to limit local emissions will contribute to a change in sailing routes, like observed when restrictions are introduced in some fjords with periodically heavy traffic.

A prerequisite for further development of new activities in the Arctic is a well-developed infrastructure for search and rescue. Due to large distances, sparsely populated coastline, darkness and challenging weather conditions, search and rescue capacities for an increasing maritime activity is a challenge. The SARiNOR projects (/148/) have analysed the situation and the expected development, and recommended measures such as establishing an Arctic emergency preparedness resource base in Svalbard. The current search and rescue capacity is not capable for handling large or long-lasting accidents, which increases the importance of measures reducing probability of an event. The need for development of equipment designed and adapted to polar conditions is also identified, as most of the equipment related to SAR, navigation and communication available on the market today is not certified for the low temperatures and other extreme polar conditions. There are also indications on that certified equipment is not performing as expected (/149/).

In 2013, 3 833 sailors were registered in the in the Norwegian Arctic and 598 of these was in the youngest age distribution groups 15-19 and 20-24 years (/150/). To ensure a stable or growth of Norwegian locally recruited seafarers, discussions on strengthening of the basic maritime education in the Norwegian Arctic are ongoing. The advantage of have grown up, being educated and trained in conditions close to what are experienced in polar waters are valuable for the future shipping in these areas.

¹⁷ IMOs International Code for Ships Operating in Polar Waters.

Crewing is a significant cost for many ship segments, both in direct labour costs such as wages, crew changes and transportation and social costs, and in indirect costs such as on-board living quarters, safety measures and loss of lives in accidents. To reduce this cost elements and thus enabling ships as profitable services for more areas of use and increase the safety, heavy research and development funding is now allocated to development of increased degrees of automation and autonomous vessels. Currently there are two civil society public known autonomous ship projects in Norway; Yara Birkeland and the ASKO fjord crossing unit. Both these will operate in south-east Norway. Several test areas for development of technologies for automated and autonomous ships are allocated, but none in the Norwegian Arctic (/151/).

When discussing these concepts and technology, degrees of automation is perhaps of more importance than unmanned and autonomous ships. Looking back, technological development such as e.g. electronic charts, dynamic positioning and unmanned engine rooms have reduced workload onboard. Currently, systems for auto-crossing of fjords for car ferries, remote controlled machine room, and other means of reorganising and reducing manual work tasks are being developed. Increased connectivity and available computing power enable such development.

Moving autonomy and automated ships further north, more demanding conditions in remote polar areas will require more automation in form of collecting data as basis for taking the right operational decisions. Better systems for predicting polar lows, ice conditions, icing etc. must be developed to reduce the additional risk experienced in polar waters. The IMO Polar Code points at a set of additional hazards that may be experienced and requires that the associated risks are mitigated by implementing different mitigating measures. In addition, communication systems are not as available in the Norwegian Arctic as further south (/152/).

The industry's ambitions within de-carbonization is relatively ambitious, with 50 % reduction of emissions in 2050 and carbon neutral as soon as possible a latest by 2100. This requires among other things energy efficiency measures, new logistic chains and new ways of energy storage. One of the first alternative energy storages for emission reductions was LNG. This fuel has great advantages when it comes to local pollution but depending on engine technology it also reduces greenhouse gas emissions. Currently there are several new LNG-fuelled vessels under construction that will operate in the Norwegian Arctic. Most vessels on the coastal route Bergen-Kirkenes will also from 2020 be LNG fuelled. Another emission reduction measure that is picking up implementation speed rapidly is the use of batteries on ships. Two main concepts are in use; fully electric vessels, typically car ferries for fjord crossings, and hybridisation of fossil fuels and batteries, increasing the energy efficiency. This trend is also spreading to other related industries such as the aquaculture industry. Recent examples of hybridization of ships belonging to the Norwegian Arctic can be found in the fishing industry where two new coastal purse seiners just where delivered with battery installation.

Tourism

From being a midnight sun destination during the summer months, the Norwegian Arctic is now an all-year tourist region with inflow of tourists both from cruise vessels and airlines, from all over the world. Genuine experiences and nature is the key product, such as whale safaris, winter conditions, northern light, mountain hiking, dogsled trips in addition to restaurants and local food experiences.

In 2015 the tourism industries in the Norwegian Arctic had a value creation of 8 billion NOK, which accounts for 9 % of the total value creation from market-oriented industries in the region, compared to 3 % nationally (/153/). The number of people employed in the tourism industry in 2017 was 16 094, which represent 6.7 % of employment in the Norwegian Arctic. From 2013-2017 the Norwegian Arctic had a 30 % increase in commercial overnight stays, compared to 11.5 % for the whole of Norway. When looking only at foreign traffic the growth was at 52.2 % for the Norwegian Arctic and 29.3 % for the whole of Norway. Troms had a growth of 71.7 %, Nordland 51.8 % and Finnmark 25.8 %. On Svalbard the growth in overnight stays from 2013-2017 was at 41.8 %, while the growth for foreign traffic alone was 191.9 % (/154/). From 2017-2018 the growth flattened out with a decrease of 1 % in total commercial

overnights in the Norwegian Arctic compared to 2 % increase in the whole of Norway. Foreign traffic increased with 6 %, while it nationally increased with 2 % (/155/).

Transport is the largest industry in terms of value creation in 2015 and stood for close to 60 % of the value creation in the tourism industry. The demand for transport is big in The Norwegian Arctic as the distances in the region are large. Many of the largest passenger transport companies have their main offices in the North (Hurtigruten, Widerøe and Torghatten), and The Norwegian Arctic receives large amounts of subsidies related to transportation. The fastest growing of the industries within tourism is the adventure tourism, which tripled its value creation from 2004-2015. It had a value creation of 175 million NOK and 525 employed in 2015 (/153/). In 2017 the number of employed in the industry was 1 715 (/154/).

A report from Menon (/156/) on the tourism industry in Tromsø based on 2016 figures shows that it is the third largest in terms of value creation overall with 2.6 billion NOK, the second largest employer in the municipality with 4 300 employees, and with a 50 % increase in numbers of companies over the last 10 years with a particular strong growth in the events- and exploration category.

The Arctic is a popular destination also in the cruise industry. In 2018 Longyearbyen in Svalbard had 27 cruise ships calls and received almost 46,000 cruise passengers (/157/). There is very high activity in the explorer cruise market, with about 32 vessels on the yards or in the order books. This includes vessels specifically equipped for cold weather operations, such as e.g. the polar icebreaker-class Ponant-project.

Workers in the hotel and restaurant industry have a notably difference in age distribution compared to other main industries in the region with the highest proportion in the three youngest age groups (15-19, 20-24 and 25-39 years) and lowest in the three oldest groups (/158/). This is in line with national statistics, which show that 32 % of employees in the accommodation and restaurant segment is below 24 years old (/159/). This indicates that the industry can facilitate young people into employment.

Indicators

Statistics Norway (SSB) makes figures for both GDP fixed prices and employment, i.e. the subcomponents, but does not publish the indicator as defined.

Statistics Norway (SSB) publishes monthly earnings for employees, by occupational group, sector, industry, gender and working time. Further they publish unemployment rates. Based on this, an indicator can be created, except for persons with disabilities.

- Statistics Norway (SSB) makes figures based on the labour force survey for the proportion of youth (aged 15-24 years) not in education, employment or training.
- Statistics Norway (SSB) makes figures for tourism that can be linked to the indicator via the satellite accounts for tourism. An indicator for the proportion of jobs in sustainable tourism industries out of total tourism jobs is not fully developed.

SDG 9 – Industry, innovation and infrastructure



Level 2: Important, attention is required for this SDG in the Norwegian Arctic

The following SDG 9 targets are discussed in this chapter:

Target 9.1. Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

Target 9.2. Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries

Target 9.3. Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets

Target 9.4. By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

Target 9.5. Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

Develop quality, reliable and sustainable infrastructure

Road transport is the backbone of the logistics systems in the Norwegian Arctic. Small cities and towns, relatively small factories and production facilities and low population makes trucks and cars a natural and low-cost choice for transport. The main challenges seem to be related to winter conditions reducing the regularity and safety for passenger and goods, especially for the fish export. Nordlandsforskning (/160/) has analyzed 17 roads crossing mountains and quantified a yearly loss of 90 million NOK due to low regularity, and also expect the total loss picture to be significantly higher.

Increasing the share of cargo transported by ships on behalf of road transport is a clear target in several public strategies and missions. Ports and fairways are a vital part of the discussion, together with transport time and voyage costs from pilotage and other maritime services. Based on trend analysis, risk reducing effects and other benefits from improving the fairways, the Norwegian Coastal Administration is planning large investments to enhance the safety and efficiency of sea transport.

In a prognosis developed in 2015 (/161/), estimated growth in maritime traffic for Nordland, Troms and Finnmark presented an expected growth of 45 % and 27 % in sailed distance, with the strongest growth in large ship types such as tankers, container vessels and cruise vessels. To maintain the current safety level, a number of measures are identified and started implemented such as renewal of lighthouses and beacons, more vessel traffic services (VTS), and for the Arctic and Svalbard in particular improve traffic surveillance, marine geodata and define recommended fairways (/162/).

One highly relevant example of moving cargo from road to sea, is export of fresh fish such as salmon. In a study from 2018 (/163/) the potential effects of utilizing a new cooling technology, which keeps the fish fresh longer, as enabler for transport by sea showed significant potential profitability both for the society and businesses. This scenario included in the study was based on a port in Trøndelag, but by sailing one day and a half further north significant parts of the salmon producing areas of the southern parts of the Norwegian Arctic will be within reach.

The railway 'Nordlandsbanen' in the southern parts of the Norwegian Arctic is a single-track rail between Trondheim and Bodø. It is built with sharp turns which are limiting the speed and run by diesel-fueled locomotives. Norwegian Railway Directorate is currently working on concept evaluation studies for developing this railway, including expanding it further north to Tromsø. Future cargo volumes, especially from the aquaculture industry, is central in this work.

This corresponds well with input from the industry regarding a need for a better and more reliable railroad. For current improvements, in the national budget for 2018 the government prioritized measures for improving Narvik Station to facilitate long trains and enhance traffic separation and management. On Ofotbanen that goes from Narvik to the Swedish border it is political pressure to get a double track to handle the expected increase in traffic.

Aviation in Norway is of high importance due to the long distances between cities and towns, which reflects the high domestic traffic. In the Norwegian Arctic, infrastructure for aviation have two main parts; regional airports with connections to other regional airports which are very important for business travelers and tourists, and local airports with short runways for smaller planes heavily reducing travel time in sparsely populated areas. In the national airport company Avinor's analysis of benefits from aviation (/164/), companies in Tromsø rates the importance of their airport very high. Medical treatment and hospital structure are depending on functional airports. In 2013 the Norwegian parliament decided that a new airport should be built in Mo i Rana. The construction is included in the national transportation plan on the last period of the plan (2018-2029).

Greenhouse gas emissions is an important issue from the aviation sector. For the local air traffic, as discussed in SDG 7, a possible solution for parts of the traffic may be in sight; small electrical airplanes. To reduce costs related to airports, several technological measures are under development such as remote towers and unmanned snow removal on the runways (/165/). A low-cost operations concept is important especially at the smaller airports to uphold activity in low utilization periods.

Connectivity have become a necessity for businesses and everyday life. Three main categories of infrastructure in that respect can be identified; fixed broadband, mobile networks and satellite coverage. According to the Business Index North, based on 2016 numbers over 90 % of households in the Norwegian Arctic have access to basic broadband (/127/). Numbers for high speed broadband, 100 mbps, are 70 % in Nordland, 75 % in Troms and 80 % in Finnmark. For mobile 4G coverage, the percentage of coverage in the territories in the same counties are 83 %, 75 % and 93 %.

Satellite coverage is an important alternative for the shipping and offshore industries. High-capacity broadband coverage is delivered from geostationary satellites, with limited coverage in the Arctic. Low orbit satellites have coverage but delivers less bandwidth and lower quality service. To enable high-speed satellite communication in the Arctic, Space Norway is working on a project where the goal is to launch two satellites in high-elliptical orbit, giving full coverage and high bandwidth (/166/).

Increase the access to financial services

A study based from 2015 points out that companies in the Norwegian Arctic have a higher debt/equity ratio, more private owners and less foreign and governmental capital invested (/167/). The differences are significant, but there are also indications on that a change in the direction of the national average is occurring. The study also presents an investment outlook, expecting investment in the region in the period 2016-2022 to be 410 billion NOK, with housing, offshore, infrastructure and power utilities as the largest segments. Of the investments, 22 % are expected to be governmental funded investments, 46 % by private investors and 32 % as investments in offshore oil and gas.

From the Business Index North (/127/), it is indicated that financing may be a general challenge in the Arctic and that banks may be reluctant to help young growth companies. This increases the importance of risk willing investors, and measures to attract investors to companies that operate far away from capital markets. To facilitate this, the government have established two funds; the 'Co-investment fund for Northern Norway' (/168/), which will invest in young companies in the Norwegian Arctic together with other private investors. The other fund is for investment in Russia and Eastern Europe to facilitate growth and cooperation between companies in the Norwegian Arctic and the countries and region mentioned above. The latter of these funds will be managed from a private company in Kirkenes, with an additional purpose of build up the financial asset and investment management activity and competence in the region.

Upgrade infrastructure and retrofit industries to make them sustainable and clean

Considering ferries as a part of the infrastructure in the Norwegian Arctic, a major upgrade into more sustainable solutions is taking place in Norway. Batteries as energy storage for ferries has developed very fast. The first fully electric ferry M/F Ampere was launched in 2015, and according to the Ministry of Climate and Environment, all car ferries are to be fueled by electrical power within 2025. This reduces emissions and facilitates technology development. A challenge in some crossings is available infrastructure for charging, which has led to development of grids and of land-based energy storages for fast transfer to the ships.

In Nordland county, the crossing Tjøtta-Forvik is signed for electrical ferries, and other crossings such as Vennesund-Holm and Horn-Andalsvåg are expected to be next with one electrical ferry for each. Five crossings in Troms with electrical power are expected to be put on tender in the near future. After the ferry revolutions, high speed passenger boats are expected to be next infrastructure segment for low or zero-emission technology.

Another example of sustainable industry and infrastructure development is the use of CO₂ to produce micro algae for fish feed. A project where carbon dioxide and residue heat from the production is used to cultivate algae, which again is used for producing fish feed at the ferrosilicon producer Finnfjord in Troms has created international interest.

Enhance scientific research and innovation

To further advance the blue economy, research-based knowledge must be produced. Taking into the account the broad term of a blue economy, there are many sources for research and development available. The Research Council of Norway have a broad range of relevant programs such as e.g.:

- Climate change research KLIMAFORSK.
- Programs for the Arctic and northern areas such as NORD, POLARPROG, NORRUS and SIOS.
- Oceans, health technology and operations such as SANOCEAN, JPIOCEANS.
- Petroleum research such as PETROMAX, DEMO2020, OG21.
- Marine resources MARINFORSK.
- Maritime technology and operations such as Maririm21, MAROFF.

- Aquaculture research in HAVBRUK.
- Energy research in ENERGIX.
- Centres for research-based innovation such as SFI MOVE and SFI EXPOSED.

In addition, the EU has several programmes and projects such as the Horizon 2020, the European Maritime and fisheries fund with their Blue Economy call, and the BlueEDU, a competence programmes for the aquaculture sector.

Another important source of research funding for the aquaculture and the fisheries sectors is the industry's own fund, The Norwegian Seafood Research Fund (FHF), which redistributes 0.3 % of fish export income to research and development.

In terms of innovation in the region, key aspects regarding innovation in the Arctic overall according to Business Index North (/127/) is that the area contains significant innovation power, and that brands can and are often built on the identity of life in the Arctic. Emerging sectors such as tourism and food related industries have built strong growth on this. Several clusters are facilitating the growth, such as the bioprospecting cluster in Tromsø, tourism clusters and aquaculture clusters.

Indicators

- Statistics Norway (SSB) can make an indicator for the proportion of the rural population who live within 2 km of an all-season road. The indicator is not fully developed with method and definitions. Statistics Norway can also make an indicator for passenger and freight volumes, by fashion or transport based on figures for domestic transport services.
- Statistics Norway (SSB) can make an indicator on the manufacturing value added as a proportion of GDP and per capita based on figures from the national accounts.
- Statistics Norway (SSB) can make an indicator for the proportion of small-scale industries in total industry value added. The indicator is not fully developed with a method and definitions. Statistics Norway has, however, made ad hoc calculations earlier, so that this indicator can be calculated for Norway.
- Statistics Norway (SSB) produces figures on emissions from Norwegian economic activity that can be used to calculate the CO₂ emission per unit of value added.
- Statistics Norway (SSB) and NIFU make statistics on Research and development expenditure as a proportion of GDP. The also make statistics on researchers (in full-time equivalent) per million inhabitants.

SDG 10 – Reduced inequalities



Level 3: Less important, there are already good conditions for this SDG in the Norwegian Arctic

The following SDG 10 targets are discussed in this chapter:

Target 10.1 By 2030, progressively achieve and sustain income growth of the bottom 40 % of the population at a rate higher than the national average

Target 10.3 Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard

Target 10.4 Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality

It is the Ministry of Finance that is responsible for this target in Norway. Norway are one of the leading countries for income equality.

Income equality (national)

The World Bank has calculated that the 40 % of the population with the lowest income in Norway had an annualized income growth of 2.11 percent from 2010-2015 (/169/). Statistics Norway shows an annualized income growth of 3.6 percent in the same period for all households in Norway (/170/). Norway has a special focus on assuring sustaining income growth of the 40 % of the population with the lowest income at a rate higher than the national average (/171/).

Statistics Norway uses yearly income 50 % under the median income to calculate how many people are living with low income (this is the OECD-norm). The number of people living with a low income has increased from 3.5 % in 2009, to 4 % today. This is probably due to the financial crisis and the relative high amount of refugees Norway has accepted the last years. Fast integration is one focus area that is prioritized to reduce wage inequality together with free kindergarten for low income families (/172/). For the Norwegian Arctic the share of people living with low income is 4.5 % which is somewhat lower than the Norwegian average with 5.5 % (/173/).

The Government is giving priority to ensuring quality in education and employment, especially for young people and those at risk of marginalisation. This is an important contribution to realising the 2030 Agenda with a vision of 'leaving no one behind'. Norway has a special focus on reducing the proportion of young people not in employment, education or training (/171/).

Wage equality are also measured by the Gini index, a statistical measurement for income distribution, and are in Norway one of the lowest in the OECD area, meaning low inequality. There is high labour participation and high public compensation in case of sickness or unemployment. The taxation system is designed to reduce inequality by taxing high incomes higher than lower incomes. Most social benefits are equal for all residents and consist of free healthcare and education. This is to promote equal possibilities for all (/172/). In 2016 the Gini index in Norway was

0.248, while the same index in the Norwegian Arctic was 0.216 (/165/). This indicates that there is a slightly greater equality in the Norwegian Arctic than for Norway on average.

Another way to measure income equality are by labour share of GDP and this indicator has increased from 46 % in 2000 to 52 % in 2016, this is the indicator that Statistics Norway use (/174/).



Figure 29 For the Norwegian Arctic, the share of people living with low income is 4.5 %.

Income equality (foreign)

Gender equality and rights for women and girls, access to education and health for all, and a human rights-based approach, are crucial factors for reducing extreme poverty and creating equal opportunities for all, including people with disabilities, indigenous peoples, and marginalised groups. These policies are essential if we are to 'leave no one behind' in the implementation of the 2030 Agenda. One example of Norwegian priorities and partnerships in this area includes engaging in partnerships under the UN, the World Bank and other organisations to strengthen women's rights and gender equality in economic, social and political life, which is crucial for economic development and growth.

Norway gives preferences to developing countries in foreign trade, among others toll by preferences for import. Norway are among the countries that donate the most per inhabitant to developing countries (/169/). In OECD Norway are registered with 3.6 billion dollars in net transfers in 2015 (/171/).

The foreign efforts are prioritized between:

- Increasing ODA (Official Development Assistance) for education, with a special focus on girls' education, education in emergencies and education quality.

- Maintaining a high level of investments in global health, in particular efforts to improve maternal health and reduce child mortality.
- Working in partnerships, including with the private sector, Every Woman Every Child, the vaccine alliance GAVI, and the Global Partnership on Education (GPE).
- Engaging in partnerships under the UN, the World Bank and other organisations to strengthen women's rights and gender equality in economic, social and political life, which is crucial for economic development and growth (/171/).

Indicators

Statistics Norway (SSB) can calculate growth rates of household expenditure or income per capita among the bottom 40 % of the population and the total population. As of today, this is done on consumption unit and not per capita.

Statistics Norway (SSB) can probably calculate the proportion of population reporting having been personally discriminated against or harassed within the previous 12 months on the basis of a ground of discrimination prohibited under international human rights law. The indicator is not fully developed with method and definitions. Statistics Norway can probably extract relevant figures from the Health Survey, which has some issues related to discrimination, and the Living Conditions Survey among immigrants.

- Statistics Norway (SSB) can make an indicator on labour share of GDP, including wages and social protection transfers based on figures on labour costs in the national accounts.

SDG 12 – Responsible consumption and production



Level 2: Important, attention is required for this SDG in the Norwegian Arctic

The following SDG 12 targets are discussed in this chapter:

Target 12.1. Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries

Target 12.5. By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

Target 12.6. Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

Target 12.7. Promote public procurement practices that are sustainable, in accordance with national policies and priorities

Target 12.10. Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products

Implement the 10-year framework of programmes on sustainable consumption and production

The 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP) represents a commitment among Heads of State to accelerate the global shift towards Sustainable Consumption and Production (SCP) patterns. The framework aims at developing, replicating and scaling up SCP and resource efficiency initiatives through international cooperation and multi-stakeholder programmes. It consists of six programmes: Sustainable Public Procurement, Consumer Information for SCP, Sustainable Tourism, Sustainable Lifestyles and Education, Sustainable Buildings and Construction, and Sustainable Food Systems (/175/). Norway was one of the countries that committed to this framework under the Rio+20 UN Conference on Sustainable Development in 2012, and in 2015 Norway adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals.

In Norway the SDGs are followed up and reported on through the budget process. Responsibility for each of the SDGs is placed on a coordinating ministry, where the Ministry of Climate and Environment is responsible for coordinating the work related to SDG 12 and target 12.1. The status of the follow up of is reported by each ministry in their budget proposals and the Ministry of Finance sums up the main points in the national budget presented to the Storting (Norwegian Parliament) annually. Established formal mechanisms ensures dialogue and cooperation with the Sami parliament and local and regional authorities (/176/). Norway's status on the sustainable development goals has also been outlined in reports to the United Nations.

Sustainable consumption and production is mentioned as one of the targets that poses particular challenges nationally. Norwegians have a high level of consumption. The amount of waste has increased with over 50 % since

1995, and the government has few means for affecting this (/177/). An agreement between the Government and the food industry has been concluded to reduce food waste by 50 % within 2030. Norway also provides financial support to the development of an international FAO-guideline for food waste in the value chain for fish (/178/). In addition, the Government is helping to raise awareness and share knowledge about food waste with both consumers and the food industry through the industry initiative 'Matvett.no'. Pollution from chemicals and waste has been strongly reduced since the 1970s. Material recovery has increased, and hazardous waste is collected and treated separately (/179/). The web-based guide 'Sortere.no' helps consumers find information on how and where to recycle products (/180/). The Ministry of Climate and Environment presented in 2017 a white paper on waste policy and circular economy (/181/), and in the processing of this it was decided by the Storting, amongst others, that a national strategy for a circular economy is to be developed, along with national targets for waste prevention, waste recovering and recycling (/182/).

Norwegian laws and regulations are important means to ensure efficient use and management of natural resources onshore and at sea. The new regulation on public procurement includes requirements related to environment, human rights and other social responsibilities, and Norwegian companies are required to report on corporate social responsibility. Environmental education is a part of the school curriculum, and the government encourages the use of the national label for sustainable destinations related to travels and tourism. Internationally, Norway supports a variety of initiatives related to sustainable consumption and production, both financially and in-kind, and is committed to international efforts to phase out fossil fuel subsidies to ensure a transition to sustainable consumption (/23/).

The government has stated that they want to increase the efforts towards making the Norwegian Arctic one of the most sustainable regions in the country (/183/). A new Arctic Strategy was presented in 2017, and although not specifically outlined, it does include goals that are related to SDG 12 (/18/). This strategy is currently being updated.

Losses from fisheries and aquaculture

In general, discards of catch is not perceived as a large challenge in Norwegian Arctic fishing. All fish shall be brought to land, a requirement that has been in place since the late 1980s. There are strict regulatory regimes on avoiding catching unwanted fish, such as requirements to fishing gear and where to fish that is followed up by the Norwegian Directorate of Fisheries and the coastguard. Still there are some examples of discards, both from small and large vessels.

Quality deterioration of catch to a level not suitable for human consumption can happen with most fishing gears and vessels. Causes could be technical challenges e.g. with cargo handling systems, operational in the sense of catching too much at once or passive gear such as nets and lines left too long out. Depending a bit on the type of vessel and fishery, time from catch to delivery is usually critical. In some pelagic fisheries such as capelin and blue whiting, large shares of the catch go directly to production of fish meal or oil.

There have been discussions if the minimum pricing system for fish gives the right incentives to invest in high-quality measures and operations. In a study from 2016 (/184/) first hand value of haddock in good and bad condition was compared. Haddock is a specie that quickly loses its quality if not treated optimally, and low quality is often related to large catches where the fishermen may not have sufficient time to do this. The perhaps unexpected finding was that in periods with large catches, the price difference between the quality categories was reduced. Causes may be that larger catches gave better economies of scale at the fish factory.

In the aquaculture industry mortality in the various stages of fish farming can be quite substantially. According to governmental (/185/) numbers, 15-20 % of the individuals are lost during the process, corresponding to 6-9 % of the total weight. The graph below shows the distribution of the causes.

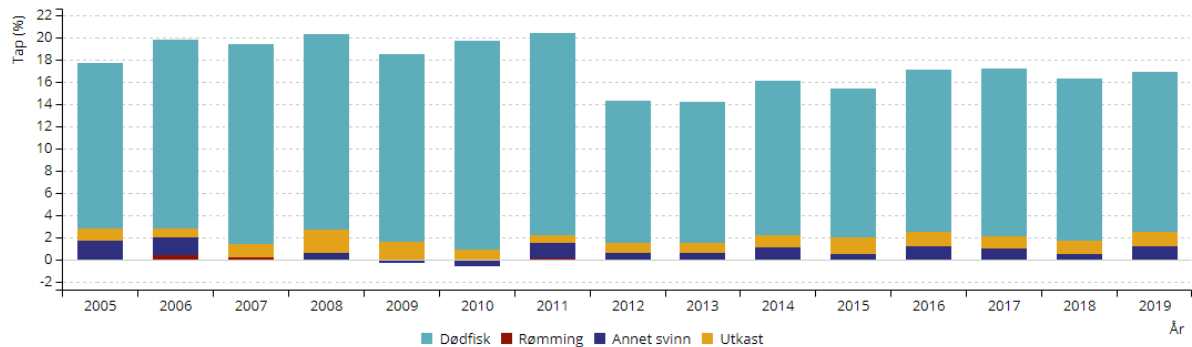


Figure 30 Fish mortality and cause distribution. (The Norwegian Directorate of Fisheries / Barentswatch)

The light blue legend is fish mortality during production, red is escapes from cages, yellow discards and dark blue other losses. Causes for mortality is not registered in the same dataset, but according to the Institute for Marine Research annual risk study for the industry (/186/), stress, injuries, parasites and diseases are listed as general causes. From the same study, there are indications that mortality in the Norwegian Arctic are low, especially in Nordland and Troms. Removal of sea lice is for the fish a risky operation and one of the causes for mortality. In areas with less need for this, such as the Norwegian Arctic, lower such rates could be expected.

Although uncertainties in the data and lack of detail knowledge exists, there are differences in how the various methods for removal of lice affects the fish, and indications on individual differences between each operation in the same method. Sea lice is the major change of the industry today, and heavy research activities takes place both in research institutions and in the industry.

Substantially reduce waste generation from fishing and aquaculture

Plastic and other waste in the ocean and along the coastline is an environmental problem with increased extent and attention the last years. In general, most of the marine pollution comes from land-based sources. In the Arctic, there are indications that a larger share of the pollution is linked to maritime activity, and especially to fishing activities (/187/). As discussed in SDG 14, waste management on land is not perceived to be a major problem, but there are still challenges on the maritime side.

A large share of the maritime traffic in the Norwegian Arctic is fishing vessels. A project lasting from 2017-2018 has mapped attitudes and culture towards marine litter in the fishing fleet (/188/). The indication is that the fleet now has a higher awareness towards reducing pollution from the fleet, and that the younger generation fishermen are leading by example.

In addition to general waste from ships, the fishing vessels generate waste from lost fishing gear. Since early 1980s, the Norwegian Directorate of Fisheries have performed clean-up missions to remove fishing gear and other litter from the ocean. Accumulated up to 2014 approximately 18,000 nets have been removed in addition to large amounts of ropes, wires, trawl and other equipment (/189/).

Reduction of loss of gear is a priority for the governments. According to law, professional fishermen must try to recover lost gear, and if they are not able they must report this to the coastguard. People fishing for leisure must also report losses, and to facilitate this the Fisheries Directorate has developed a mobile application for reporting losses. According to the directorate, there is an increasing trend that the gear is returned to the owner, thus reusing it and thereby reducing waste.

'Fishing for litter' is a pilot programme targeting fishing vessels to bring ashore marine debris collected during fishing by establishing free return stations. A study from 2017 evaluated the programme and analysed the litter brought to land (/190/). Of 48 tons 37 was recyclable fishery waste.

In the Report No. 35 to the Storting (2016/2017) (/191/) regarding the Norwegian Ocean, a number of measures are pointed out. For the fishing industry, in addition to the measures discussed above, additional measures such as gear loss reduction and recycling are suggested.

Marine pollution from the aquaculture industry was analysed by SINTEF in 2017, which concluded that it is not likely that the industry is a significant source (/192/). There are currently discussions regarding wear of feed pipes as a source of possible microplastic pollution.

In terms of circular economy, some trends may be observed. Recycling of fishing gear is a relatively new industry. One example is NOFIR AS, a company located in Bodø specializing in recycling of ropes, nets and other fishing gear. Use of the entire fish is another, with examples both from the wild fish processing industry and aquaculture, where bi-products such as guts and bones are being used as raw material for oil and meal products. A third is the use of sludge from fish farms and extract valuable products (/193/).

There is a growing public focus on how to combat marine litter. In Norway, the engagement really accelerated in 2017 when a stranded whale was found dead on Sotra with it's stomach full of plastic. It has become popular to engage the local community in cleaning up coastal areas and dissemination of knowledge about consequences of marine litter is growing. The Norwegian Environment Agency has established a support scheme where people, NGOs, municipalities and other can apply for support for projects that aim to clean up marine litter. In 2018, many projects in Finnmark, Troms and Nordland were awarded money from the support scheme. Some of them are listed below:

- SALT Lofoten AS was awarded 3 million NOK for clean-up actions and workshops.
- Finnmark Friluftsråd was awarded 1 million NOK to clean coastal areas and make preventive efforts to combat marine litter in 23 municipalities in the north of Troms and Finnmark.
- Svalbard Friluft was awarded 500,000 NOK to reduce marine litter along the beaches in the Isfjord area by facilitating outdoor recreation.
- Ren Kyst Helgeland was awarded 650,000 NOK to clean up at islands and mainland, including knowledge sharing in schools.

Encourage companies to adopt sustainable practices

There is no existing conclusive method or definition for what is considered sufficient reporting on sustainability (/01/). There are, however, several guidelines and standards available for sustainability reporting. Recognized international standards include, among others, GRI (Global Reporting Initiative), UNGC (United Nations Global Compact), SASB (Sustainability Accounting Standards), IIRC (International Integrated Reporting Council) and CDP (Carbon Disclosure Project).

Incentives

The Norwegian Government is engaged in further development of international reporting requirements, and transpose these into national laws (/176/). In 2013, The Norwegian Accounting Act was updated with Section 3-3c which includes requirements on reporting of corporate social responsibility (/194/). Additionally, Oslo Stock Exchange has collaborated with the Norwegian Forum for Responsible and Sustainable Investment (Norsif) and issued a guidance on the reporting of corporate responsibility, which is based on the GRI Sustainability Reporting Standards (/195/).

Norway

Every other year, KPMG publishes a study on the sustainability reporting from the largest companies in the world. KPMG Norge has considered the 100 largest companies in Norway as of June 2017, and their findings indicate that 89 % of these companies conduct reporting on sustainability, and 81 % of the companies with sustainability reporting practices include this in their Annual Report (/196/). The increase in sustainability reporting seen from 2013 to 2017 was identified as strongly driven by paragraph 3-3c in the Norwegian Accounting Act on corporate social responsibility reporting. With respect to third party verification, only one out of five of the 100 largest Norwegian companies has external verification of their sustainability reports, compared to 67 % of the 250 largest companies world-wide.

Norwegian Arctic Region

As of today, companies reporting on sustainability in the Norwegian Arctic are not identified on a common and publicly available platform. For the three northernmost counties in Norway, Nordland, Troms and Finnmark, a big part of the ocean-based industries is found within the fishery and fish farming sector. To investigate further the sustainability reporting practices within this industry, the top 20 companies in the region measured by income (/197/) were identified. Among these, we find Biomar A.S., Cermaq Norway AS, Nordlaks Oppdrett AS, Nova Sea AS and Lerøy Aurora AS. Cermaq, Biomar Group and Lerøy Seafood Group are all registered in GRI's Sustainability Disclosure Database (/198/) and report according to the GRI Standard. To evaluate the sustainability reporting for the remaining companies, further investigation is needed to consider the reporting practice in each company separately.

Promote public procurement practices that are sustainable

Purchases made by the public sector account for approximately 15 % of gross domestic product and amounts to around 500 billion NOK yearly (/199/). The new legislation on public procurement that entered into force 1th January 2017 states that all public purchasers are obligated to take into consideration environment and climate, pay and working conditions, use of apprentices, human rights, and other social responsibilities in their procurement processes (/200/). Although data on to which extent the new social considerations are incorporated in public purchases in The Norwegian Arctic has not been found, it is reasonable to assume that findings in national studies also are applicable for the region.

In a study done by Agency for Public Management and eGovernment (Difi) and Ethical Trading Initiative Norway (IEH) (/201/) looking at the use of ethical requirements in public procurement for five high risk categories (clothing and footwear, playground and sports equipment, IT equipment, furniture and fixtures and natural stone) it is found that good ethical requirements (requirements that comply with the ILO's core conventions or stricter) are not stipulated in 49 % of procurements done in 2016. For high-risk goods included in building and construction work good ethical requirements are only used in about one out of five procurements, whereas for procurements that involves goods only (clothing and footwear, IT equipment, playground and sports equipment, furniture and fixtures) about two thirds have used good ethical requirements. The analysis also states that there is a need to strengthen the competence among contracting authorities and to build knowledge among suppliers. In an earlier study done by IEH and Norad (/202/) they found a positive trend in the use of good ethical requirements from 2009-2014. This could indicate that the public sector is on the right track, but still has a way to go.

A study done by Oslo Economics (/199/) looking at the effect of new social considerations in public procurements in 2017 supports this view. In a survey sent out to public purchasers they found that the new society considerations have become more important the last years in the eyes of the 87 respondents, and especially pay- and working conditions, use of apprentices and climate environment. Human rights and universal design were rated as very or quite important by 77 % and 76 % respectively. It should be mentioned that out of the 87 respondents, only three were located in The Norwegian Arctic. They also found that requirements related to environment was stipulated in 51 of 97 specifications, used as award criteria in 27 % of the competitions, and among these 4.5 % was weighted

above 30 %. As a comparison, a study looking at 244 public procurements in 2015 (/203/) showed that 25 % of the tender documentation included environment as an award criterion and 0.4 % was weighted above 30 %. The study by Oslo Economics also points out that the increased complexity in public procurements represents challenges related to competence and capacity, and that these challenges are partly dealt with through experience sharing between contracting authorities, standardized requirements, guidance from The Agency for public Management and eGovernment of Norway (Difi), and the use of digital procurement tools. Several of the respondents say that they use time on courses and competence development, receives guidance from Difi and other organisations that work with social considerations, and have increased cooperation with other public purchasers.

An example of such initiatives in the North is Coordinated Procurement in Nordland (SIIN, former SIIS). This is a cooperation between 20 municipalities in Nordland that among others seek to increase efficiency, innovation and competence (/204/). Social responsibility is acknowledged as an important part of the work, where environment, apprenticeship and inhibiting work-related crime is specifically mentioned (/205/). The initiative is related to the National Programme for Supplier Development, also referred to as Innovative Procurements, and is a supplement to Difi and the rest of the public policy system (/206/). The purpose of the programme is to accelerate innovations and development of new solutions in public procurements, and one of the objectives of the programme is to reduce emission. Ten of the participants in the programme are located in the Norwegian Arctic.

An additional initiative in the Norwegian Arctic is the supplier development program 'Higher up in the value chain' developed by the Sami Parliament, the county authorities in Nordland, Troms and Finnmark, in collaboration with Innovation Norway Arctic/Nordland and the Research Council of Norway, Northern Norway (/207/). Start-up is in March this year and the purpose of the program is to increase sustainable value creation and competitiveness among the industries in Northern Norway', and increase the expertise within sea food, tourism and adventure tourism and affiliated industries, with a focus on sustainability, cold climate, exposed conditions and natural adventures.

Develop and implement tools to monitor sustainable tourism

As discussed in SDG 8, the Norwegian Arctic has experienced a tremendous growth related to tourism. For some of the most visited destinations in The Norwegian Arctic this growth has become a challenge. Lack of infrastructure to accommodate the mass of people visiting has resulted in litter overflowing, human waste and toilet paper in the nature, and outworn hiking trails. Lofoten is an example of such a destination. Mass tourism also has a negative effect on the perceived value of an experience, with crowded streets and endless queues, and it can also become a hassle for the local population. It is the municipalities responsibility to solve these challenges, but lack of resources makes it difficult (/208/). Tourist tax has been discussed as a solution, but the proposal was rejected by the Norwegian Parliament (/209/).

One step that has been taken by the Norwegian government is the subsidy scheme National Hiking Trails launched in 2017 to solve challenges related to degradation of nature, waste management and safety for destinations that have experienced an extraordinary increase in international visits (/210/). In 2018 five hiking destinations in The Norwegian Arctic received subsidies, out of a total of 14 destinations: Segla på Senja (Troms), Engabreen in Meløy (Nordland), Reinebringen in Moskenes (Nordland), Dronningruta in Øksnes (Nordland) and Utvelgelse av sti i Lofoten (Nordland) (/211/).

Another challenge related to the enormous growth in tourism is the imprint it has on our climate and local pollution. The long distances in the Norwegian Arctic requires tourists to travel by air, with ferries, cruise, long-distances busses or cars to get around. Cruise stands for the highest emission per passenger-kilometre, followed by car and air travels (/212/). The cruise traffic to the Norwegian Arctic is increasing. From experiencing a decline in traffic from 2012-2016 (/213/), the number of cruise calls increased by 20 % from 2017-2018 for 12 of the harbours in the Norwegian Arctic, and the numbers are expected to continue to grow further (/214/). To promote the development towards greener solutions the largest ports in Norway have agreed on a model, Environment Port Index (EPI), to calculate the

environmental impact of a cruise vessel while at berth and use this as basis for rewarding the most environmentally friendly vessels. Tromsø port is the only port in the Northern region that has joined this collaboration (/215/). In addition, an agreement between the largest cruise destinations in Norway was recently signed, which outlines 14 environmental requirements related to the cruise industry. From the Norwegian Arctic, Tromsø and Nordkapp were among the participants (/216/).

The Label of Sustainable Destination is a tool developed by Innovation Norway that allow travel destinations to work systematically towards becoming more sustainable. It is based on UNWTOs ten principles for sustainable tourism and consist of a standard with a set of criteria and indicators that covers nature, culture, environment, social values and economic viability. The destinations need to show continuous improvement along the indicators which is measured through yearly performance counts and renewing the brand every three years (/217/). So far there are three destinations in the Arctic that have been awarded the label, Vegaøyene, Region Lyngenfjord and Svalbard, and several more are in the process: Narvik, Tromsø, Senja and Midt-Troms, Lofotoen, Alta (/218/), Kirkenes (/219/), Varanger (Vardø, Vadsø, Nesseby og Båtsfjord) (/220/), and Vesterålen (/221/).

Indicators

An indicator for global food loss index has for the time being not been established and will require considerable development if it is to be made for Norway.

Statistics Norway (SSB) produces statistics on the national recycling rate, tonnes of material recycled based information of waste delivered for recycling both from the household and the industry.

- Number of companies operating in the Norwegian Arctic publishing sustainability reports. The indicator does not have an established method and definitions for what will be a sufficient reporting on sustainability.
- Implementation of sustainable public procurement policies and action plans.
- Number of sustainable tourism strategies or policies implemented for the Norwegian Arctic.

Partnerships

SDG 17 – Partnerships for the goals



Level 1: Very important, high attention is required for this SDG in the Norwegian Arctic

The following SDG 17 targets are discussed in this chapter:

Target 17.16. Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries

Target 17.17. Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

Goal 17 seeks to strengthen global partnerships to support and achieve the ambitious targets of the 2030 Agenda, bringing together national governments, the international community, civil society, the private sector and other actors. The Norwegian Arctic is a region in continuous development with significant potential for economic growth. However, this is dependent on peace and stability being maintained in the region, that development and conservation go hand in hand and that due regard is taken to the local society and indigenous rights. This requires multi-stakeholder partnerships at several levels – from international co-operation to local community partnerships.

International and intergovernmental co-operation

International cooperation, promoting peaceful and sustainable development in the Arctic, is a key priority in Norway's Arctic strategy (/18/). The government gives high priority to cooperation in the Arctic Council, the Barents cooperation, the Baltic Sea cooperation and the Northern Dimension. It is also important that regional and local authorities, as well as various institutions and NGOs, participate actively in in these cooperation arenas:

- The Arctic Council promotes cooperation, coordination and interaction among the Arctic States, Arctic indigenous representatives (Permanent Participants) and observers to the Council. For example, the Saami rights and interests are represented by the Saami Council, an NGO with Saami member organizations in Finland, Russia, Norway and Sweden.
- The cooperation in the Barents Euro-Arctic Region operates on two levels: intergovernmental and interregional between counties or similar sub-national entities.

- The Baltic Sea cooperation and the Northern Dimension promotes regional cooperation characterised not only by involving governments and authorities, but also a wide range of businesses, interest groups and civil society representatives as well as various financial institutions and development banks.

As the majority of Norway's fisheries are conducted on stocks that are shared with other states, close cooperation is also required between neighbouring countries to set quota levels and management strategies. The cooperation with Russia in the north takes place in the Joint Norwegian-Russian Fisheries Commission which has a long history of developing management strategies and setting TACs (Total Allowable Catch) for shared stocks.

The Nordic Council of Ministers also have a specific co-operation programme for the Arctic and the programme for 2018–2021 (/222/) stresses the importance of co-operation addressing all of the SDGs. A total of 6.52 million DKK was allocated in June 2018 towards Nordic Arctic Cooperation Programmes.

As the Arctic is undergoing radical changes with global impact, there is a large number of joint international research initiatives and collaboration in the region. The International Arctic Science Committee (IASC) is a non-governmental, international scientific organization and an observer to the Arctic Council. The organization seeks to encourage and facilitate cooperation in all aspects of Arctic research, in all countries engaged in Arctic research and in all areas of the Arctic region.

National and local co-operation

When addressing challenges and opportunities in the Norwegian Arctic, it is also important to establish community partnerships that explore local problems, identify potential solutions, and propose appropriate policies and measures. The importance of such place-based community partnerships is highlighted in the Arctic Resilience report (/12/) with a focus on adaptation to climate change which to a great extent involves actions by individuals, households or local communities.

At national level, there are many research partnerships focusing on the Arctic. The Nansen Legacy platform, for example, is the collective answer of the Norwegian research community to the outstanding changes witnessed in the Barents Sea and the Arctic as a whole (/223/). This is a joint Norwegian research platform that aims to provide an integrated Arctic perspective on climate and ecosystem change, from physical processes to living resources, and from understanding the past to predicting the future.

The Arctic Economic Council (AEC) is an independent organization that facilitates Arctic business-to-business activities and responsible economic development through the sharing of best practices, technological solutions, standards, and other information. However, there seems to be a potential for enhanced partnership between businesses and between businesses and the civil society in the region.

Indicators

Number of multi-stakeholder partnerships being supported in the Norwegian Arctic by public or private funding. Currently, no statistics are available.

Key results

From the work presented in this report (part 1) the key results from the four main SDG categories (biosphere, society, economy and partnerships) are presented below.

Biosphere

A major threat to the Norwegian Arctic is global warming and climate change. The Arctic is currently experiencing warming that is two to three times higher than the global annual average. A warming beyond 1.5° will have significant impact on risks to marine biodiversity, fisheries, and ecosystems, and their functions and services to humans. Further there will also be an increased probability of an ice-free Arctic Ocean during the summer.

The ecological status of the coastal waters in the Norwegian Arctic is very good. There are very few coastal waters (< 3 %) that are at risk of not achieving the target defined by the EU Water Framework Directive for 2021 of good ecological and chemical status. The main threats to the ecological status in the Norwegian Arctic are the human activities related to the oil and gas industry, fishing industry, ship traffic, industry along the coast (chemicals, metals), discharges from cities, airports and landfills. The Norwegian Arctic also receives long range transported pollutants by air from the Northern Hemisphere.

In recent years there has been more focus on plastics and microplastics in the sea. Recent sampling of the seabed in the northern North Sea and the Barents Sea showed that all the sediment samples contained microplastics.

With respect to fishing in the Norwegian Arctic the management and regulations of the authorities is functioning well, with little overfishing and major fish stocks at sustainable levels. Small-scale fisheries are important for local communities and in 2012, 79 % of the registered Norwegian fishing fleet was fishing vessels under 11 meters.

Norway has 82,500 km² of marine protected areas in the Norwegian Arctic and these are mainly around Svalbard. This is almost half of the total marine protected areas nominated by the countries in the OSPAR. The task of the marine protected areas (Marine Resources Act) is to conserve and protect vulnerable marine species and habitats such as the cold-water coral reefs.

The status of the natural habitats in the Norwegian Arctic varies. The Barents Sea area has fish populations in good condition, while most of the seabird populations have had a significant and rapid decline. The melting ice cover is a major threat for the polar bears, since they hunt mainly from the ice. Their most important prey species, the ringed seal and bearded seal, are perhaps even more strongly associated with the sea ice. The polar bear is at the top of the Arctic food chain and will therefore be rapidly affected by changes in the populations of prey species. It has been documented that polar bears have high loads of persistent organic pollutants (POPs), and that these pollutants affect their health.

Society

There is limited poverty in Norway and the Norwegian Arctic. Norway has universal and free access to healthcare, education and welfare. The income inequality in Norway is low but rising, and the counties Nordland, Troms and Finnmark in the Norwegian Arctic have among the lowest income inequality levels. The low income inequality is related to that Norway has high labour participation and high public compensation in case of sickness or unemployment. The taxation system is designed to reduce inequality by taxing high incomes higher than lower incomes. Most social benefits are equal for all residents and consist of free healthcare and education.

Unemployment rates in the Norwegian Arctic is low but the share of population on disability benefits in the Norwegian Arctic is slightly higher compared to mean in Norway.

Food production in the Norwegian Arctic is mainly related to fishery and aquaculture where the productivity has increased substantially in recent decades while the number of people working full time in this sector decreased. With respect to agriculture, the Norwegian Arctic is not one of the more productive regions in Norway. Additionally, reindeer is an important part of the traditional food production in the region.

Health in Norway and the Norwegian Arctic is generally good and life expectancy is high. There are however some challenges in the Norwegian Arctic particularly related to non-communicable diseases and obesity. Finnmark has a higher rate of type-2 diabetes and the Norwegian Arctic also has higher levels of cardiovascular disease than the national level, with Finnmark having the highest levels. A higher percentage of youth in the Norwegian Arctic are overweight or obese compared to the rest of the country.

In the Norwegian Arctic the school results for the pupils are lower than the national average, and there is a shortage of qualified teachers. Participation in secondary education is a general challenge in Norway, with 15 % of students dropping out of high school. High-school drop-out rates are higher in the Norwegian Arctic than in the rest of the country, with 16 % dropping out of high school in Troms, 18 % in Nordland and 21 % in Finnmark. Drop-out rates differ considerably between vocational education and education preparing for higher education, being 29 % and 6 % respectively. Drop-out rates are also considerably lower for girls than for boys. The Sami people in the Norwegian Arctic have lower levels of formal education than the rest of the population in Norway. There are also gender differences within the Sami population. For example, 23.8 % of the women have short higher education compared to 12.2 % of the men.

Violence against women and girls is a challenge in the Norwegian Arctic. The Sami population is more exposed to violence than the rest of the population in Norway. A very high share of Sami women, 49 %, report that they have been exposed to violence, compared to 35 % of non-Sami women in Norway.

The counties in the Norwegian Arctic perform better compared to the rest of the country in terms of women in leadership in business. Looking at the private sector and public sector together, there are more women in management in the Norwegian Arctic compared to Norway. While 35.7 % of managers in Norway are women, the numbers for Nordland, Troms and Finnmark are on average 39 %.

Norway and the Norwegian Arctic has come a long way in terms of securing affordable and clean energy for everyone. 96 % of the electricity production in the Norwegian Arctic comes from renewables. Hydropower plays a key role in the Norwegian power system, and the Norwegian Arctic is no exception. Wind power is also growing and is expected to take a larger share in the coming years.

Outside Svalbard, the only power production from non-renewable sources in the Norwegian Arctic is located at Melkøya outside Hammerfest where there is a facility that processes natural gas from the Snøhvit field in the Barents Sea. The facility uses gas as energy source in power generation. The Barents Sea has several oil and gas discoveries and the Johan Castberg field is under development and will start producing in 2022. The Norwegian Petroleum Directorate estimates that the Barents Sea has more than 2/3 of the undiscovered oil and gas resources on the Norwegian Shelf and there is currently high exploration activity in the area.

Svalbard is a special case in many ways, also in terms of energy supply. The winter is long, with a dark period for almost 4 months and low temperatures both summer and winter. The core of today's energy supply is based on a power plant using locally extracted coal. It is not a sustainable long-term solution to have a coal-based energy system in Svalbard. The Ministry of Petroleum and Energy has recently published a study that highlight the solutions for future energy supply in Svalbard. The solutions that have been suggested are: LNG power plant, Heat power plant based on pellets and Solar power in combination with LNG.

Norway has experienced a rapidly increasing sale of electric cars in recent years. However, the Norwegian Arctic with long distances and low temperatures has had a much more moderate sale of electric cars. With respect to public transport the urbanisation is strongest in the two biggest cities in the Norwegian Arctic, Tromsø and Bodø, with

76,000 and 52,000 inhabitants respectively. Both cities have plans for replacing traditional fossil buses with electric buses.

For marine transportation in Norway and the Norwegian Arctic, zero emission vessels using battery instead of diesel engines, will likely be limited to smaller vessels or vessels with short distance operations such as car ferries. For long range large ships, electrification is more complicated and alternative fuels will be the likely solution to reduce GHG emissions. In aeronautics, electrification will likely not go beyond short range small aircraft for the next decades.

The industry and the oil and gas sector accounts for about 50 % of the total emissions in Norway. A large part of the industry segment is already electrified, and the remainder, which is currently covered by fossil fuels, mainly covers high-temperature processes and various heating purposes where electricity is to a small extent applicable. The oil and gas sector utilize gas as energy source offshore. In the future, more and more platforms will be supplied with clean electricity, either from shore or from offshore wind turbines. This is already planned for some Norwegian platforms. The Goliat platform outside Hammerfest in Finnmark is partly supplied with electricity from shore.

In agriculture electricity accounted for 52 % of the energy consumption and the remaining part was covered by different fossil fuel products in 2017. Important steps will be to make processes more energy efficient, replace fossil fuel with electricity and to increase the use of sustainable biomass.

Fish farming used about 1.5 TWh of power in 2017. Important steps to cut emissions in fish farming are the same as for agriculture, and electricity will play a key role. About 50 % of the fish farms in Norway get power from shore, while the rest use a diesel generator to generate power.

The Norwegian Arctic is part of the Norwegian national targets for reducing the loss of cultural heritage. They include protecting a more representative selection of the cultural heritage, reducing losses of cultural monuments and sites, and implementing various conservation. The ambition is that within 2020, 90 % of all municipalities in Norway should have documented plans for how to take care of their cultural heritage. The status of these plans varies; Tromsø is currently working on their cultural heritage plan, while Bodø has not yet started but plans to start up the work in 2019 and finish within 2020.

Looking at crime rates such as violence, Nordland and Troms counties are on national average while Finnmark is considerable higher. In addition, as discussed earlier, there are clear signs that the Sami population and specially the women are more exposed to violence and abuse than others.

Economy

For the Norwegian Arctic, the ocean and its resources are a key source of employment and income. While on a national level 11% of employment is directly related to the ocean industries, the corresponding share in the Norwegian Arctic is 20 %.

For achieving higher levels of productivity, the Norwegian Arctic has some complicating factors; there is a much lower population growth and a lower educational level and higher sick leave in the region. In addition, the Norwegian Arctic has a lack of healthcare and educational workers and a lack of resources with higher academic education in the cities.

There are several key ocean-based industries in the Norwegian Arctic (in alphabetical order):

Aquaculture: Aquaculture in this region is an industry that has grown rapidly over the last 25 years with salmon as the main product. The cold waters of the Norwegian Arctic are preferable locations for production due to less challenges with lice and diseases. Most of the future growth in Norwegian aquaculture is expected to come from this region.

Bioprospecting: Bioprospecting is the search for plant and animal species from which medicinal drugs and other commercially valuable compounds can be obtained. The Norwegian Arctic with its rich oceans and fjords has a nature given advantage. In addition, the fishing and aquaculture industry provides opportunities for exploration of these

resources. This could for example be by-products from fisheries and aquaculture, farming of seaweed, development of new sources and properties of fish feed, and search for valuable chemistry in organisms. This is an industry under development and still mainly at the research level today.

Fisheries: The Norwegian Arctic is home to some of the largest and most valuable fish stocks in the world, such as the northeast arctic cod and (partly) the Norwegian spring spawning herring. Fisheries have always been an important part of the coastal communities of this region.

Mining: Mining is a land-based industry and the Norwegian Arctic has substantial amounts of ore deposits and traditionally this region has been a main point for production of ores and industrial minerals. At the moment there is only one active mine for metallic ore in the Norwegian Arctic that is situated in Nordland. A new copper mining project in Finnmark has a substantial opposition in the population against disposal of the tailings in the local fjord. The local Sami population also opposes the project with regards to negative effects on fishing in the fjord and the land they use for reindeer herding.

Oil and gas: The Norwegian oil and gas industry have considerable presence in the Norwegian Arctic with large estimated shares of undiscovered resources. Offshore exploration and production give significant activities on land in selected locations.

Shipping and ports: The maritime industry has significant activity in the region. From the oil and gas extraction in Russia and Finnmark large tankers are sailing outside the coast. Further there is a substantial traffic of cruise and passenger vessels, fishing vessels are working on the fishing grounds, and there are offshore service vessels serving the oil fields at Haltenbanken and the Barents Sea. The expected decrease in future polar ice is expected to cause growing ship traffic from Europe to Asia and vice versa through the North-Eastern sea route due to that this will be a shorter transport route.

Tourism: The Norwegian Arctic has become an all-year tourist region with visiting tourists both from cruise vessels and airlines, from all over the world. In 2015 the tourism industries in the Norwegian Arctic accounted for 9 % of the total value creation in the region.

The infrastructure in the Norwegian Arctic is today highly dependent on road transport. Small cities and towns, relatively small factories and production facilities and low population makes road transport a natural and low-cost choice for transport. In the public strategies for the Norwegian Arctic it is a clear target reduce greenhouse gas emissions, for example by increasing the amount of cargo transported by low-emission ships on behalf of road transport. Another example is the ongoing concept study on developing the railway from Trondheim to Bodø (Nordlandsbanen) and to expand it to Tromsø. For aviation a possible solution for the future could be to use small electric airplanes for local air traffic.

Norway and the Norwegian Arctic has a high level of consumption, this poses particular challenges with respect to sustainable consumption and production. The amount of waste has increased with over 50 % since 1995 in Norway. There are several government led initiatives for waste reduction, like programmes on reducing food waste, increasing material recovery, collection and treatment of hazardous waste and environmental education. For the Norwegian Arctic relevant challenges are also reduction of waste generated in the fishing and aquaculture sector. Government programmes have been launched for reducing loss of fishing gear.

Of the 100 largest companies in Norway, 81 % had sustainability reporting included in their Annual Report in 2017. As of today, there is no common and publicly available platform for companies reporting on sustainability in the Norwegian Arctic.

In Norway purchases made by the public sector account for approximately 15 % of gross domestic product and amounts to around 500 billion NOK yearly. Public purchasers are obligated to take into consideration environment and climate, pay and working conditions, use of apprentices, human rights, and other social responsibilities in their

procurement processes. In the Norwegian Arctic there are local initiatives linked to improvement of public procurement, like 'Coordinated Procurement in Nordland' and 'Higher up in the value chain'.

The tremendous growth related to tourism has become a challenge for some of the most visited destinations in the Norwegian Arctic like for example in Lofoten. Lack of infrastructure to accommodate the mass of people visiting has resulted in litter overflowing, human waste and toilet paper in the nature, and outworn hiking trails. It is the municipalities responsibility to solve these challenges, but lack of resources makes it difficult. Tourist tax has been discussed as a solution, but the proposal was rejected by the Norwegian Parliament.

Partnerships

The Norwegian Arctic is a region in continuous development with significant potential for economic growth. To achieve such a development the region is dependent on peace and stability, that development and conservation go hand in hand and that due regard is taken to the local society and indigenous rights. This requires multi-stakeholder partnerships at several levels – from international co-operation to local community partnerships.

At international level there are several intergovernmental co-operations like the Arctic Council, the Barents cooperation, the Baltic Sea cooperation and the Northern Dimension. The Nordic Council of Ministers have a specific co-operation programme for the Arctic.

At national level, there are many research partnerships focusing on the Arctic. One example is the Nansen Legacy platform, which is the collective answer of the Norwegian research community to the outstanding changes witnessed in the Barents Sea and the Arctic as a whole.

At local level it is important to explore local problems, identify potential solutions, and propose appropriate policies and measures. The importance of local community partnerships is highlighted in the Arctic Resilience report.

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