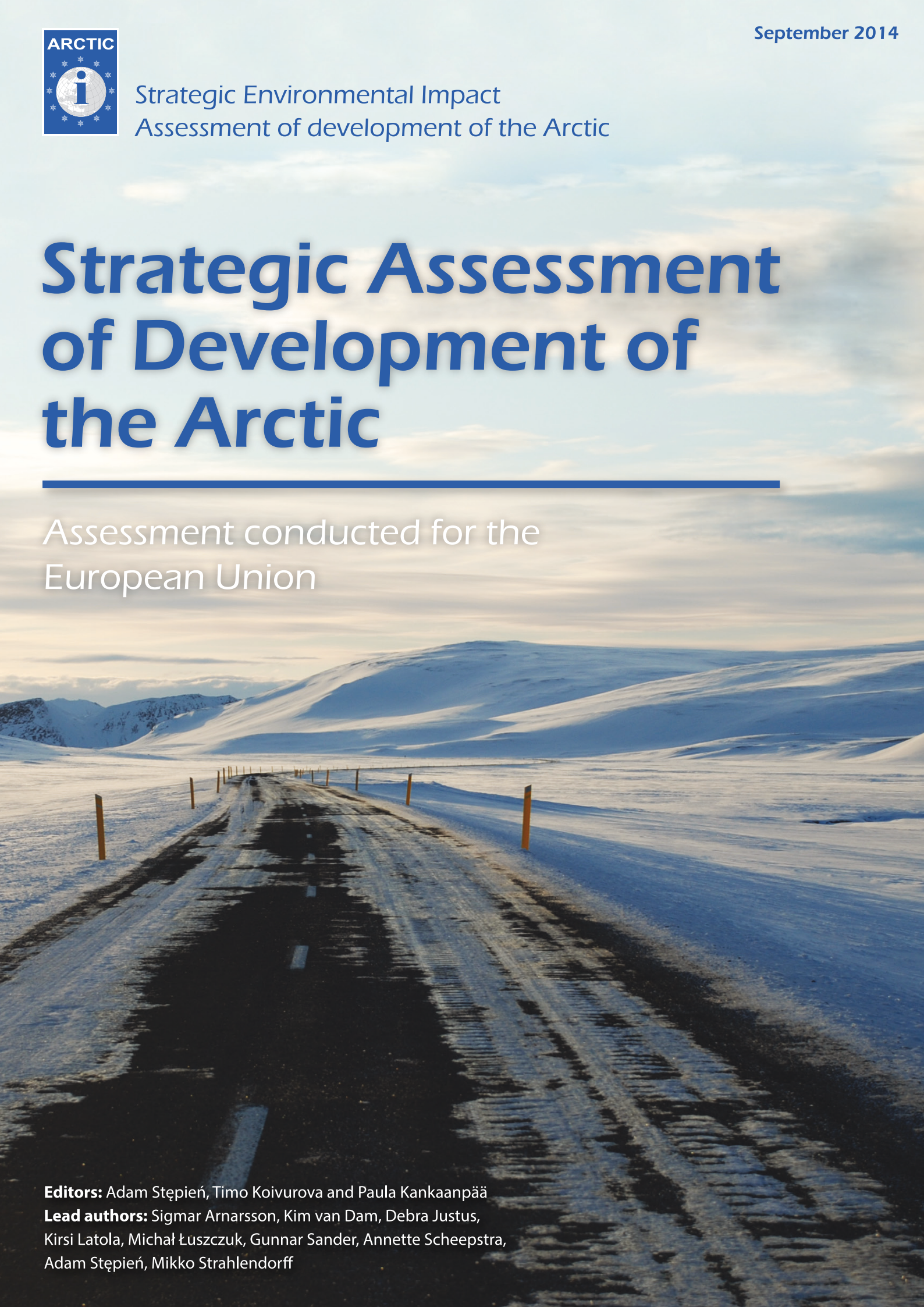
September 2014

Strategic Environmental Impact
Assessment of development of the Arctic

Strategic Assessment of Development of the Arctic

Assessment conducted for the European Union



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Strategic Assessment Of Development Of The Arctic

Assessment conducted for the European Union

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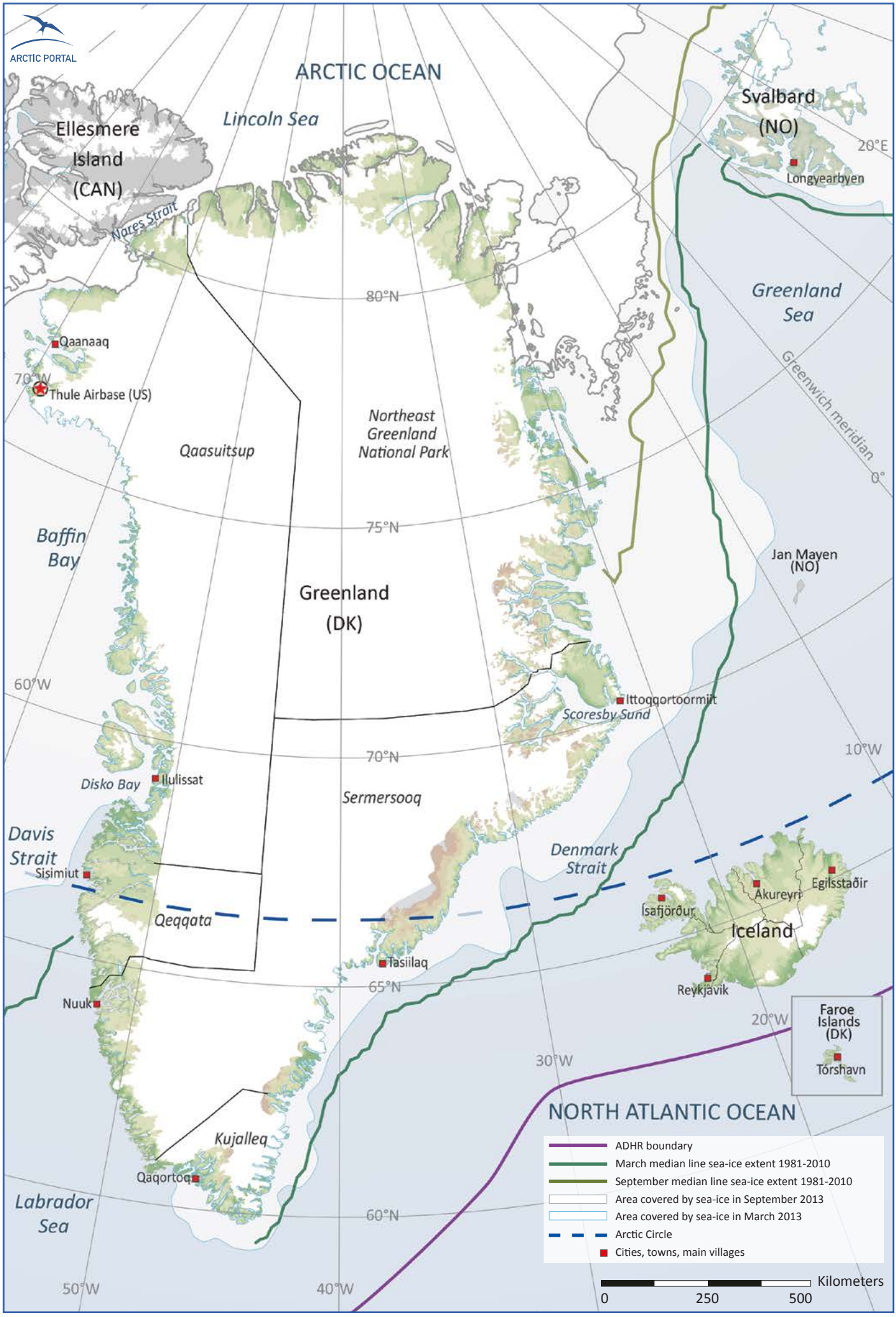
ARCTIC PORTAL
ARCTIC OCEAN
Lincoln Sea
Ellesmere Island (CAN)
Nares Strait
Svalbard (NO)
20°E
Longyearbyen
Greenland Sea
Greenwich meridian
0°
80°N
Qaanaaq
70°W
Thule Airbase (US)
Northeast Greenland National Park
Qaasuitsup
75°N
Baffin Bay
Greenland (DK)
Jan Mayen (NO)
60°W
Ittoqqortoormiit
Scoresby Sund
70°N
10°W
Disko Bay
Ilulissat
Sermersooq
Davis Strait
Denmark Strait
Sisimiut
Egilsstaðir
Akureyri
Ísafjörður
Iceland
Qeqqata
Tasiilaq
65°N
Reykjavik
Nuuk
20°W
Faroe Islands (DK)
Tórshavn
30°W
NORTH ATLANTIC OCEAN
Kujalleq
Qaqortoq
Labrador Sea
60°N
50°W
40°W
ADHR boundary
March median line sea-ice extent 1981-2010
September median line sea-ice extent 1981-2010
Area covered by sea-ice in September 2013
Area covered by sea-ice in March 2013
Arctic Circle
Cities, towns, main villages
Kilometers
0
250
500


ARCTIC PORTAL
10°E
20°E
30°E
40°E
70°N
65°N
60°N
55°N
Barents Sea
Norwegian Sea
North Sea
Baltic Sea
White Sea
Gulf of Bothnia
Gulf of Finland
Gulf of Riga
Skagerrak
Hammerfest
Kirkenes
Murmansk
Finnmark
Tromsø
Kandalaksha
Troms
Lappi
Vitino
Kiruna
Rovaniemi
Bodø
Norrbotten
Russia
Nordland
Luleå
Oulu
Kainuu
Pohjois-Pohjanmaa
Pohjois-Karjala
Keski-Pohjanmaa
Pohjois-Savo
Västerbotten
Umeå
Nord-Trøndelag
Pohjanmaa
Finland
Västernorrland
Östersund
Hernösand
Pirkanmaa
Satakunta
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Stockholm
Bergen
Buskerud
Hordaland
Oslo
Värmland
Norway
Stavanger
Västra Götaland
Gotland
Kristiansand
Gothenburg
Hallands
Skåne
Malmö
Denmark
Estonia
Latvia
Lithuania
Country boundaries
ADHR boundary
Indicative boundary of Sápmi (Sámi area)
Boundary of Barents region (Barents Regional Council)
Observer to Barents region (Barents Regional Council)
Area covered by sea-ice in September 2013
Arctic Circle
Cities, towns, main villages
Kilometers
0
250
500



The Project: Strategic Environmental Impact Assessment of Development of the Arctic

The 'Strategic Assessment of Development of the Arctic' report is the main product of the Preparatory Action project: Strategic Environmental Impact Assessment of development of the Arctic (Service contract 191 105/2012/637465/SER/EI), financed by the Directorate-General for the Environment, and carried out by a network of 19 leading Arctic research and communication centres and universities with extensive activities in and knowledge of the Arctic. The project was led by the Arctic Centre of the University of Lapland and contributes to the EU Arctic Information Centre initiative.

The primary objective of the project was to increase awareness about the Arctic and its changing political, economic and environmental landscape, as well as to comprehend the impact of EU policies on the future of the Arctic region by participating in and benefiting from multidimensional dialogues and information exchange between the EU and civil society. This was implemented by using Impact Assessment as a tool to put together information for the needs of decision- and policy-makers.

To support the EU in the development of its Arctic policies, the Preparatory Action project combined science-based information with the views and perspectives of Arctic stakeholders. The co-production of knowledge through science-policy interaction is urgently called for in Arctic discourses today. With this project, the EU took on a pioneering role in carrying out large-scale impact assessments for policy-makers in the Arctic.

The project also analysed the need for establishing an EU Arctic Information Centre that would operate as a network of European institutions for information, outreach and insight into Arctic issues, and which would seek to provide the EU, its citizens, institutions, companies and Member States with Arctic information and a factual overview about the status and trends in the Arctic.

See: *www.arcticinfo.eu*

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eco logic

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G·R·I·D
ARENDAL

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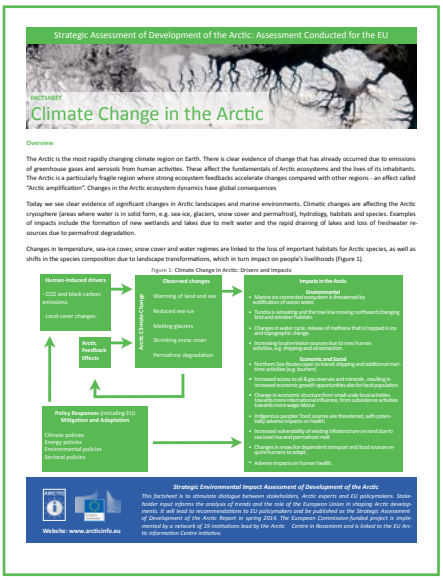
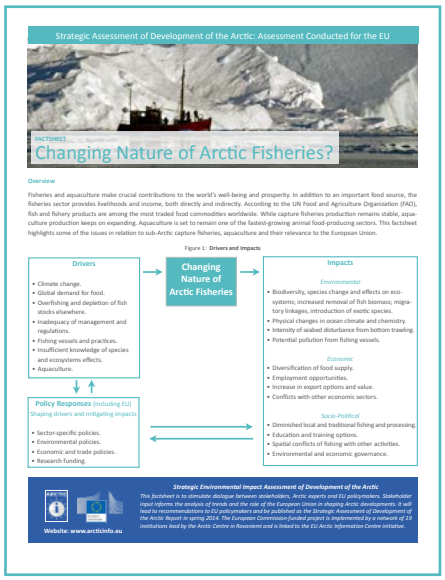
Factsheets

Factsheets produced as a part of the Strategic Assessment of Development of the Arctic have been primarily designed as a background material for consultations with Arctic stakeholders.





Available at www.arcticinfo.eu

Executive Summary

THE ASSESSMENT

The 'Strategic Assessment of Development of the Arctic: Assessment Conducted for the European Union" report considers the trends and developments taking place in the European Arctic today. That includes a view to 2030, with an emphasis on the uncertainties. The analysis has been conducted on the basis of seven themes focused on change. The implications of Arctic changes for the European Union as well as the role of EU policies and actions in the Arctic are examined. The European Arctic is understood here as the part of the circumpolar Arctic located between Greenland and northwest Russia (Figure ES1).

Figure ES1: *European Arctic as Defined in the Strategic Assessment of Development of the Arctic.*
Source: Arctic Portal, 2014.

The report is the main outcome of the 'Strategic Environmental Impact Assessment of development of the Arctic', a project funded by the European Commission and carried out by a network of 19 European research and communication institutions specialised in Arctic affairs, led by the Arctic Centre, University of Lapland. It contributes to the EU Arctic Information Centre initiative. All project partners participated in the assessment work, but the results and findings are the sole responsibility of the authors of this report. The full version of the report is available at www.arcticinfo.eu.

The objective of the assessment was to "assess the impacts of development in the Arctic and of EU policies affecting the Arctic region on the political, economic and environmental landscape of the EU and the Arctic region." The assessment work, conducted between April 2013 and May 2014, proved highly challenging owing to its broad scope and the ambitious programme of stakeholder involvement.

Enhancing dialogue between Arctic actors, experts and EU policy-makers was a focus. Therefore, involving Arctic stakeholders through workshops, an online questionnaire and direct outreach comprised a key component of the study. The authors developed recommendations by building on ideas proposed by stakeholders.

The summary presents key messages regarding development of the Arctic, suggestions for the further evolution of the EU Arctic policy, and provides an overview of the findings and recommendations of seven thematic report chapters.

DEVELOPMENT OF THE ARCTIC: KEY MESSAGES

1. Arctic environmental and socioeconomic changes are driven primarily by climate change and the global economy, with demand for resources remaining a key driver of economic developments. Nevertheless, other factors, such as regulatory frameworks, prove to be critical in many cases.

This assessment shows that the global economy and climate change are key drivers of developments in the European Arctic. Climate change impacts should not be analysed independently, but always in the light of multiple activities, particularly in the industrial sector, and existing governance frameworks.

In the context of the globalised world economy, the demand for the region's renewable and non-renewable resources is currently the main factor affecting economic activities in the Arctic. Significant fluctuations of resource prices have a critical influence on development trends, especially in the case of extractive industries.

The influence of markets and climate change impacts may be sometimes outmatched by the role of regulatory frameworks and administrative or political decisions, such as the opening of new areas for oil and gas exploration and legislation pertaining to reindeer herding or nature protection.

Social challenges and conflicts, environmental concerns, indigenous rights, as well as local perceptions of needs, risks and opportunities may facilitate, enhance or hinder particular developments or transformations. These dynamics differ in various parts of the Arctic, and in some instances they may prove to be critical for particular economic activities.

The social transformation in the Arctic is also primarily driven by globalisation, including its sociocultural dimension. In the European Arctic, global cultural changes and information technology, next to economic developments, are of key importance for social and cultural change.

2. Climate change has profound impacts on Arctic biodiversity, landscape and livelihoods, but limited influence on current and expected industrial, economic and social developments.

Climate change is profoundly transforming the Arctic region with impacts on biodiversity, marine and terrestrial ecosystems, landscape and nature-based livelihoods. The region warms two to three times faster than the global average and is particularly vulnerable, given the dependence of human-natural systems on the cryosphere and the fragility of Arctic ecosystems. Effects are evidenced in the melting of the ice sheet in Greenland, decrease in the extent and type of sea ice, thawing permafrost and coastal erosion. However, in Northern Fennoscandia (northern regions of Norway, Sweden and Finland), changes in snow cover and in lake and river ice conditions are the most pronounced and have a number of implications, mostly adverse, for example for the maintenance of roads or for nature-based livelihoods such as reindeer herding.

Climate change affects economic activities in the Arctic both positively and negatively. Yet, regulatory frameworks and demand for Arctic resources constitute the pivotal factors shaping the pace and direction of economic developments both at present and by 2030. The current and future influence of different types of drivers cannot be thoroughly quantified, but the majority of the researchers and stakeholders involved in this assessment share the same general view of the limited role of climate change in socioeconomic development. This is particularly true for extractive industries, but also for tourism, forestry, fisheries and even reindeer herding. Climate change has a comparatively greater impact on Arctic maritime transport, but also here a number of constraints exist, including seasonality and the predictability of the shipping season as well as the high costs associated with Arctic shipping.

Policy-makers also need to take into account the indirect impacts of global climate change on the Arctic. Indirect impacts include changes in demand for Arctic resources due to the influence of climate change on the global economy or the implications of climate change mitigation policies, which, for instance, facilitate the development of renewable energy in the region.

Despite the often expressed claims, it is far from certain that opportunities connected with climate change – in terms of maritime transport, fisheries or resource extraction – will balance out or even outweigh the impacts and risks associated with it. While climate change already adversely impacts the Arctic, it has a restricted role in triggering Arctic economic development, in particular in the European part of the region.

3. Current economic and social developments are generally moderate and expectations for the near-term are modest. However, even a modest increase in economic activities requires a response.

Overall, the development and transformation of Arctic regions are gradual and uneven. In the Arctic Ocean proper (in comparison to some of the adjacent seas) economic developments, especially in the case of hydrocarbon extraction and fisheries, are predicted to be either very limited or decades away.

Policies and strategies based on notions of an “Arctic boom” risk being misguided. In particular, shifts in demand for resources can lead to both an increase and a decrease in the intensity of industrial activities in the Arctic. This does not mean that current and future developments do not require policy responses now, including enhancement of policies and governance systems as well as investments in knowledge-building and infrastructure. Even a moderate increase in economic activities may have a significant adverse impact on the Arctic environment and societies or might involve major risks. This is due to the vulnerable nature of the Arctic environment, the region’s unique cultures and existing gaps in scientific knowledge. For instance, any activities taking place in ice-covered waters are connected with high environmental risks.

4. Arctic developments are closely interconnected.

Examination of the seven themes within this assessment shows that the trends, drivers and implications of each are closely interconnected. Many activities, such as mining, shipping and forestry, are likely to have significant environmental and social impacts, even if they are conducted in a responsible manner with high safety and environmental standards and in the bounds of an effective regulatory system.

In decision-making the interplay between various drivers, activities and their impacts should be always taken into account. No development should be analysed in isolation.

The impacts are particularly pronounced when multiple activities result in cumulative impacts. Moreover, conflicts between different industries, for example hydrocarbon extraction and fisheries, are possible. Many traditional livelihoods, like reindeer herding or fishing, may not be able to withstand simultaneous pressures from multiple industrial developments.

On the other hand, different activities may complement one another and contribute to a more diversified economic structure. This may occur for instance in tourism and reindeer herding in terms of protection of natural and cultural values, or in relation to employment opportunities in mining and tourism. Infrastructure that enables one activity may beneficially serve others, such as port facilities.

5. The European Union is affected by the changes in the Arctic.

Changes in Arctic climate are of critical importance for Europe. For instance, possible methane releases from Arctic permafrost and loss of snow cover contribute to global warming. Direct impacts include a rise in the sea level and the influence on weather in Europe.

The gradual opening of Arctic sea routes will be important for European transport and shipbuilding industries. The region's fisheries are a significant food source. The EU imports Arctic oil and natural gas to meet its energy needs. Northern Fennoscandia is one of the main regions for EU domestic production of minerals. The cultures of European Arctic peoples, especially the Sámi – the EU's only recognised indigenous group – are an indispensable part of Europe's cultural diversity.

THE EU ARCTIC POLICY FRAMEWORK: SUGGESTIONS FOR FUTURE DEVELOPMENT

The EU policy towards the Arctic is an evolving process. Building from previous policy statements, there is a prospect that a comprehensive policy framework stating EU interests and goals will be formulated. In that regard, this section puts forward a set of suggestions derived from stakeholder input, the analysis of EU policies and the report's thematic recommendations. The latter, referring to specific policy areas, are summarised in the next section.

1. The EU is encouraged to continue and to reinforce investment in gaining knowledge and better understanding of Arctic changes and their implications.

Numerous uncertainties and the dynamic nature of the social-environmental systems in the Arctic require an in-depth understanding of the physical, biological and social processes at play. The findings of EU-funded research should be better communicated to EU decision-makers, Arctic stakeholders and the EU public at large in formats that are adjusted to the needs and capacities of particular audiences. In addition, integrated assessments are among the key elements of a more comprehensive understanding of Arctic change is to carry out, which bring together environmental, social and economic issues and bridge the knowledge gap between science, policy-makers and stakeholders.

2. Constructive engagement of Arctic actors in EU decision-making should be enhanced.

Specific characteristics of the Arctic region require tailored solutions to address environmental, social and governance challenges. Some EU policies proposed and designed for a broad EU constituency may need to be assessed also in the context of Arctic-specific challenges or implications. In line with the principle of "engagement" within EU Arctic policy, both indigenous and non-indigenous stakeholders should be included in the EU decision-making processes that may affect them. In the light of a more visible and long-term presence of the EU in the region, there is a need for creating sustained structures for consultation and engagement. Such structures would contribute to facilitating effective communication between Arctic stakeholders and the EU decision-makers.

In the context of consultations with indigenous peoples, it must be remembered that they are not only stakeholders but also rights-holders. It is therefore vital to take into account international guidelines and legal frameworks, in particular the UN Declaration of the Rights of Indigenous Peoples, in any engagement with indigenous actors.

Engagement of non-EU Arctic actors in decision-making processes may be challenging, as EU legal and institutional frameworks are designed primarily for EU citizens and stakeholders. However, constructive engagement with non-EU actors may take the form of consultations or effective, transparent and meaningful involvement in assessment processes. In some cases, for example indigenous communities or disadvantaged groups, engagement may need to be supported by capacity-building.

3. Diversity within the Arctic region needs to be taken into account.

The Arctic regions are varied, even if they share numerous common characteristics. Policy-making processes addressing Arctic issues or affecting Arctic regions have to take this diversity into account. EU competences and influence, which vary between sectors and geographical locations, also contribute to this heterogeneity.

Statements that are true for the European Arctic or Fennoscandia may cause misunderstandings in other parts of the circumpolar North. Policy tools applicable to one part of the region may be inappropriate in the circumpolar context. Due to the diversity of the Arctic, it is also necessary to engage with local actors and stakeholders in order to understand specific conditions and values.

4. The EU should pay special attention to the European Arctic.

The trends occurring throughout the circumpolar Arctic are also manifest in the European Arctic, including the EU's own northernmost regions. It is important that policy-makers and other European actors perceive the challenges prevalent in the European Arctic not as remote and exotic, but as inherently European issues.

It is crucial to provide support for sustainable development and high environmental standards, and to demonstrate the positive imprint of such efforts in the EU's northernmost regions and their closest neighbours. That cannot mean losing focus on the main global trends and pan-Arctic environmental priorities. However, in this way the EU may establish itself more firmly and be more broadly acknowledged as an Arctic actor, and as a consequence gain greater influence on Arctic affairs in general.

Recent EU policy documents highlight EU actions in the European North. However, challenges particular to the European Arctic – as a region distinct in the circumpolar context – as well as clear goals and priorities specific for that region are not elaborated. The policy documents should state very clearly which aims and actions refer to the circumpolar Arctic, and which to its European and EU part.

5. An EU policy framework for the Arctic needs to adapt to the complex landscape of governance in the region.

Finding a balance between internal coherence and adjusting to the complexity of Arctic governance will be an ongoing challenge for EU policy-making.

Effective co-ordination within the European Commission and the European External Action Service as well as the identification of principles to guide various EU actions in Arctic matters are highly commendable. The Arctic policy framework can be used to address potentially diverging policy objectives, for example simultaneously pursuing climate change goals and energy security or, in the context of land use conflicts, facilitating domestic extraction of minerals and at the same time supporting local and traditional livelihoods and cultures.

However, a policy framework must be not only coherent, but also adapted to the complexity and institutional diversity that are characteristic of Arctic governance. A good understanding of local governance is necessary as many decisions affecting the Arctic environment, societies and economy are made locally.

While complexity and fragmentation do not have to be seen as disadvantages of Arctic governance, possibilities for enhancing governance frameworks exist and are highlighted in this report's thematic recommendations. The EU can positively contribute to gradual integration and enhancement within some sectors of Arctic governance, such as shipping or biodiversity. This can be achieved primarily through the EU's influence on the relevant international frameworks and participation in the venues of Arctic regional governance.

6. Co-operation with Arctic partners within venues of Arctic regional governance remains, despite the challenges involved, a key priority both in the European Arctic and at the circumpolar level.

Indispensable elements of the EU's presence in the Arctic include substantial contributions to the work of the Arctic Council working groups and the active and substance-oriented participation of the European Commission in the Barents Euro-Arctic Council. This also remains true for increasingly challenging collaboration with Russian partners.

In terms of substantial input, the Commission should continue to build on and highlight the expertise of specialised EU agencies, in particular the European Maritime Safety Agency and the European Environment Agency. Financial or technical support for projects implemented under the auspices of Arctic co-operation forums should be further explored.

Support for and participation in Arctic Council knowledge-building and standard-setting activities regarding maritime shipping, climate change adaptation, black carbon, oil spills and biodiversity are particularly relevant, with the focus on developments at the level of the Arctic Council's working groups. In the Barents Euro-Arctic Council, the further alignment of Barents co-operation with EU funding programmes and the Northern Dimension is needed.

EU POLICIES AFFECTING THE ARCTIC: KEY THEMATIC FINDINGS AND RECOMMENDATIONS

Climate Change in the Arctic

Due to climate change, the Arctic is the most rapidly changing region on Earth. There is clear evidence that change has already occurred due to emissions of greenhouse gases and aerosols from human activities, which affect the fundamentals of the Arctic ecosystems and the lives of the Northerners. Over the second half of the 20th century, warming in the Arctic led to increased loss of snow cover in spring and summer and simultaneously increased snowfall during boreal autumn and winter. Arctic sea-ice change has been linked to changes in mid-latitude weather patterns that increase the probability of extreme weather events, such as droughts, floods and heat waves in summer and cold snaps in winter. The warming trend also appears to result in increased precipitation in northern Europe. The sea level rise is also one of the main concerns.

The EU can influence Arctic climate change by limiting its own emissions, including short-lived climate forcers, and championing an effective and broad global climate agreement. The EU has made progress in curbing GHG emissions, partly through policy measures in energy, transport and efficiency improvements, and has set targets for further gains in the period to 2030. The EU, as a key actor in the UNFCCC negotiations, can highlight the Arctic within international processes and support any potential initiatives coming from the Arctic Council. Eventually, the EU is in a good position to support adaptation in the region (inter alia, via the EU's 2013 Adaptation Strategy).

The EU is encouraged to increase its efforts and contributions to enhance sustained observation activities in the Arctic in order to improve understanding of climate change mechanisms and effects in the region. This can be done by, for example, using the framework of European Research Infrastructure Consortia or Horizon 2020 infrastructure funding.

Current satellite-based earth observation systems do not fulfil user needs for communication and monitoring. The EU should address this shortcoming through EU-funded satellite programmes. Both for decision-making in the near term and for long-term guidance for Arctic adaptation and sustainable development, climate indicators specific to the Arctic should be identified and corresponding data obtained. Moreover, in the European Arctic, there is a clear role for the EU in moving gradually from adaptation planning to implementation and undertaking concrete actions.

Changes in Arctic Maritime Transport

Arctic maritime transport is still dominated by internal and destinational traffic (including cruise tourism), highly interlinked with extraction of Arctic resources. This is likely to remain the case in the coming decades. Trans-Arctic shipping is slowly emerging, but there are major constraints for its rapid expansion. The EU may gain access to new resources and growing trade. European ship owners and maritime industries expect economic gains. However, the Arctic is a frontier region for shipping with high risks and various environmental concerns.

The EU influences Arctic shipping by contributing to shaping international standards and regulations, legislating on member states' responsibilities as port or flag states and building up Arctic maritime infrastructure such as through its satellite programmes.

The EU should contribute to improved regulation of Arctic shipping by supporting high standards in the Polar Code, supplemented by additional measures to address invasive species, heavy fuel oil and emissions to air. The European Commission should follow the current discussions on heavy fuel oil within the Protection of Arctic Marine Environment working group of the Arctic Council.

The EU should also consider stronger involvement in international co-operation on maritime infrastructure and research. Examples of possible contributions are hydrographic mapping, better sea-ice, meteorological and oceanographic observations and forecasts, ship surveillance, communication systems, and search and rescue capabilities. EU support to the Galileo and Copernicus programmes and its SafeSeaNet and CleanSeaNet initiatives are important in this context. More support for monitoring is needed in order to improve the understanding of environmental conditions and the impacts of shipping as well as to find effective measures to reduce negative impacts. There is also wide scope for technological innovation in ship design, emission and waste reductions, cleaning hulls and ballast water in Arctic conditions.

Changing Nature of Arctic Fisheries and Aquaculture

Fishing is a vital economic activity in the Arctic. Fisheries are characterised by fluctuations that may be exacerbated by climate change. Arctic coastal states are currently exploring possibilities for establishing a fisheries management regime in the Arctic Ocean, even though it seems unlikely that large-scale fisheries will be established in the area in the future. Aquaculture production is growing fast and becoming a crucial part of the economy in many Northern communities.

The EU is a major consumer of Arctic fish and is keen to ensure good co-operation with Arctic states in the sustainable management of marine living resources. The EU influences Arctic fisheries via food safety standards, legislation related to the port state and flag state responsibilities of its members, and participation in international and regional regulatory frameworks.

The EU can improve management in the light of the Common Fisheries Policy reform and contribute to enhanced co-operation, information sharing and research, with inclusion of local and traditional knowledge. EU efforts to combat illegal, unreported and unregulated fishing should be further strengthened. The EU should address the need to reduce fishing capacity by decreasing incentives for economically unsustainable fisheries.

Developing Oil and Gas Resources in Arctic Waters

While interest in Arctic offshore hydrocarbon exploitation has increased in recent years, actual developments have been slow to follow, with major differences across the Arctic region. Critical factors that EU decision-makers need to take into account are the local benefits of resource development, risks, responding to which requires appropriate regulations, as well as gaps in knowledge and research efforts.

Meeting the growing demand of EU citizens for energy in a safe and environmentally responsible manner is a key challenge for EU institutions. The EU has limited, but multifaceted, functional competences that enable it to play a role in promoting high standards for resource development including through support for developing technologies specific for Arctic application, efforts to address climate change and relations with Arctic partners.

Funding and investment frameworks can facilitate high standards for regulators and industry to ensure that Arctic hydrocarbon developments are environmentally and socially responsible. It is recommended that the EU increase its support for research on the Arctic environment and relevant technology advances. This would improve risk assessment related to oil and gas developments in Arctic waters and foster technology developments particular to the region such as oil spills in ice conditions. Cross-disciplinary research programmes are an important mechanism, such as within the Horizon 2020 programme. Despite numerous challenges, the EU should continue and strengthen energy dialogues with non-EU Arctic partners within existing forums. One option would be to include energy issues in the Northern Dimension Policy.

Mining in the European Arctic

The European Arctic is currently experiencing an upsurge in mining activities, but future developments will be highly sensitive to mineral price fluctuations. The EU is a major consumer and importer of Arctic raw materials. As the EU is concerned about the security of supply, it encourages domestic mineral extraction, among others, via its Raw Materials Initiative.

Both Arctic communities and industry call for enhanced information flows, as well as improved and more inclusive decision-making frameworks. It is recommended that the EU should adopt a more integrated and transparent view and clearly articulate its interests related to mining in the European Arctic. Building trust and facilitating mechanisms to enhance dialogue with the residents of the North, including indigenous peoples, is an important element of such integration. Information platforms may be based, for example, on INSPIRE infrastructure for spatial information in Europe (designed to contribute to environmental decision-making) or the outcomes of projects like Promine (which mapped European mineral resources). The EU could also support the collection and sharing of mining data and knowledge, for example via the Horizon 2020 programme or the European Innovation Partnership on Raw Materials.

The EU regulatory framework could better contribute to harmonising environmental, economic and social assessments, paying special attention to local social issues and indigenous rights. This could be partly done within the current reform of the EU environmental impact assessment legislation. The EU, as a major global actor, can also influence international governance, standard-setting and co-operation to facilitate increased responsibility in mining activities.

Activities Affecting Land Use in the European Arctic

Globalisation and indirectly climate change have increased the pressures on developing new mining projects, transport routes and renewable energy. At the same time, tourism and traditional livelihoods such as reindeer husbandry require large areas of pristine nature, which other activities may adversely affect.

The planning of new activities must respect the needs, culture and livelihoods of local and indigenous communities, including land rights. Proper assessment of social impacts is essential in order to mitigate conflicts between different values and interest groups. When European Arctic land-use issues are considered, EU policy-makers should pay particular attention to the aspects of human well-being and social sustainability, public participation and indigenous rights. This is especially important when these elements differ from the needs and values typical of the more densely populated areas in the south.

There is a need for enhanced information exchange between Arctic local and regional actors and EU institutions. Stronger inclusion of social aspects and challenges in the EU frameworks for impact assessment as well as in dialogue with Arctic partners including Russia is advised.

Social and Cultural Changes in the European Arctic

This report's overview of the region's sociocultural landscape includes innovative and growing Arctic cities, thinning-out rural areas, demographic challenges, and dependence on extractive and primary industries. Indigenous peoples often experience these elements in distinct manners.

The EU has a number of programmes that support socioeconomic development and co-operation in the North, as well as relevant transport policies and environmental regulations. When designing and carrying out relevant policies, the EU decision-makers should take into account: the region's intra-regional and core-periphery connectivity; power structures, social conflicts and cultural diversity; human-nature interactions; as well as the state of innovation, entrepreneurship and education.

An EU focus on entrepreneurship and innovation within co-operation and cohesion programmes should be continued and strengthened, with greater attention to gender issues and indigenous peoples. In particular, the activism of dynamic indigenous youth should be supported. Intra-regional accessibility and connectivity, including challenging cross-border projects, must not be neglected in the light of a focus on core-periphery connections within frameworks such as the Trans-European Transport network. The special characteristics and needs of Arctic cities and their importance for regional development need to be taken into account in EU policies and programmes.

SADA Theme	Key trends	Main drivers, conditions, and shaping elements	Relevant areas of EU policy	Critical factors for EU decision-making	Recommendations
3. Climate Change in the Arctic	• Arctic sea-ice cover is rapidly shrinking • Melting ice is raising sea levels • Snow cover is shrinking faster than sea-ice extent • Climate change impacts on Arctic biodiversity and livelihoods are already visible	• Human-induced drivers: • Greenhouse gases and black carbon emissions • Land use changes	• Energy and climate policies • Air pollution • Climate adaptation in Europe • Research and earth observation	• Energy • Holistic governance frameworks for economic and climate sustainability • Monitoring of Arctic change • Communication on climate change	• Sustaining systematic observation activities. • Contributing to international co-operation and acting via own energy policy: primary policy areas for EU action regarding climate change. • Supporting regional and local adaptation.
4. Changes in Arctic Maritime Transport	• Destinational and internal traffic in the Arctic are increasing • Trans-Arctic shipping is emerging • Cruise tourism grows, but shows uneven development	• Demand for Arctic resources: fish, timber, minerals, oil and gas • Sea-ice • Infrastructure deficit • Ship technology • Safety and environmental standards • World trade • Transport costs	• Regulations on safety and environmental performance of shipping • Activity in international regulatory bodies • Support for improved infrastructure and services for Arctic maritime transport • Research	• Additional risks • Fragmented governance system • Research, data collection and technology investments	• Improve the governance of Arctic shipping by supporting a Polar Code with high safety and environmental standards and additional measures to supplement it. • Support the development of critical maritime infrastructure. • Improve the knowledge needed for safer and environmentally responsible maritime activities.
5. Changing Nature of Arctic Fisheries	• Stable fisheries within framework of uncertainties • Growth in aquaculture in the European Arctic	• Global demand for fisheries produce • Resource management • Climate change	• Acting via EU's market size and proximity • Participating in global frameworks affecting trade in fish • Combating illegal fishing • Food safety standards	• Governance and Management • Climate Change and Species Distribution and Composition • Global Demand for Fish	• Improve management, co-operation and research. • Continue to combat illegal, unreported and unregulated (IUU) fisheries. • Reduce fishing capacity. • Secure inflow of Arctic seafood into EU markets.
6. Developing Oil and Gas Resources in Arctic Waters	• Increase in planning and exploration, but limited developments throughout the Arctic(with greater intensity of activities in Barents Region)	• Scope and pace of climate change in the Arctic • Economic conditions and global markets • Advances in offshore technology and maritime transport industries • Policy developments	• Market influence and co-operation with Arctic partners • Energy and environment	• Local benefits • Regulations • Research	• Support innovative research and education in the areas of Arctic technology and the Arctic environment. • Continue and strengthen energy dialogue with non-EU Arctic partners. • Enhance funding and investment frameworks for environmentally and socially responsible Arctic hydrocarbon projects.
SADA Theme	Key trends	Main drivers, conditions, and shaping elements	Relevant areas of EU policy	Critical factors for EU decision-making	Recommendations

SADA Theme	Key trends	Main drivers, conditions, and shaping elements	Relevant areas of EU policy	Critical factors for EU decision-making	Recommendations
7. Mining in the European Arctic	• Upsurge in mining activity	• (Appropriate geology) • Global demand for mineral resources • Technologies • Legal, administrative and political landscape • Climate change	• Creating conditions for mining activities • Research and innovation, enhancing technological developments • Environmental and conservation regulations • Safety regulations • Transport • Relationship with Greenland and other Arctic partners	• Global and European demand for resources • Environmental Concerns and Uncertainty • Local Communities and Socio-Economic Impact • Indigenous Peoples' Land Rights • Existing Decision-Making Structures and Policy	• Facilitate the collection and sharing of data, knowledge and information • Develop and integrated view on mining sector and transparent policies • Harmonise environmental, economic and social assessments • Improving dialogue and meaningful consultation, in particular with indigenous and local people • Support international governance and cooperation enhancing responsible mining
8. Land-Use Pressures in the European Arctic	• Increasing land use pressures on Arctic landscape (especially mining, renewable energy and tourism)	• Globalisation • Climate change • Increasing role of environmental values	• Regulations relevant for tourism, forestry, renewable energy, transport, reindeer husbandry • Nature conservation and biodiversity • Variety of frameworks relevant for managing social conflicts	• Human well-being and social sustainability • Public participation • Indigenous Rights	• Increase knowledge generation and sharing. • Include social impact assessment more effectively in the environmental impact assessment process.
9. Social and Cultural Changes in the European Arctic	• Complex demographic trends and urbanisation • Changing livelihoods and lifestyles • On-going dependence on the primary sector and public transfers • Rising role of education and research • Increasing inclusiveness and complexity of governance	• Globalisation and use of natural resources • Accessibility • Global cultural change • Indigenous activism and recognition of indigenous rights	• EU funding for regional cooperation and cohesion • Accessibility • Research and education and cross-border cooperation • Traditional livelihoods and Indigenous Peoples	• Intra-regional and extra-regional accessibility and connectivity • Power structures, social conflicts and cultural diversity • Human-nature interactions • Innovativeness, entrepreneurship and education	• Give a voice to Arctic communities in policy developments that may affect them. • Support entrepreneurship and innovation with sensitivity to indigenous youth and gender issues. • Invest in intra-regional accessibility and connectivity. • Consider the special needs of Arctic cities in relevant EU policies and programmes.
SADA Theme	Key trends	Main drivers, conditions, and shaping elements	Relevant areas of EU policy	Critical factors for EU decision-making	Recommendations

Preface

The 'Strategic Assessment of Development of the Arctic: An assessment conducted for the European Union' is a final report of an assessment conducted within the 'Strategic Environmental Impact Assessment of Development of the Arctic' project funded by the European Union. Although the whole project Network participated in the assessment process and contributed to the production of this report, the findings should not be understood as a common statement endorsed by all institutions within the network. The responsibility for the report findings and messages lies solely with the report authors.

The assessment process started in April 2013 with the design of a methodology and selection of the main Arctic developments to be examined. Project partner experts produced thematic factsheets on seven themes. These served as background papers for the consultation process that included thematic workshops and an online questionnaire. This report is a synthesis of stakeholder input and expert analysis. Stakeholders had a chance to comment on the draft report and their feedback has been implemented in the final stage of the assessment to the extent possible. The project report was finalised in May 2014.

The recommendations proposed in this report have been developed on the basis of ideas coming from stakeholders, generated within workshops, via online questionnaire and through direct engagement. However, the final content and order of the recommendations have been drafted and chosen by the authors. Therefore, the final recommendations cannot be seen as a direct outcome of stakeholder consultations.

Due to time and resource constraints, this study, despite its broad objective and ambitious aims, should not be directly compared to major Arctic assessment projects, such as the assessments conducted by the Arctic Council. Rather, this work is a content-rich snapshot of the development of the Arctic, and at the same time an example how assessment methodologies can be used to better understand the changes occurring in the region.

Acknowledgments

The report authors and the whole project network would like to express their utmost gratitude primarily to all those who participated in stakeholder workshops in Rovaniemi and Tromsø and who filled out the assessment online questionnaire. Their participation and contribution at various stages of the process was an indispensable element of the assessment. The authors are also grateful for the contribution provided by numerous researchers and experts, who are acknowledged in the respective chapters.

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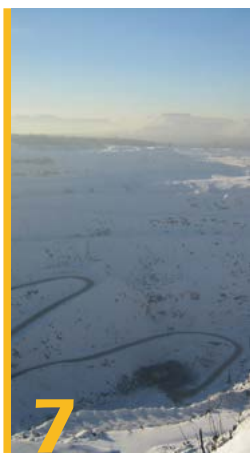




List of acronyms

AAC	Arctic Athabaskan Council
AACA	Adaptation Actions for a Changing Arctic
ABA	Arctic Biodiversity Assessment
AC	Arctic Council
ACCESS	Arctic Climate Change, Economy and Society (project)
ACIA	Arctic Climate Impact Assessment
AEPS	Arctic Environmental Protection Strategy
AHDR	Arctic Human Development Report
AIS	Automatic Identification System
AMAP	Arctic Monitoring and Assessment Programme (AC working group)
ARR	Arctic Resilience Report
ATQ	Autonomous Tariff Quota
bcm	Billion Cubic Metres
boe	Barrels of Oil Equivalent
BPAN	Barents Protected Areas Network
CAFF	Conservation of Arctic Flora and Fauna (AC working group)
CAP	Common Agricultural Policy (EU)
CBD	Convention on Biological Diversity
CFP	Common Fisheries Policy (EU)
COP	Conference of the Parties
CSR	Corporate Social Responsibility
DG	Directorate-General (European Commission or European Parliament)
DNV	Det Norske Veritas
DPSIR	Driving force–Pressures–State–Impact–Response framework
EC	European Community
ECA	Emissions Control Area (MARPOL)
ECRA	European Climate Research Alliance
EEA	European Economic Area
EEA	European Environment Agency
EEAA	European Economic Area Agreement
EEAS	European External Action Service
EEC	European Economic Community
EEZ	Exclusive Economic Zones
EFTA	European Free Trade Association
EGNOS	European Geostationary Navigation Overlay Service
EIA	Environmental Impact Assessment
EIP	European Innovation Partnership
EMAS	Eco-management and Audit Scheme (EU)
ENP	European Neighbourhood Policy
ENPI	European Neighbourhood and Partnership Instrument
EO	Earth Observation
EP	European Parliament
EPPR	Emergency Prevention, Preparedness and Response (AC working group)

ERIC	European Research Infrastructure Consortium
ESA	European Space Agency
ETS	Emissions Trading System (EU)
EU	European Union
EUAIC	EU Arctic Information Centre (initiative)
FAO	UN Food and Agriculture Organization
FMP	Fishery Management Plan
FPIC	Free, Prior and Informed Consent
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMES	Global Monitoring for Environment and Security
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	European GNSS Supervisory Authority
IA	Impact Assessment
IACHR	Inter-American Commission on Human Rights
IASC	International Arctic Science Committee
ICC	Inuit Circumpolar Council
ICES	International Council for the Exploration of the Sea
ICOS	Integrated Carbon Observing System
ICT	Information and Communication Technology
IEA	International Energy Agency
IGO	Inter-governmental Organization
ILO	International Labour Organization
ILO169	1989 International Labour Organization (ILO) Convention no 169 concerning Indigenous and Tribal Peoples in Independent Countries
IMO	International Maritime Organization
IMP	Integrated Maritime Policy (EU)
IOC	International Oil Companies
IPCC	Intergovernmental Panel on Climate Change
IUU	Illegal, Unreported and Unregulated Fisheries/Fishing
LME	Large Marine Ecosystems
LNG	Liquefied Natural Gas
LOS	Law of the Sea
MaReMa	Centre of Marine Resource Management
MARPOL	Convention on the Prevention of Pollution from Ships
MoU/MOU	Memorandum of Understanding
NEAFC	North East Atlantic Fisheries Commission
NEP	Northeast Passage
NGLs	Natural Gas Liquids
NGO	Non-governmental Organization
NOAA	National Oceanic and Atmospheric Administration (US)
NOC	National Oil Companies
NOFIMA	The Norwegian Institute of Food, Fisheries and Aquaculture Research
NordMin	Nordic Network on Mining Expertise

Nordregio	Nordic Centre for Spatial Development
NPA	Northern Periphery and Arctic Programme 2014-2020
NPFMC	North Pacific Fishery Management Council
NPP	Northern Periphery Programme 2007-2013
NSIDC	National Snow and Ice Data Centre
NSPA	Northern Sparsely Populated Areas
NSR	Northern Sea Route
NWP	Northwest Passage
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PAME	Protection of Arctic Marine Environment (AC working group)
PAN	Protected Area Network
PCB	Polychlorinated biphenyl
PCW	Polar Communication & Weather (Canada)
PSSA	Particularly Sensitive Sea Area
REDD+	Efforts to reduce emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks
REE	Rare Earth Elements
REFIT	Regulatory Fitness and Performance Programme
RFMO	Regional Fisheries Management Organisation
SADA	Strategic Assessment of Development of the Arctic
SAON	Sustaining Arctic Observing Networks
SAR	Search and Rescue
SDWG	Sustainable Development Working Group (AC)
SEA	Strategic Environmental Assessment
SIOS	Svalbard Integrated Observation System
SLE	Sea level equivalent
SOLAS	Convention on the Safety of Life at Sea
SWD	Staff Working Document (European Commission)
SWIPA	Sea, Water, Ice and Permafrost in the Arctic
TAC	Total Allowable Catch
TEKES	Finnish Funding Agency for Innovation
TEN-T	Trans-European Transport Network
TEU	Treaty on the European Union
TFEU	Treaty on the Functioning of the European Union
US	United States
USGS	US Geological Survey
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNDRIP	United Nations Declaration of Rights of Indigenous Peoples
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
WFD	Water Framework Directive

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Part I INTRODUCTION

Chapter 1

SCOPE, METHODOLOGY AND STAKEHOLDER ENGAGEMENT

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Chapter cover image: Greenlandic house right next to the Disco Bay.
Photo: GettyImages

1.1 Objective

The general objective of the Strategic Assessment of Development of the Arctic is "to assess the impacts of development in the Arctic and of European Union policies affecting the Arctic on the political, economic, and environmental landscape of the EU and the Arctic region".

This objective has three dimensions:

- To provide an overview of changes and developments occurring in the Arctic (trends), including the implications of these changes for the EU environment, economy and societies (also specifically for the EU Arctic regions).
- To examine the role and influence of EU policies and actions in the Arctic.
- To involve stakeholders in discussion on the EU-Arctic relationship and incorporate stakeholder input into the assessment. A series of factsheets have been drafted to serve as background papers for the consultation process and as a starting point for report chapters.

Unlike typical strategic impact assessments, SADA does not assess a proposed policy and alternative policy options. Its primary aim is to provide an overview, based partly on input from stakeholders, of current Arctic development and the relationship between the EU and the Arctic.

SADA's objective is to enhance knowledge of the EU among Arctic actors and of the Arctic within the EU by providing balanced, concise and up-to-date information both on the region and on the EU's multifaceted roles in influencing Arctic trends.

1.1.1 Geographic Scope

This report covers the European Arctic, understood as a region extending from Greenland to northwest Russia (Figure 1.1), with a focus on areas where EU policies have the greatest leverage (Northern Fennoscandia and the European Economic Area). The report takes account of a pan-Arctic perspective where it is relevant for EU policy-making or for better understanding of the examined developments.

The Arctic region is considered according to the boundaries drawn by the Arctic Human Development Report (AHDR) (Figure 0.2).[1] Taking the AHDR boundaries as a starting point, some chapters take into account issues outside of the defined area, when they are of significance for Arctic developments.

1.1.2 Thematic Scope

Seven themes – focused on change – have been chosen for assessment:

1. Climate Change in the Arctic
2. Changes in Arctic Maritime Transport
3. Changing Nature of Arctic Fisheries
4. Developing Oil and Gas Resources in Arctic Waters
5. Mining in the European Arctic
6. Activities Affecting Land Use in the European Arctic
7. Social and Cultural Changes in the European Arctic

Thematic chapters can be viewed as independent studies, which follow a similar structure, adjusted to the specifics of each theme:

- Overview of current trends in the Arctic including main drivers, environmental, social, political and economic impacts, and an overview of governance
- Outlook to 2030
- Implications of Arctic changes for the EU
- EU policies relevant for identified Arctic trends
- Critical factors for EU decision-making
- Recommendations

The chapters progress from general pan-Arctic discussion to issues specific to the European Arctic. Chapter 3 provides an overview of climate change in the region, and thereby constitutes a basis for the discussion presented in the other chapters, where climate change is examined as one of the drivers. Chapters 4 to 7 address specific developments occurring in the Arctic. Chapter 8 discusses a variety of issues connected with land-use pressures (including social conflicts or cumulative impacts). The multitude of terrestrial activities in the Arctic are discussed in an integrated manner. Mining, as a key terrestrial activity, is taken up separately in Chapter 7. Social and cultural changes in the European Arctic, connected partly with developments discussed in previous chapters, are examined in Chapter 9. Chapters 7-9 focus exclusively on the European Arctic with particular emphasis on the situation in Northern Fennoscandia. Chapter 10 serves as a summary and conclusion identifying the key messages of the assessment.

The assessment themes were chosen on the basis of: a scoping workshop (conducted among the project network in February 2013 in Rovaniemi, Finland), a review of recent Arctic assessments and debates, as well as initial outreach to stakeholders. Several issues are discussed across the report chapters, including indigenous peoples' issues, biodiversity, research and Arctic governance. Some important topics, such as persistent organic pollutants, are not elaborated here as they have been discussed comprehensively in recent reports.[2]

1. Arctic Human Development Report (AHDR), 2004, Stefansson Arctic Institute, Arctic Council.

2. E.g. Cavalieri, S. et al., (2010). EU Arctic Footprint and Policy Assessment

Figure 1.1: *European Arctic as Defined in the Strategic Assessment of Development of the Arctic.*
Source: Arctic Portal, 2014.

1.1.3 Supporting EU Policy-Making

One of the aims of SADA is to assist the EU in its stated goal of being a more active, knowledgeable and responsible Arctic actor. The report offers guidance for EU decision-making regarding:

- Process of formulating an overarching Arctic policy.
- Decision-making regarding issues that are specifically Arctic.
- Policies that are designed for the general EU constituency, but have specific implications for the Arctic.

The guidance is composed of several elements:

- An overview of Arctic trends.
- Identification of the implications of Arctic developments for the EU.
- Identification of EU policies relevant for the Arctic.
- Critical factors for EU decision-making.
- Recommendations.
- Overview of the diverse opinions, interests and values among Arctic stakeholders (mainly in Annex 1).

The process has been also designed to contribute to forging a lasting partnership between Arctic stakeholders, EU policy-makers and Arctic experts.

Report, Ecologic Institute. *http://arctic-footprint.eu/.* Accessed 20 November 2013.

1.2 Methodology and Assessment Process

SADA builds on two interlinked parallel processes: (i) internal expert-led assessment and (ii) stakeholder consultations (Figure 1.2). Thus, the study combines expert knowledge with stakeholders' input.

1. SADA experts provided an overview of Arctic trends and developments, including their key drivers and important implications.

2. Based on this overview, implications of Arctic changes for the EU are identified (by identifying the EU's interests and related policy areas affected by Arctic changes).

3. EU policies that affect or are relevant for Arctic changes are identified and assessed in general terms.

4. The information collected in the first phase of the assessment was presented in factsheets (www.arcticinfo.eu), which served as background papers for stakeholder consultations.

5. Stakeholder consultations were conducted through workshops (focused on interaction between stakeholders) and online questionnaires (collecting individual perspectives).

6. Assessment teams combined expert analysis with stakeholder input to develop a draft report, which was then submitted to stakeholders for further feedback.

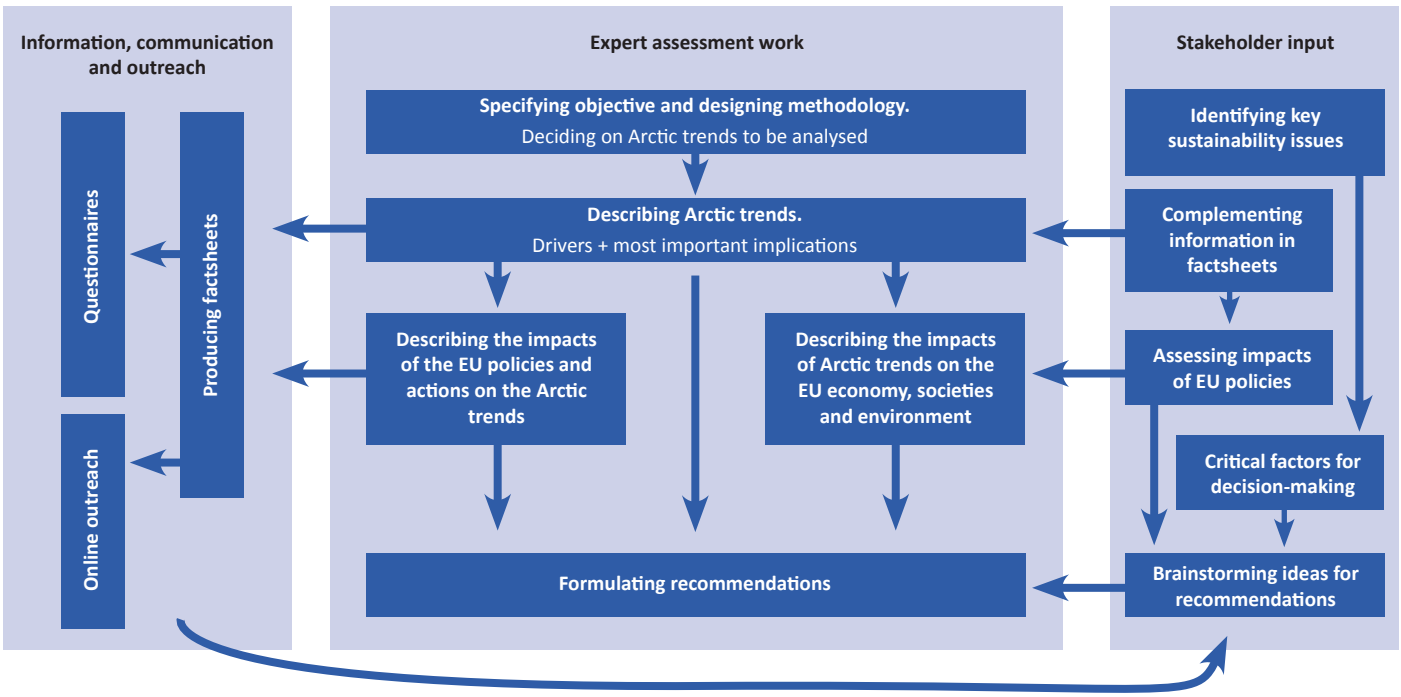

Figure 1.2: *Strategic Assessment of Development of the Arctic Process*

1.2.1 Arctic Trends and Their Implications

The overview of Arctic trends and their implications as well as an understanding of the role of EU policies in shaping/responding to them is based on the significantly simplified DPSIR framework (driving force, pressures, state, impact and response). The framework, developed by the European Environment Agency, presents causal linkages between drivers and the pressures they exert on the environment/society, and the state of the environment/society under these stresses.[3] Instead of pressure and a static notion of state in DPSIR, the assessment team adopted a dynamic approach (trends and developments). The assessment takes into account the diversity of the Arctic, characteristics of particular regions and the diverse values or viewpoints of different groups.

Trends are understood as changes occurring in the region in the recent past, currently and expected in the near future, as well as their general direction and pace. Discussing "Arctic trends" is a major simplification, as they are in fact a bundle of various, temporarily and spatially diverse changes.

The concept of a driver has been applied in SADA more broadly than in DPSIR (primarily human needs), and is understood as all elements that cause or shape certain activities, synonymous with driving factors, shaping elements or conditions of developments. Impacts or implications are understood as effects of changes on the environment, society, economy, culture and politics.

The report does not propose scenarios for Arctic developments. Nevertheless, as it identifies the drivers and critical factors for decision-making, it provides tools to consider Arctic futures. Each chapter features a brief assessment of likely developments to 2030 with an emphasis on uncertainties.

1.2.2 Identifying and Assessing EU Policies

The authors identified five dimensions of Arctic-relevant EU policies/actions:

- Those directly relevant for the EU Arctic (Finland and Sweden) and the European Economic Area (EEA, including Norway and Iceland, where significant parts of EU regulatory frameworks apply), including cohesion and co-operation programmes.
- Indirect impacts via policies and actions shaping the EU's environmental and economic footprint in the region.
- Co-operation programmes in Greenland and northwest Russia.
- EU-funded research.
- EU influence on Arctic-relevant international developments (e.g. United Nations Framework Convention on Climate Change, Convention on Biological Diversity and the Arctic Council).

The focus in SADA is on the policies and actions of the EU and not its individual member states, although often these cannot be clearly separated. Moreover, the majority of EU policies and actions affecting the Arctic are not designed specifically with the Arctic in mind, or if Arctic issues are considered, they constitute only a minor element within a multiplicity of policy considerations (see Chapter 2).

1.2.3 Critical Factors for Decision-Making

Each chapter includes a list of three to four critical factors for decision-making. The SADA team applied the concept of "critical factors for decision-making" – developed by Partidário[4] – in a simplified manner, due to the broad scope/objective of the assessment and the needs of stakeholder engagement.

Critical factors for decision-making include:

- Most important and most uncertain issues.
- Key challenges that need to be taken into account in policy-making.
- Issues where significant differences between actors' values occur, and which require stakeholder engagement.

Thus, critical factors refer to a broad array of issues, including drivers, values and significant impacts (e.g. biodiversity or employment), or main aspects or tools of governance (such as spatial planning).

Discussion and presentation of critical factors served several purposes:

- Identification of issues on which experts needed to focus in the final stage of assessment work.
- Discussions of critical factors revealed stakeholder opinions and values.
- Critical factors help to create a basis for future development of scenarios and alternatives for EU policies and decisions relevant for the Arctic.
- When policies refer to broad European constituency, the critical factors are those issues that must be taken into account with regard to the Arctic implications of EU policy choices.

1.2.4 Recommendations

Recommendations in SADA aim to suggest policy areas and actions that authors see as important for the EU

3. European Environment Agency (2011). Europe's environment: An Assessment of Assessments. EEA, Copenhagen.

4. Partidário, M. d R., (2007). Strategic Environmental Assessment Good Practices Guide. Methodological Guidance. Amador: Portuguese Environment Agency; Partidário, M. d R. (2008), "Strategic-based model for SEA based on Critical Factors for Decision Making". Paper presented at the 28th Annual Conference of the International Association for Impact Assessment, Perth, 3-10 May 2008.

policy-makers to consider. The recommendations have been developed by the experts, building on the ideas proposed by stakeholders in the thematic workshops and online questionnaire, as well as on the analysis of Arctic trends and relevant EU policies. Therefore, the recommendations should not be seen as coming directly from stakeholders. Both the specific content and order of recommendations in each chapter is the choice of the authors.

The proposed ideas have been analysed in the light of EU competences, in terms of their feasibility and realism, and alignment with EU Arctic policy guiding principles (knowledge, responsibility, engagement). The recommendations are the outcome of analysis conducted by the report authors, and they have not been drafted and agreed as a common position of the whole project network.

1.2.5 Stakeholder Consultations

The consultation process was one of the most important elements of SADA, creating a space for dialogue and contributing to long-term participatory partnerships. Stakeholders (in workshops and via an online questionnaire) scrutinised the approach of experts and were a crucial source of information. They provided guidance on the further focus of assessment work and proposed initial ideas for recommendations.

The team followed the principles of expert humility (to criticism and limitations of expert knowledge), openness (to other viewpoints), critical approach (to information coming from different sources), and long-term engagement.

Stakeholders were seen as representing certain viewpoints and sensitivities rather than specific institutions, organisations or groups. A broad understanding of Arctic stakeholders has been applied, including:[5]

- Primary stakeholders – those likely to be positively or negatively affected.
- Secondary stakeholders – intermediaries in the policy-making process and its implementation – those who have critical interests, knowledge and expertise.
- Key stakeholders – those able to significantly influence the policy-making processes.

As a means of communication with stakeholders, a series of background papers (factsheets) were written in lay terms and based on existing studies (factsheets can be downloaded from *www.arcticinfo.eu*). The chapters in this report build from those factsheets.

Consultations were composed of several elements:

- Consultation meetings (in Rovaniemi in October 2013 and Tromsø in January 2014)
- Online questionnaire
- Interactive website
- Feedback process, where workshop participants and questionnaire respondents commented on the results of consultations and assessment
- Direct outreach to stakeholders by the report authors

1.3 Overview of Stakeholder Consultations

Tina Schoolmeester (GRID-Arendal) and *Adam Stępień* (Arctic Centre)

1.3.1 Stakeholder Consultation Meetings

Consultation meetings in Rovaniemi and Tromsø consisted of plenary sessions and content-focused workshops. During the general meetings, an overview of the project was presented and experts gave presentations to stimulate discussion on important trends and issues. A total of nine workshops addressed seven assessment themes. More than 1100 individual invitations were sent and about 200 participants attended the consultation meetings (including 30 members of the EUAIC network in each meeting), 120 of whom actively participated in the workshops.

The workshops proved a good way to communicate between the Arctic stakeholders and experts conducting the study. Participants gave generally positive feedback on both the format and the content of the consultation meetings and appreciated having the chance to express their own views and hear the opinions of other stakeholders.

Stakeholders in general agreed that common drivers for many Arctic developments are global demand for resources and a main natural physical driver – climate change. Broad public participation, especially of the local Arctic communities, has been identified in several workshops as a need, critical factor and a corresponding area for recommendations for EU policy-making. The importance of supporting research, education and technological development was also emphasised very extensively across the themes. Entrepreneurship and international co-operation (in particular with Russia) proved to rate highly, too, as did good governance and the need for clear regulations. It was also pointed out that the EU should be more actively involved in international negotiations (e.g. Polar Code, climate change negotiations). Respecting the local Arctic communities and ensuring that revenues from resources in the Arctic reach the local communities as well were also recurrent issues. Safety, security and preparedness

5. Based on: UNEP (United Nations Environment Programme) (2009). Integrated Assessment: Mainstreaming Sustainability into Policymaking. A guidance manual. UNEP.

measures were deemed particularly important for offshore business development (shipping and oil and gas) due to the harsh and remote environment. Health and environmental concerns were among the frequently highlighted issues.

The report from the stakeholder consultation workshops in Rovaniemi and Tromsø can be found in Annex 1.1 (available online at *www.arcticinfo.eu*).

1.3.2 Online Questionnaires

The online questionnaires, which in general followed similar steps to those used in the workshops, aimed to provide concrete, individual inputs. Respondents were able to freely choose the questions they were interested in answering. The online questionnaire gathered 260 responses, around half of which were fairly substantial or extensive.

Often, the greatest criticism regarding the content of the factsheets was expressed by the representatives of the industry, clearly showing the need to engage practitioners in assessment work. Each comment from the stakeholders was considered and addressed as extensively as possible, taking into account stakeholders' background.

Stakeholders highlighted the importance of communication, participation and dialogue, in light of a number of misrepresentations of particular topics or of industries within the society. There is interest among the respondents in what the EU could do regarding various issues in the Arctic, but correspondingly little knowledge of the Union's competences, policies and regulatory framework. Differences of opinion between various groups are evident.

The summary report from the online questionnaire is attached to this report as Annex 1.2 (available online at *www.arcticinfo.eu*).



Chapter 2

THE EUROPEAN UNION AND THE ARCTIC REGION: AN ONGOING LEARNING PROCESS

Timo Koivurova and Adam Stępień (1)

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Chapter cover image: Snowmobile sign.
Photo: GettyImages

2.1 European Union's Presence in the Arctic

Discussions on the role of the European Union in the Arctic often emphasise the fact that the EU has no Arctic Ocean shoreline. Indeed, Greenland, which acceded to the European Economic Community (EEC, the EU's predecessor) as a part of Denmark, withdrew from the EEC in 1985 after obtaining Home Rule and holding a referendum. However, in reality the EU (as we know it today) has been present in the Arctic since the establishment of the European Communities in the 1950s. This is a natural consequence of European states – and thus the EU – being close neighbours of the region, and influencing the region via factors such as its resource demand, pollution produced in the EU or funding dedicated for Arctic research. Moreover, since the 1990s the EU institutions have been involved in international co-operation in the North, including via the Northern Dimension framework and membership in the Barents Euro-Arctic Council.

Today's EU-28 has many competences to act in various policy spheres, which also extend to the Arctic.[1] In lay terms, EU competences mean that the Union can legislate and enact directives/regulations or develop policy in certain areas. To decide in which policy areas the EU has competence is an act with clear consequences. First of all, the competence can be exclusive to the EU, meaning that the member states do not have competence to legislate and develop policy in this field (e.g. management of marine living resources). The competence can also be shared between member states and the EU (e.g. environmental policies), and that is why in many policy areas it is the EU and the member states that become parties to international treaties. In some cases, the competence still falls under the member states, but the EU has complementary competence (e.g. in tourism).

Most of these EU policies – in one way or another – influence all regions where the EU is present. This is true also for the Arctic, even if a particular policy was designed with the general European constituency rather than the Arctic in mind. The 2010 EU Arctic Footprint and Policy Assessment Report[2] showed, for example, that PCB-153 emissions from Europe constitute 57% of all emissions reaching the Arctic. Similarly, the EU's share of mercury emissions in the Arctic is about 24% – although the EU contributes only 5.5% to global mercury emissions. In 2012, the EU contributed 11.3% to global carbon dioxide emissions.[3] The EU accounted for 39% of fish imports from Arctic countries, and 24% of final demand for products from the Arctic oil and gas industry.[4] Europeans account for 27% of Arctic tourists.

EU regulations and actions have importance especially in the European Arctic. It can be broadly said that the EU's direct influence is clearest in the northern territories of its member states (Finland and Sweden) and the parties to the EEA agreement (mainland Norway and Iceland), but its fairly strong indirect influence extends to the area from Greenland to northwest Russia, which is the focus of this report.

A small part of the territories of EU member states (Finland and Sweden) belong to the Arctic region (as defined by the AHDR or Arctic Council's Arctic Monitoring and Assessment Programme). In Norway and Iceland, due to the European Economic Area (EEA) Agreement, a significant number of EU regulations are applicable. The EU has a special relationship with Greenland based on the 1985 Greenland Treaty; Fisheries Agreement (2013-2015); a Partnership Agreement (a new agreement being finalised at the time of completing this report); and Greenland's status within the Overseas Countries and Territories Association. Although Denmark is an EU member state, the Kingdom of Denmark is comprised of three territories: Denmark and the self-governing Faroe Islands and Greenland. Thus, the government of Denmark, itself member of the EU, represents the Faroe Islands and Greenland as non-EU territories.

The EU is also involved in developments in northwest Russia via its regional and cross-border funding (e.g. Kolarctic ENPI [European Neighbourhood Partnership Instrument] programme) and various financial instruments, including the Initiative for Democracy and Human Rights.

Despite the presence discussed above, the EU has found it challenging to be acknowledged as an Arctic actor by the key regional players. This is partly due to the ban on placing seal products on the EU market, adopted in 2009.[5] This caused outrage especially in Canada among commercial sealers and indigenous peoples (despite an exemption for products originating from subsistence hunting). More recently, at the Arctic Council's Kiruna Ministerial Meeting in May 2013, the Arctic Council "received the application of the EU for observer status affirmatively",[6] with a final decision on observer status awaiting "implementation", but with the EU being invited to observe Council proceedings on an equal basis to other observers. Thus, in this report the EU is considered

1. Koivurova, T., Kokko, K., Duyck, S., Sellheim, N. & Stepien, A. (2012), The present and future competence of the European Union in the Arctic, Polar Record 48(4), 361-371.

2. Cavalieri, S. et al. (2010).

3. International Energy Agency (2013), CO2 Emissions from Fossil Fuel Combustion Highlights 2013, OECD/IEA, Paris.

4. Cavalieri, S. et al. (2010).

5. Regulation (EC) No 1007/2009 16 September 2009 on trade in seal products.

6. "The Arctic Council receives the application of the EU for observer status affirmatively, but defers a final decision on implementation until the Council ministers are agreed by consensus that the concerns of Council members, addressed by the President of the European Commission in his letter of 8 May are resolved, with the understanding that the EU may observe Council proceedings until such time as the Council acts on the letter's proposal." Arctic Council (15 May 2013). Kiruna Declaration. 8th Ministerial Meeting of the Arctic Council.

an "observer in principle" in the Arctic Council. Notably, representatives of the Commission in the Arctic Council's working groups have proven to be active both before and after May 2013.

2.2 The Process of Formulating EU Arctic Policy

Numerous EU actors are involved in the elaboration of a possible future overarching and comprehensive policy framework for a variety of EU actions relevant for the Arctic. Starting from 2006/2007, the process had been partly initiated within the EU's Integrated Maritime Policy (with the European Commission's DG Maritime Affairs and Fisheries in a key role) and partly due to rising interest in Arctic affairs within the European Parliament. The latter had already earlier participated in the Conferences of Parliamentarians of the Arctic Region, although not very visibly. The actual formulation of Arctic policy, where a number of the Commission's DGs have been involved, has been led by the DG External Relations (DG RELEX), which established the Arctic inter-service group bringing together officers from various DGs. Following the Lisbon Treaty, the European External Action Service (EEAS) has come to the fore. The European Parliament has a prominent role in this process by way of its resolutions and the activities of its members, as the Parliament provides political incentives for policy developments. The Council of the European Union (which gathers representatives of member states' ministries, or the European Council, composed of heads of states or of the governments) would be the key formal decision-maker in terms of a strategic framework for the Arctic. The Council has already taken a stance on Arctic policy in its 2009 Conclusions.[7]

Outside of the process of formulating strategic policy for the Arctic, when the EU adopts specific legislation that is Arctic-relevant, its institutions act within the legislative procedures based on the EU founding treaties (Treaty on the European Union and the Treaty on the Functioning of the European Union), which means in most cases a co-decision procedure of the European Parliament and the Council of the European Union.

In contrast to its presence in the Barents region, the EU's conscious engagement with the whole Arctic region is of fairly recent origin. As mentioned above, EU institutions started to take a more proactive approach to Arctic affairs only in 2006/2007, following the evolution of the EU's Integrated Maritime Policy and the approach of the International Polar Year. With the global surge of interest in the Arctic in 2007/2008, especially due to concerns related to alleged geopolitical manoeuvres in the region, the EU expressed its concern, identifying Arctic developments as possibly affecting its security interests.[8] A treaty for the Arctic was proposed in the 2008 resolution of the European Parliament, with a controversial reference to the Antarctic Treaty as an inspiration.[9] Even though the European Parliament's resolution did not represent the official standpoint of the EU, the concerns rose among Arctic actors regarding the EU's possible actions as an active participant in Arctic affairs.

These initial responses to the changes in Arctic governance rapidly became more nuanced following the publication of the European Commission's Communication on EU Arctic policy (2008).[10] This communication, followed by 2009 Council Conclusions, started a process of formulating the basis for an active EU presence in the entire Arctic, not just the European portion of the region.[11] Numerous autonomous EU activities are to be brought under the umbrella of "Arctic policy".

More recently, the European Parliament has focused on the EU's role in ensuring the sustainable development of the region, affirmed the EU's Arctic interests, and stressed a need for a co-ordinated EU policy.[12] The 2012 Joint Communication of the European Commission and High Representative underlined the notions of knowledge (connected with a further focus on Arctic research), responsibility (understanding the EU's environmental and social impact and acting responsibly in shaping EU footprints and Arctic developments) and engagement (co-operation with various Arctic

7. Council of the European Union. (2009). Council conclusions on Arctic issues. (2985th Foreign Affairs Council meeting, Brussels, 8 December 2009).

8. The High Representative and the European Commission expressed their concern: "The rapid melting of the polar ice caps, in particular, the Arctic, is opening up new waterways and international trade routes. In addition, the increased accessibility of the enormous hydrocarbon resources in the Arctic region is changing the geo-strategic dynamics of the region with potential consequences for international stability and European security interests. The resulting new strategic interests are illustrated by the recent planting of the Russian flag under the North Pole. There is an increasing need to address the growing debate over territorial claims and access to new trade routes by different countries which challenge Europe's ability to effectively secure its trade and resource interests in the region and may put pressure on its relations with key partners". See: Climate Change and International Security: Paper from the High Representative and the European Commission to the European Council S113/08, 14 March 2008, *http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/EN/reports/99387.pdf*. Accessed 5 March 2014.

9. The European Parliament advocates in a 2008 resolution, "Suggests that the Commission should be prepared to pursue the opening of international negotiations designed to lead to the adoption of an international treaty for the protection of the Arctic, having as its inspiration the Antarctic Treaty, as supplemented by the Madrid Protocol signed in 1991, but respecting the fundamental difference represented by the populated nature of the Arctic and the consequent rights and needs of the peoples and nations of the Arctic region; believes, however, that as a minimum starting point such a treaty could at least cover the unpopulated and unclaimed area at the centre of the Arctic Ocean". European Parliament resolution of 9 October 2008 on Arctic governance, 2010/C 9 E/07. para. 15, *http://www.europarl.europa.eu/sides/getDoc.do?type=TA&reference=P6-TA-2008-0474&language=EN*. Accessed 5 March 2014.

10. Koivurova, T. "Limits and possibilities of the Arctic Council in a rapidly changing scene of Arctic governance". vol 46: 237 Polar Record (2010) pp. 146-156, also in Hønneland, G. (Ed.) The Politics of the Arctic, Edward Elgar, 2013.

11. Council of the European Union. (2009).

12. European Parliament. 2011. Resolution of 20 January 2011 on a sustainable EU policy for the high North, A7-0377/2010.

partners).[13] This is somewhat in contrast with the 2008 Communication,[14] which emphasised the need for improvement of the Arctic governance framework,[15] a statement received with apprehension by some Arctic actors. A similar more balanced approach is also evident in the most recent European Parliament Resolution from March 2014.[16] While the Parliament has emphasised ambitious environmental goals (e.g. precautionary approach regarding fisheries), it has also acknowledged the existing situation in the region and shown great sensitivity regarding problematic issues (seal ban or hydrocarbon extraction).

13. Developing a European Union Policy towards the Arctic Region: progress since 2008 and next steps. Joint Communication of the European Commission and the High Representative of the European Union for Foreign Affairs and Security Policy to the European Parliament and the Council. Brussels, 26.6.2012. JOIN(2012) 19 final.

14. European Commission (2008), 'The European Union and the Arctic Region', Communication COM(2008)763final.

15. The 2008 Commission Communication reads: "The main problems relating to Arctic governance include the fragmentation of the legal framework, the lack of effective instruments, the absence of an overall policy-setting process and gaps in participation, implementation and geographic scope."

16. European Parliament. (2014). Joint Motion for a Resolution on the EU strategy for the Arctic (2013/2595(RSP)), *http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+MOTION+P7-RC-2014-0229+0+DOC+XML+V0//EN*. Accessed 15 March 2014. The Council issued its Conclusions in May 2014. See, Council of the European Union, Council conclusions on developing a European Union Policy towards the Arctic Region, Foreign Affairs Council meeting, Brussels, 12 May 2014.

One can observe that the approach of EU institutions to the Arctic has become more nuanced and cautious over the fairly short time that it has been formulating its Arctic policy, manifested in the 2012 Joint Communication. Compared with the 2008 Commission communication, the new Joint Communication is no longer critical of Arctic governance and expresses the EU's willingness to engage responsibly to meet the challenges the Arctic region faces with its prime actors, namely the region's nation-states and indigenous peoples. Various modes in which that is attempted, and ideas for how this engagement can be enhanced, are discussed throughout this report.

Part II THEMATIC ASSESSMENT


Sport
POLARIS

Chapter 3

CLIMATE CHANGE IN THE ARCTIC

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Key Messages:

- In the Arctic, the rate of climate warming is two to three times faster than the global average. The resulting changes have already had notable impacts on biodiversity and livelihoods. More profound implications for Arctic economies and societies are expected in the future.
- For the European Arctic, changes in snow cover are likely to be more significant than sea ice loss.
- Arctic change can have consequences for weather patterns in Europe, but forecasting Arctic weather remains challenging, as observations in the Arctic are sparse.
- The EU influences Arctic climate change by its actions that are relevant for climate change globally, primarily by contributing to international negotiations and via its own energy and climate policies. Arctic-specific policy areas include research, supporting observation and adaptation.

Recommendations to the EU:

- Sustaining systematic observation activities.
- Contributing to international co-operation and acting via own energy policy: primary policy areas for EU action regarding climate change.
- Supporting regional and local adaptation.

The main threat is the warm and unstable weather during the snowy period. [...] Our herding and way of living will die out if these changes get worse.

Reindeer herder, Sweden

The main threats are related to lack of international commitment to reduce GHG. It needs global engagement. EU efforts alone are not enough. To reach the 2 degrees centigrade target, all fossil fuels in the Arctic should remain in the ground. Another global threat is the increased population growth and global energy demand, that will be affecting the Arctic directly through extraction of Arctic natural resources as well as indirectly through the use of energy (fossil fuels) elsewhere on the planet.

There is an inconsistence in the sense that not all EU policies are aligned, meaning that EU policies are not as ambitious as desirable (e.g. energy); some should be further strengthened (aviation + marine transport), while others are more focussed on growth and global trade rather than on sustainability.

International organization, Denmark

The most important issue is methane because so little is known about it.

Climate change in the Arctic is occurring faster than elsewhere in Europe, so the majority of Europeans do not experience the changes.

Professor, Norway

There will be severe loss of biodiversity through local and regional level extinction. There will also be a radical influx of new species, both species native to more southern areas and invasive species.

I have witnessed serious measured changes in temperatures, rainfall, hydrology, temporal extent of ice in freshwaters, loss of species, decline of plant, insect and fish populations. Landscape changes are also abundantly visible with greening of the Arctic and tree level creeping up on high altitudes.

Researcher, Finland

The quotes come from respondents to the online questionnaire – an element of the consultation process within the 'Strategic Assessment of Development of the Arctic'

Chapter cover image: Snowmobile travelling over melting sea ice in Uummannaq, Greenland.

Photo: Lawrence Hislop, 2010, GRID-Arendal, www.grida.no

3.1 Introduction

This chapter considers climate change in the Arctic from a European perspective. Due to climate change, the Arctic is the most rapidly changing region on Earth. There is clear evidence that change has already occurred due to emissions of greenhouse gases and aerosols from human activities, which affect the fundamentals of the ecosystems of the Arctic and the lives of its inhabitants. The Arctic is a particularly fragile region where strong feedback linkages accelerate changes at a faster pace than in other regions – an effect called "Arctic amplification". Shifts in Arctic ecosystem dynamics have global consequences.

Today we see clear evidence of significant changes in Arctic landscapes and marine environments. Climatic changes are affecting the Arctic cryosphere, hydrology, habitats and species. In northern Fennoscandia, the changes in snow cover are particularly important for biodiversity, livelihoods and economy. Changes in temperature, sea ice cover, snow cover and water regimes are linked to the loss of important habitats for Arctic species, as well as shifts in species composition due to landscape transformations, which in turn impact on people's livelihoods (Figure 3.1).

Uncertainties regarding various driving mechanisms, evolution and specific impacts of Arctic climate change remain. More long-term observations are needed to improve climate-related predictions in the Arctic. Existing climate prediction models must be improved. Because of limitations in representing the cryosphere, climate model predictions for the Arctic have a lower confidence level than for other regions. Nevertheless, the outlook for change in the Arctic is alarming and must be taken into account despite prevalent uncertainties and limitations in the current models.

This chapter looks at potential impacts in the Arctic based on the most recent Intergovernmental Panel on Climate Change (IPCC) reports and region-specific information coming from the Arctic Monitoring and Assessment Programme (AMAP), assessments such as Sea, Water, Ice and Permafrost in the Arctic (SWIPA) and the 2004 Arctic Climate Impact Assessment (ACIA). The IPCC reviews and assesses the recent available scientific, technical and socioeconomic information relevant for the understanding of human-induced climate change and issues its reviews every four to six years. IPCC's most recent assessments – which together comprise its Fifth Assessment Report – are being released in the period from September 2013 to October 2014. The IPCC Physical Science Basis report was the first to be released and the climate change trends and impacts discussed in this chapter are largely based on its findings.[1]

1. IPCC (2013), Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V. & Midgley, P.M. (eds.)].

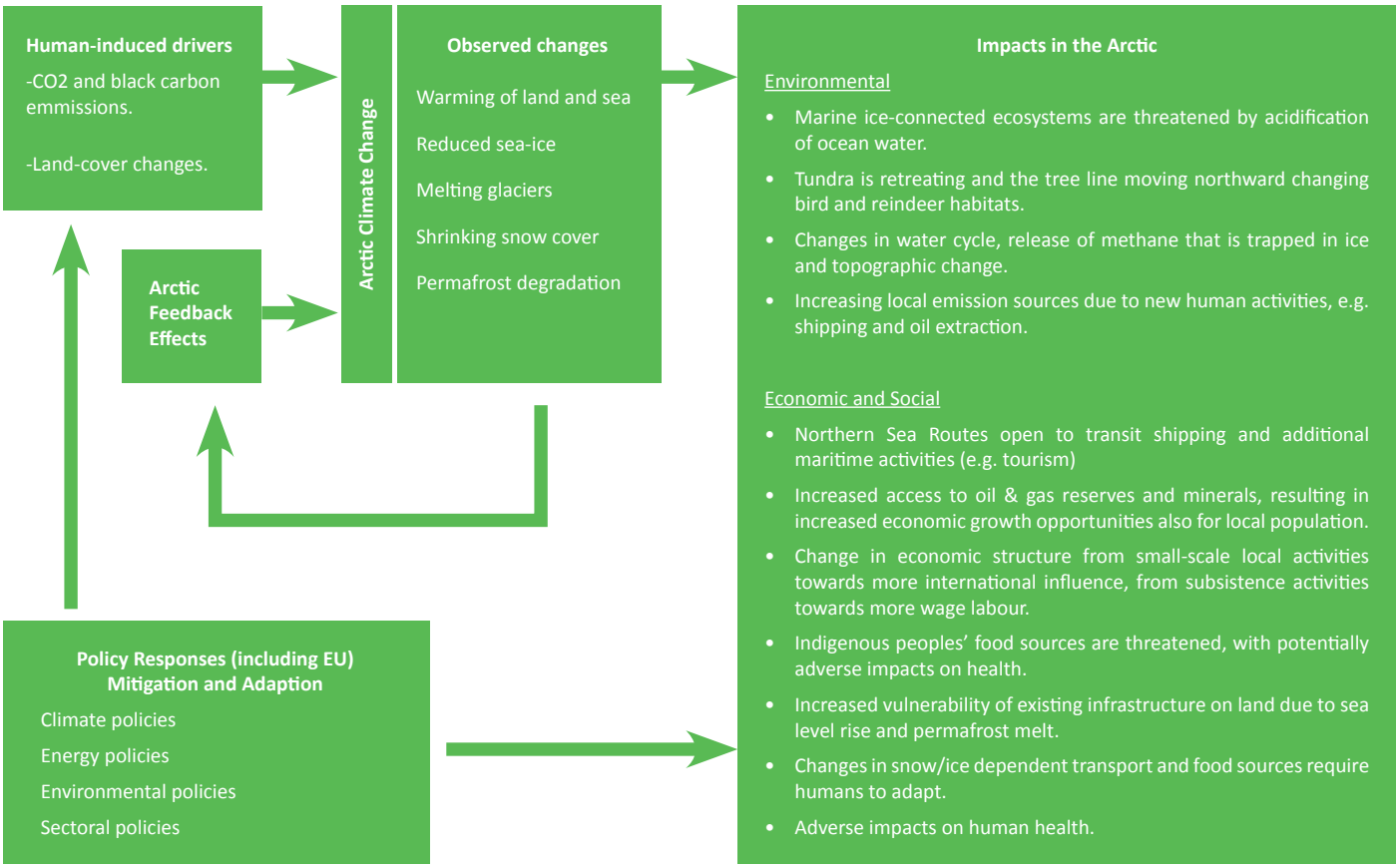

Figure 3.1: *Climate Change in the Arctic: Drivers and Impacts*

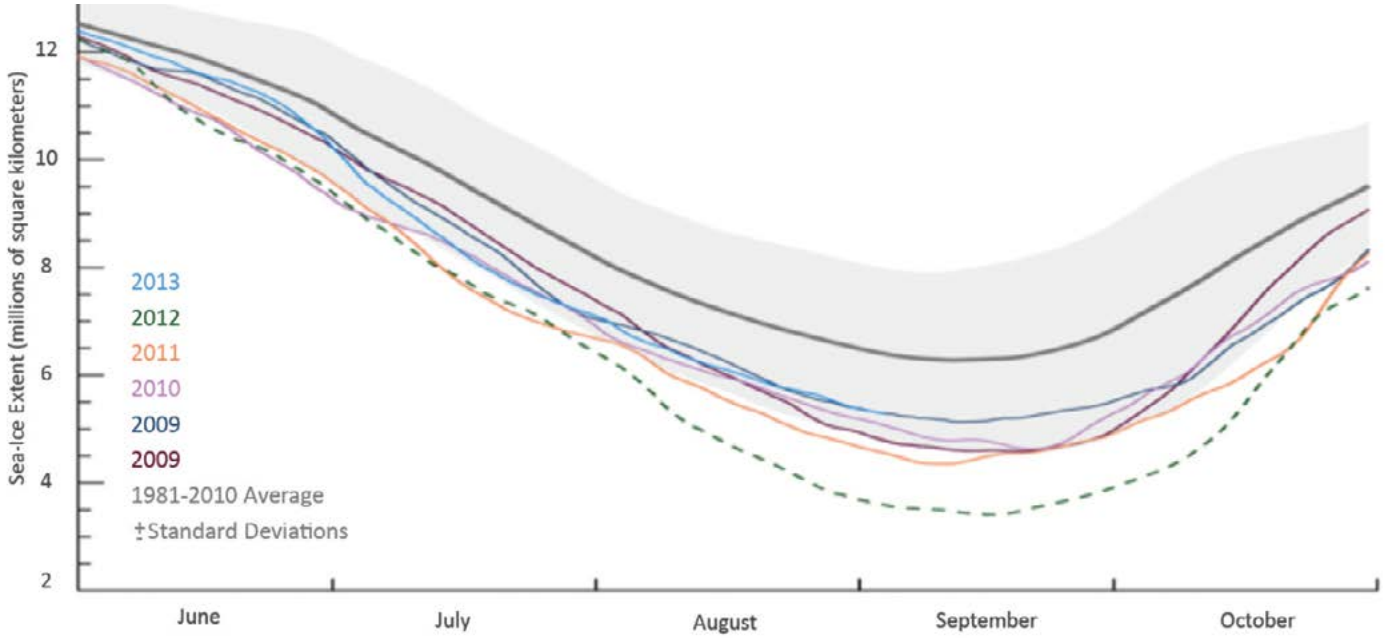

Figure 3.2: *Arctic Sea-Ice Extent, 2008-2013. Note: Area of ocean with at least 15% sea-ice. The dark grey shows the average for 1981 – 2010; light grey shading represents standard deviations.*

Source: US National Snow and Ice Data Center, 2013.

3.2 Trends and 2030 Outlook

Globally the most significant increase in temperature is in the Arctic. Models foresee an almost threefold increase in warming compared to the global average. Climate prediction models agree that the most pronounced warming (between 4 degrees Celsius (°C) and 10 °C) would likely occur over land surfaces, particularly during the boreal winter. The Arctic amplification effect results in projected temperature anomalies of more than 10 °C in the Arctic region.

3.2.1 Arctic Sea Ice Cover is Rapidly Shrinking

The summer extent of sea ice has declined notably in recent years (Figure 3.2). The difference in the extent of sea ice in September 2012 compared with the median over the last three decades is striking (Figure 3.3). In addition, the ice that remains has less multi-year ice, which means it is weaker and thinner. The outlook is that the extent of the sea ice will continue to decline and that there will be less multi-year ice. If the current trends in global warming hold, the Arctic Ocean could be nearly ice-free in late summer by the mid-2030s.[3]

3.2.2 Melting Ice Is Raising Sea Levels

Since 1993, the world average sea level has been rising by 3.2 millimetres (mm) per year, compared with the 1901-2010 average of 1.7 mm per year. As this rise is not uniform, the western North Pacific has risen by even more than 10 mm per year. The melting of glaciers in the Arctic accounts for almost 80% of total ice loss in the last decade.

Glaciers in Greenland are losing ice mass at a pace over six times greater than in the previous decade (2002-2012 average in comparison to 1992-2002) (Figure 3.4). Moreover, the speed at which the melting occurs has accelerated. Glacier melt predictions involve considerable uncertainties, but the IPCC estimates that melting ice and thermal expansion would result in a sea-level rise of about 15 centimetres in 2030 compared to 2000 levels.

3.2.3 Snow Cover Is Shrinking Faster than the Sea Ice Extent

Both the duration and spring/summer extent of snow cover are diminishing. Snow observations in recent years show a more rapid change than in sea ice. Over the period 1967–2012, the extent of the northern hemisphere snow cover decreased most in June, by 53%. Models indicate a future where winters will likely have more precipitation in the European Arctic, while summers show only modest increases. Hence, the Arctic could see a shorter period of snow cover, while having more snow during winter. In this case, snow cover in the summer would continue to shrink.

2. ACIA (2004). Impacts of the warming Arctic. Arctic Climate Impact Assessment. Arctic Council.

3. Wang, M. & Overland, J. (2012), A sea ice free summer Arctic within 30 years: An update from CMIP5 models, Geophysical research letters.

Figure 3.3: *Arctic Sea-Ice Extent, September 2012, and Median September Sea-Ice Extent, 1981-2010*

Note: Sea-ice extent on 16 September 2012 is shown in blue (all-time minimum). The extent was larger in 2013 (the smallest sea-ice extent occurs annually in mid-September). Median September extent for 1981-2010 is shown with an orange contour.

Source: Arctic Portal, based on data from US National Snow and Ice Data Center, 2013.

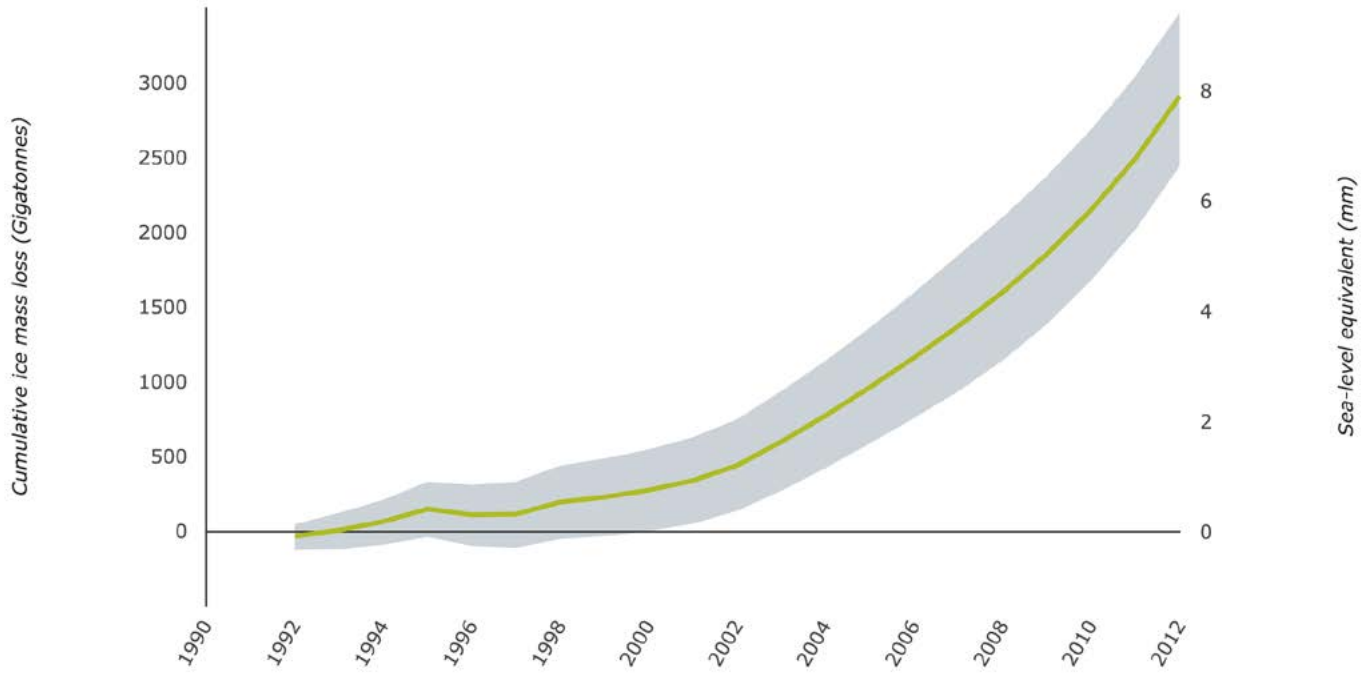

Figure 3.4: *Greenland: Cumulative Ice Mass Loss and Sea Level Equivalent*
Note: Derived as annual averages from 18 recent studies.
Source: IPCC 2013.

3.3 Drivers

The main drivers of Arctic climate change are the same as the drivers of global climate change. The complex interactions governing our atmosphere are simplified in Figure 3.5. Human activities cause emissions of greenhouse gases (GHG) and aerosols. These emissions increase the natural greenhouse effect of the atmosphere, forcing it to warm and thereby changing many other conditions on Earth.

Aerosols have more complicated processes than long-lived greenhouse gases that impact the climate, such as by changing the location and properties of clouds or by darkening snow or ice surfaces. Aerosols, including soot (black carbon particles), sulfate and co-emitted substances are estimated to contribute to Arctic amplification.[4] Black carbon on snow/ice absorbs more sunlight than clean snow. Soot in the air warms the atmosphere directly and sulfate cools it. Short-lived climate forcers (SLCFs), including methane and ozone, also have complicated feedback effects and, taking into consideration changing anthropogenic emissions, SLCFs might either accelerate or mitigate the warming.

The Arctic has a specific amplification mechanism associated with the changing Arctic sea ice extent. Warmer air and water enhance the melting of Arctic sea ice in summer. Ice reflects most sunlight back, but the open ocean absorbs the sunlight energy, resulting in additional warming.

3.4 Climate Change Impacts in the Arctic

Today's global-scale climate prediction models lack the precision and complexity for detailed regional and local impact analysis. Nonetheless, predicted changes can be related to concrete challenges for life in the Arctic.

Oceans absorb some CO2 from the atmosphere in natural processes. Additional CO2 in the atmosphere results in ocean acidification. In the Arctic and high latitudes, acidification is stronger than in regions closer to the equator because CO2 is more soluble in cold water. In addition, melting of the cryosphere adds freshwater to the Arctic Ocean, which has the potential to alter ocean circulation patterns.

Arctic biodiversity is facing challenges due to multiple stressors on natural habitats, including human activities, land-use changes, pollution and invasive species. However, according to the Arctic Biodiversity

4. Shindell, D. & Faluvegi, G. (2009). Climate response to regional radiative forcing during the twentieth century, Nature Geoscience, 2, 294 - 300; AMAP (Arctic Monitoring and Assessment Programme) (2011). The Impact of Black Carbon on Arctic Climate. Quinn, P.K., Stohl, A., Arneth, A., Berntsen, T., Burkhart, J. F., Christensen, J., Flanner, M., Kupiainen, K., Lihavainen, H., Shepherd, M., Shevchenko, V., Skov, H. & Vestreng, V.

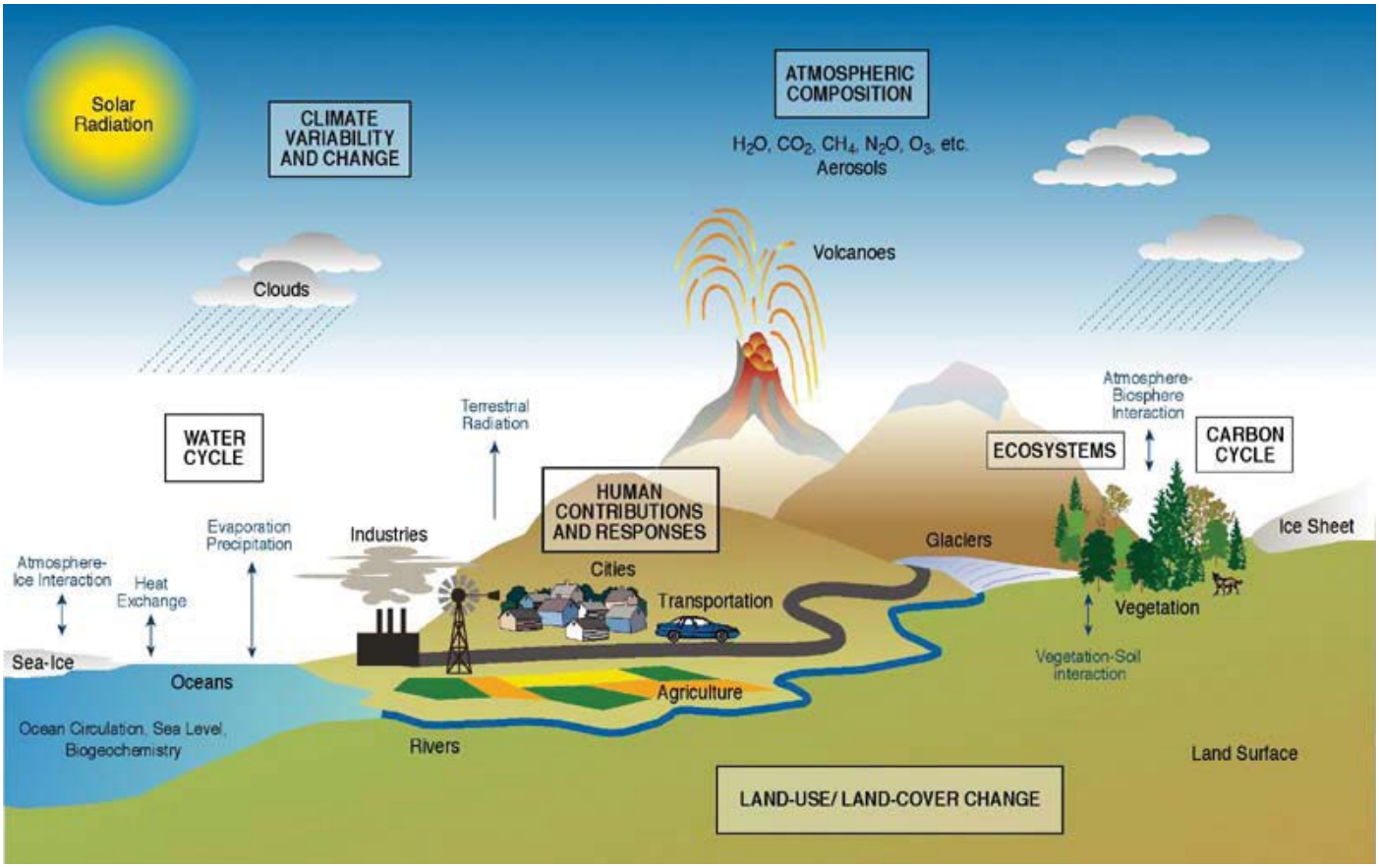

Figure 3.5: *Earth Climate System and Main Forcing Mechanisms on Our Atmosphere*
Source: Intergovernmental Panel on Climate Change, Third Assessment Report, 2001. (Downloaded from www.windows2universe.org).

Assessment, human-caused climate change is by far the most serious threat.[5] Northward range expansion of many species is already occurring and further shifts are predicted. Thus, the overall reduction of the geographical extent of terrestrial Arctic habitats is expected. Warmer temperatures and more precipitation may result in increased plant growth and expansion of animal populations, but in the long term the changes might destroy large tracts of specifically Arctic ecosystems and populations. Habitat changes include earlier and more variable snow melt, increased frequency of winter thaw-freeze events and ice crust formation, disappearance of perennial snow beds, coastal erosion and flooding of low coasts, as well as more frequent and severe extreme events. The risk is particularly high for rare species and for freshwater ecosystems, although the changes are expected to be non-linear.

Ocean acidification is one of the most concrete habitat changes for marine flora and fauna: some populations of traditional species are already growing at a slower rate and invading species are spreading.[6] The substantial loss in multi-year sea ice threatens the biology in and under the ice. Effects along the whole food chain are not yet clearly visible, but marine wildlife is already migrating and habitat changes will be more extreme in the future.

Reduced sea ice, ocean acidification and changes in landscape increase the vulnerability of Arctic inhabitants, especially indigenous peoples and their cultures.[7] Traditional food sources may decline, leading

Picture 3.1: *Polar Bears Depend on Sea Ice*
Photo: NOAA National Ocean Service.

5. CAFF (2013). Arctic Biodiversity Assessment. Synthesis. Conservation of Arctic Flora and Fauna. Arctic Council, pp. 89-101.

6. AMAP (2013). AMAP Arctic Ocean Acidification Assessment: Summary for Policy-makers. Arctic Monitoring and Assessment Programme. Arctic Council.

7. ACIA (2004). Arctic Climate Impact Assessment, Impacts of a Warming Arctic: Arctic Climate Impact Assessment.

to disruption in hunting and food-sharing practices. Changes in ice, snow cover and permafrost can make traditional transport and hunting routes more dangerous or inaccessible. Changing landscapes can disrupt forage availability, migration routes of reindeer, as well as community infrastructure, water supply and connectivity with population centres. Traditional harvesting and other nature-based activities as well as landscapes endowed with cultural and spiritual values are intimately connected with Arctic cultures and identities, both indigenous and non-indigenous, with implications for well-being. Vulnerability and adaptive capacity as properties of human societies are not straightforward concepts. Climate change vulnerability varies with time and is dependent on complex social, economic and cultural structures and interactions.[8]

The climate change impacts that have already been experienced in the European Arctic, especially in Northern Fennoscandia, are connected primarily to changing weather patterns and snow conditions. These may affect winter tourism – the main economic activity for many local communities – and may also complicate reindeer herding due to scarcity of winter pastures as well as increase flood risk. There are also concerns regarding human health due to more active vector-borne diseases. Issues of concern outside the EU Arctic are the thawing of the permafrost and coastal erosion. Conversely, climate change is often perceived as an opportunity for economic and social development, with better conditions for agriculture depending on location, lower costs of infrastructure maintenance, higher attractiveness of winter tourism and greater economic opportunities for more resource exports along Arctic sea routes.[9]

Reduced sea ice can increase access for harvesting marine resources (e.g. fish or oil and gas), although that itself may not constitute the main trigger for the occurrence of actual activities, as other factors need to be taken into account. Expanding human activities in fragile Arctic ecosystems may lead to more pollution. For instance, increased maritime traffic leads to bigger emissions of black carbon and other pollutants that can negatively impact Arctic air and water quality and amplify climate change (see Chapters 4, 5 and 6).[10]

Picture 3.2: *Ice Road and Skiing Trails on Kemijoki River in Rovaniemi, Finland. Ice and winter roads are an element of the transport network. Due to mild winters and changes in hydropower systems, it has not been possible to establish ice roads in some locations in Lapland during the past decade.*
Photo: Ilona Mettiäinen, Arctic Centre.

3.5 Governance

As a global problem, climate change needs to be tackled by the world community. The 1992 United Nations Framework Convention on Climate Change (UNFCCC) lays down general obligations to reduce greenhouse gas emissions and to adapt to consequences of climate change. Currently it has 196 parties (including the European Union).

The treaty, which only establishes general GHG emissions commitments for industrialised countries, provides a framework for negotiating specific treaties, i.e. protocols, that may set binding limits on greenhouse gases. The Kyoto Protocol, concluded in 1997, established legally binding obligations for developed countries to reduce their greenhouse gas emissions, though not all developed states adopted the Protocol and others have since withdrawn from it.

As part of the 2010 Cancun Agreements, 91 countries representing nearly 80% of global greenhouse gas emissions have adopted and submitted targets for international registration or pledged other actions for reductions. These pledges, however, are not legally binding (although they may be considered politically binding) and fall well short of what is necessary to deliver the 2 degree Celsius goal according to UNEP.[11]

A new phase in the international climate change negotiations resulted from the COP in 2011. The focus is on the negotiation of "a protocol, another legal instrument or an agreed outcome with legal force under the UNFCCC applicable to all Parties," to be negotiated by 2015 and to enter into force by 2020. It would be the first global climate agreement extending to all countries, establishing binding reduction targets for both developed and emerging economies.

8. Stepien, A., Koivurova, T., Gremsperger A. & Niemi, H. (2014). Arctic Indigenous Peoples and the Challenge of Climate Change, in Tedsen, E., Cavalieri, S. & Kraemer, R., Arctic Marine Governance: Opportunities for Transatlantic Cooperation. Dordrecht: Springer. Also the concept of well-being may have multiple meanings, including cultural, social and economic, not necessarily directly connected to income.

9. See, e.g., Mettiäinen, I. (2013). Climate Change Turn in the Regional Development Strategies of an Arctic Region, Case Finnish Lapland, Yearbook of Polar Law, 5, 143 –183; Tennberg, M. (ed.) (2012), Governing the Uncertain. Adaptation and Climate in Russia and Finland. Dordrecht: Springer; Evengård, B. & Sauerborn R. (2009). Climate change influences infectious diseases both in the Arctic and the tropics: joining the dots, Global Health Action 2.

10. See Intergovernmental Panel on Climate Change (IPCC) (2014). Climate Change 2014: Impacts, Adaptation and Vulnerability. Summary for Policy-makers. Fifth Assessment Report. See *http://ipcc-wg2.gov/AR5/images/uploads/IPCC_WG2AR5_SPM_Approved.pdf*. Accessed 31 March 2014.

11. UNEP (2012), The Emissions Gap Report 2012. United Nations Environment Programme (UNEP), Nairobi.

Governments Agree on a Target of 2 degrees Celsius and 450 ppm CO_2

At the 2010 UNFCCC Conference of Parties, governments agreed that the average global temperature increase, compared with pre-industrial levels, must be held below 2 °C. Therefore, GHG emissions must be reduced (Cancun Agreements), because an increase of 0.8 °C has already occurred.

There is broad international acceptance that stabilising the atmospheric concentration of greenhouse gases at below 450 parts per million (ppm) of carbon-dioxide equivalent gives a 50% chance to curb global warming below 2 °C. This threshold is drawing close. Carbon dioxide levels reached 400 ppm in May 2013, having jumped by 2.7 ppm in 2012 – the second-highest rise since record-keeping began.

In 2012, 38 countries, representing 13% of global GHG emissions, extended the Kyoto Protocol to 2020, taking on binding targets. Major GHG emitters either do not have binding emission reduction targets, such as China, or are outside of the Kyoto Protocol, such as the United States, the second-largest emitter. Canada has also withdrawn from the Protocol, while Russia, Japan and New Zealand have refused a post-2012 Kyoto target.

The Inuit, under the auspices of the Inuit Circumpolar Council, initiated legal proceedings against the United States (in the Inter-American Commission on Human Rights [IACHR]) on the basis of climate change having adverse effect on the human rights of the Inuit. The petition was unsuccessful in legal terms but highlighted the plight of Arctic indigenous peoples. More recently, the Arctic Athabaskan Council initiated proceedings against Canada for its failure to address black carbon pollution, due to its effects on increased warming and melting.

Climate change is also being addressed at the regional, Arctic level. Since countries in the Arctic can directly influence some effects by reducing the sources of short-lived climate forcers, they agreed recently within the Arctic Council to pursue actions to establish national black carbon emission inventories.

Vulnerability and Adaptation to Climate Change in the Arctic has been the main climate change adaptation programme under the auspices of the Arctic Council. Ongoing work is carried out via the Adaptation Actions for a Changing Arctic project. The aim is to enhance the capacity of decision-makers to manage climate risks via an information portal and through improved predictions of multivariate impacts.

Local and regional authorities in the European Arctic are taking measures to address climate adaptation in the development of strategies where both relevant risks and opportunities are considered.[12] In Russia, even though the mainstream discourse on climate change diverges from that prevalent in the West, the Barents regions are also taking up strategic work with regard to climate change.[13]

12. Mettiäinen (2013).

13. Forbes, B. & Stammler, F. (2009), Arctic climate change discourse: the contrasting politics of research agendas in the West and Russia, 2 Polar Research, 28–42.

3.6 How Climate Change in the Arctic May Affect the European Union

Climate change is evident in the Arctic areas of European Union (EU) member states and the impacts are felt all over the world. The Arctic, as an important part of the global climate system, plays a crucial role in how Europe is affected by climate change.

The European Environment Agency (EEA) highlighted the main impacts of climate change in Europe,[14] including: increased mean temperature and longer heat waves, increase in precipitation in northern and north-western Europe and decrease in southern Europe, warmer rivers and lakes, changes in river flows depending on the region, earlier spring and later autumn, and changes in conditions for agriculture. The contribution of climate change to the costs of damage caused by natural disasters is expected to increase in the future. Specific impacts vary to a great extent across the continent.

The melting of the Greenland ice sheet is a significant cause of the rise in the sea level. The impact will affect coastal areas in central and southern Europe.[15] The Netherlands is already commercialising adaptation measures against coastal flooding.

Arctic amplification has implications for the weather and climate of Europe.[16] A warmer Arctic led to increased loss of snow cover in spring and summer over the second half of the last century. In contrast, the snow cover in the boreal autumn and winter increased over the 20th century, since a warmer atmosphere produces greater snowfall in autumn (especially in October). This trend seems to be accelerating.[17]

Arctic sea ice change has also been linked to changes in mid-latitude weather patterns that increase the

14. See, e.g. European Environment Agency (2012). Climate change, impacts and vulnerability in Europe 2012. EEA Report No 12/2012.

15. European Environment Agency (2012). Climate change, impacts and vulnerability in Europe 2012. EEA Report No 12/2012.

16. Francis, J. A. & Vavrus S. J. (2012). Evidence linking Arctic amplification to extreme weather in mid-latitudes. Geophysical Research Letters, 39. L06801, doi:10.1029/2012GL051000.

17. IPCC (2013).

Why Does the Arctic Warm Faster than Lower Latitudes? – Arctic Feedbacks[2]

- As snow and ice melt, darker land and ocean surfaces absorb more solar energy and the additional trapped energy directly increases the warming of the atmosphere.
- The Arctic atmosphere is shallower than in lower latitudes (thus, the same amount of absorbed energy warms the atmosphere more) and less effective in transporting energy away.
- Black carbon (soot) increases energy absorption both in the atmosphere and on snow and ice cover.

probability of persistent extreme weather events, such as droughts, floods and heat waves in summer and cold snaps in winter.[18] Loss of Arctic sea ice appears to result in increased precipitation in northern Europe.[19] The very low extent of sea ice in summer and autumn enhances the probability of a colder following winter in Europe.

Decreased winter sea ice coverage, accompanied by a higher surface temperature over the Arctic Ocean, results in a less maritime, more continental climate in Europe. Anomalously low sea ice coverage in the Barents and Kara Seas in winter increases variability in European winter temperatures.

The Arctic environment will be under stress from rapid changes. This will also affect EU territory, thus exerting pressure on EU regulatory frameworks. The most imminent area is biodiversity, as many Arctic species will be threatened in Europe. Arctic species today enjoy large areas of habitat that support a range of ecological processes and interactions.[20] However, climate change, industrial development, pollution, local disturbances and invasive alien species are affecting the Arctic, and their impacts are increasing. Nature conservation goals (like stopping biodiversity loss) may be hard to achieve.

EU policy areas likely affected by Arctic change include transport, energy, fisheries, climate change and the environment. Therefore, it would be useful to prepare the next Multiannual Financial Framework of the EU (2021-2027) with the relevant predicted climate impacts in mind.

3.7 EU Policies Relevant for Arctic Climate Change

The EU has the most significant influence on Arctic climate change via its transport, energy, trade and climate policies, and particularly in its role in helping to shape a global climate regime. A significant portion of the black carbon reaching the Arctic originates in Europe. The EU accounts for about 11% of global GHG emissions (2011).[21]

The EU's share of global emissions has been declining. In part this reflects positive results from mitigation and efficiency gains, as well as shifts in economic structure with less manufacturing and more services as well as the economic slowdown since 2008. It is also due to the increase in GHG emissions from large emerging economies such as China and India, whose production supplies European markets.

The most visible components of the EU's climate change-related policies have been its 20-20-20 targets — 20% cut in GHG emissions, 20% share of renewables in energy consumption and 20% increase in energy efficiency — by 2020. The EU is well on the way to meeting the emissions goal, with a 27% reduction expected by 2020.

New climate and energy goals for 2030 were launched in January 2014. The target is to reduce domestic GHG emissions by 40% from the 1990 levels (and towards the target of an 80% cut by 2050) and increase the share of renewables to at least 27% by 2030.[22] The role of energy efficiency in the 2030 framework will be further considered in a review of the Energy Efficiency Directive due to be concluded later in 2014. In the context of the UNFCCC and international negotiations, the EU has a joint reduction target, which is internally shared among member states.

EU policies in many areas affect energy production, the largest contributor to CO2 emissions. In the transport sector, curbing emissions remains challenging, even though the EU has fuel-economy standards, supports public and rail transport and has made attempts to

18. Tang, Q., Zhang, X. & Francis, J. A. (2014). Extreme summer weather in northern mid-latitudes linked to a vanishing cryosphere. Nature Climate Change, 4, 45–50, doi:10.1038/nclimate2065.

19. Screen, J.A. (2013). Influence of Arctic sea ice on European summer precipitation. Environmental Research Letters 8(4), doi:10.1088/1748-9326/8/4/044015.

20. CAFF (Conservation of Arctic Flora and Fauna) (2013). Arctic Biodiversity Assessment: Report for Policy Makers. CAFF, Akureyri, Iceland.

21. European Environment Agency.

22. European Commission (2013). 2030 climate and energy goals for a competitive, secure and low-carbon EU economy. *europa.eu*, Accessed 10 January 2014.

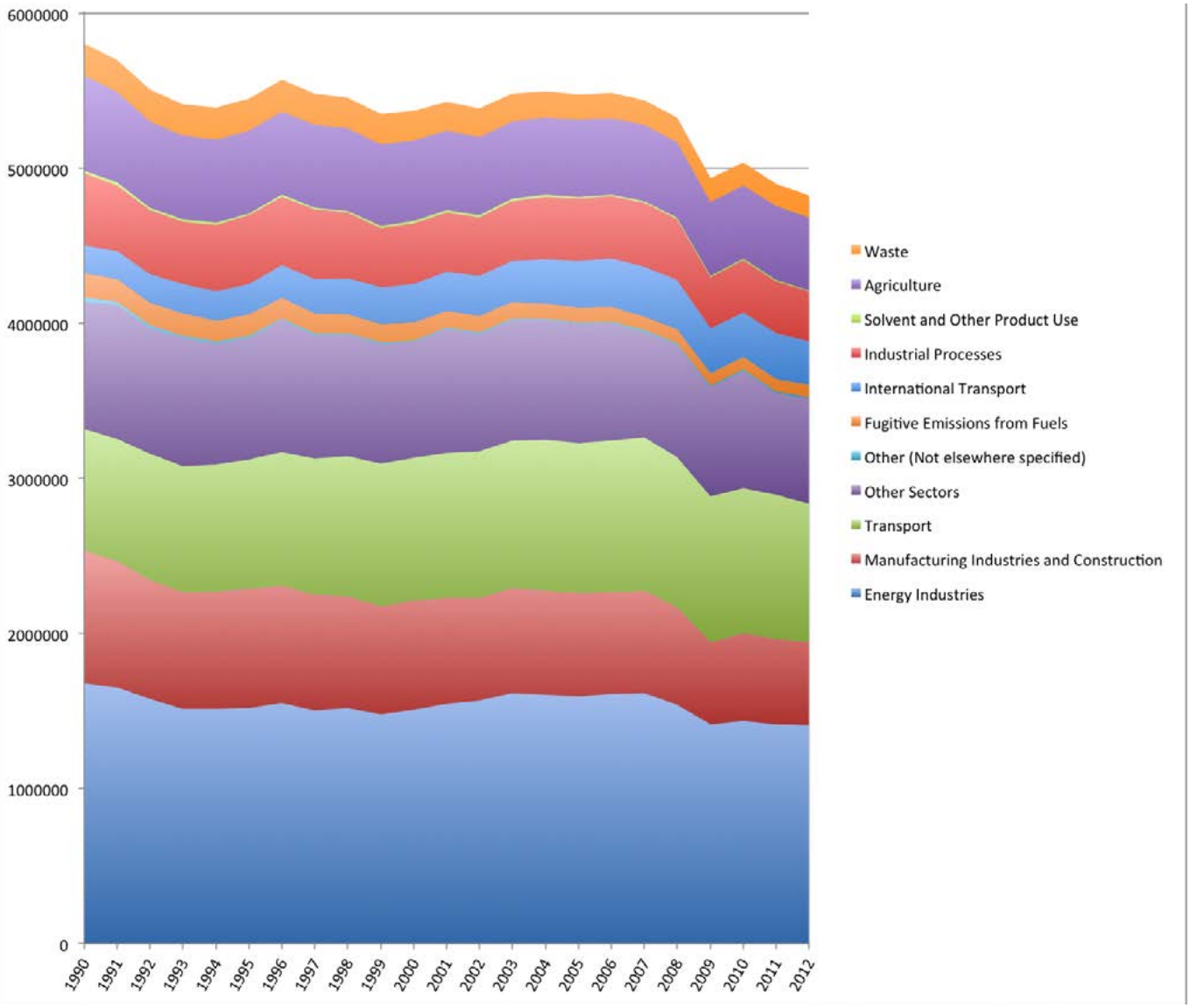

Figure 3.6: *EU-28 Greenhouse Gas Emissions by Sector, 1990 – 2012.*

Notes: in thousands tonnes of CO2 equivalent. The data does not include land use, land use change and forestry, which for the EU constitute negative emissions (-304 mln t). Sources: European Environment Agency 2014; Arctic Portal. (Figure modified in February 2015).

introduce a carbon tax for aviation. The EU established the world's first GHG emissions trading system (EU ETS). It covers about 45% of EU GHG emissions and is a key instrument to reach the emission reduction targets. However, the carbon price in the EU ETS declined by more than 80% from 2008 to 2013, partly due to the economic slowdown. To make the EU ETS more robust and effective in promoting low-carbon investment at least cost to society, the Commission proposes to establish a market stability reserve at the beginning of the next ETS trading period in 2021. The reserve would both address the emission allowances surplus that has built up in recent years and improve the system's resilience to major shocks by automatically adjusting the supply of allowances to be auctioned.[23]

The EU Clean Air policy package adopted in December 2013 includes short-lived climate forcers (including black carbon). The EU is also active in addressing black carbon emissions from ships within the International Maritime Organization. The European Commission is a leader in the UNEP-led Climate and Clean Air Coalition.

The EU is increasingly active in climate adaptation within Europe, including its northernmost regions, on the basis of the 2013 Climate Adaptation Strategy package. Adaptation is to be taken into account, with Arctic regions perceived as particularly vulnerable, across various EU policies including: transport, health, migration, cohesion, agriculture, disaster insurance, fisheries, and maritime and coastal issues. The EU climate adaptation platform, CLIMATE-Adapt, is intended to support informed decision-making at all governance levels and to include a toolset for adaptation planning. The strategy also encourages member states to prepare national adaptation strategies. Swedish and Finnish strategies have already been adopted. In addition, EU funding programmes have supported development of regional and local climate change strategies (e.g. European Regional Development Fund in Finnish Lapland).

23. European Commission website at *http://ec.europa.eu/clima/policies/2030/index_en.htm*. Accessed 5 March 2014.

The EU will provide EUR 12 billion for space technologies in the 2014-2020 financial framework, including the Copernicus and Galileo programmes. Copernicus, the EU's Earth Observation Programme, will significantly contribute to the regular observation and monitoring of the atmosphere, oceans and land surfaces, and will provide information in support of a broad range of environmental and security applications and decisions.[24] The data provided will also enable progress in improving maritime security, climate change monitoring and providing support in emergency and crisis situations.

Good quality Arctic analysis that combines satellite (areal) and point measurements (reanalysis[25]) and quality multi-parameter data in 3D would help to improve climate predictions in the Arctic. Such analysis for the Arctic should be facilitated following the launch of the Copernicus programme's climate change service (due to start in 2015).[26] Full quality in reanalysis can mainly be achieved by comparing to other reanalyses, so conducting several is necessary. For example, Ohio State University in the United States is currently completing the first Arctic reanalysis that covers the period 2000-2012.

3.8 Critical Factors for EU Decision-Making

Stakeholder consultations included strong representation from researchers, among a variety of other interests. The following issues were raised as particularly relevant and challenging when considering actions related to Arctic climate change.

3.8.1 Energy

The topic encompasses global energy production as well as hydrocarbon exploitation in Arctic territories. Combustion of carbon fuels is the primary contributor to human-induced CO2 emissions worldwide. While climate change is opening access to unexploited resources in the Arctic, their potential development would expand the fuel supply and exacerbate the climate change effects. Investments in Arctic hydrocarbon extraction would lock in emissions for decades to come. The contradictions around Arctic reserves of fossil fuels have become a focus of many environmental NGOs, some of which advocate a ban on Arctic exploration and development activities. Other parties consider these reserves to be a key driver of new economic activities in the Arctic, helping to address the region's varied challenges and problems.

3.8.2 Holistic Governance Frameworks for Economic and Climate Sustainability

To find a balance between economic, environmental and social interests and to pursue sustainable development, it is necessary to connect all types of governance and economic frameworks. Ideally this contributes to sustainable development (low-carbon green economy, land/marine spatial planning, ecosystem-based management). In order to move closer to holistic governance, such frameworks need to include all three dimensions of sustainability, following the outcomes of Rio+20.[27] The structure of governance plays a key role in addressing the challenge of climate change, in terms of both mitigation and adaptation.

3.8.3 Monitoring of Arctic Change

Arctic observations have many operators with different requirements, but few stations for achieving good spatial coverage. Satellites give good spatial coverage except over the pole, but the resulting data represents an areal average rather than point measurements (like stations). Combining both sets is desirable to produce consistent data sets for understanding the whole situation. Particularly climate change modelling requires data with both full coverage and station precision.

Reanalysis is an approach that uses numerical models to calculate from all available observations (ground stations and satellite areal coverage) a consistent state of all variables of the atmosphere and its boundaries over land, ocean, lakes and ice surfaces. For the Arctic, past records at this level are strongly needed. Many current climate change models have difficulties with reproducing the past sea ice correctly, which results in higher uncertainty. Currently it is wise to use trends from recent observations rather than rely solely on model predictions.

3.8.4 Communication

Communication is important to better understand the role of the Arctic in climate change, to grasp the challenges it poses to society and to broaden participation in climate action. In the EU context, one of the key issues is linking Arctic change to feedback in Europe. Europeans need to pay attention to Arctic changes, as these affect their own lives as well.

24. European Commission. Press Release: EP adopts European Earth Observation programme Copernicus, 12 March 2014. *http://europa.eu/rapid/press-release_IP-14-257_en.htm*. Accessed 18 March 2014.

25. Reanalysis is a scientific method for developing a comprehensive record of how weather and climate are changing over time using observations and numerical models. (See *http://reanalyses.org/*.)

26. European Union (2014). Regulation of the European Parliament and of the Council establishing the Copernicus Programme and repealing Regulation (EU) N° 911/2010.

27. RIO+20 conference outcome (2010). The Future We Want: Outcome document adopted at Rio+20.

3.9 Recommendations

The following recommendations have been developed by the report authors, taking the ideas proposed by stakeholders as a starting point.

The EU aims to build flexible legislation frameworks that can adapt to new information. In association with the member states, the EU needs to establish an effective policy monitoring system to produce this guiding information. The framework model for this is already accepted in the EU and many monitoring activities have been launched to enable policy evaluation, but the monitoring and information production are not developed yet – at least not for the Arctic.[28]

Science-based policy-making and continuous performance evaluation of policy actions should become a common practice. This requires availability of accurate and updated data as well as proper communication of the current state of knowledge so that the information and its implications are understood and can be used by decision-makers. Current monitoring is not sufficient for this; it is necessary to both extend and sustain observations in the Arctic. In addition, the chain from observations to decision-making needs to be organised in an effective manner. Several key areas for improvements have been identified:

- Sustain support for monitoring infrastructure (i.e. stations, networks, data platforms, etc.).
- Station operations need to evolve from research campaigns to continuous measuring.
- Extend the observation station networks on sea ice and in the sea.
- Prioritise Arctic user requirements for Earth Observation satellite missions.

Co-ordination and communication of EU Arctic research needs to be improved. This implies increasing support for actions that enable Arctic information to more effectively inform and influence EU policy-making.

3.9.1 Support Sustaining Systematic Observation Activities

As a member of Sustaining Arctic Observing Networks (SAON), the EU should effectively support SAON's actions. So far, SAON has had limited success as tasks are performed on a voluntary basis, usually within projects with little funding. Arctic countries have not yet pooled any meaningful resources for sustaining observation infrastructure in the Arctic, so offering a European top-up could encourage them to do more.

EU research infrastructure development can add to the Arctic Observing System: examples include soon-to-be established legal entities such as the European Research Infrastructure Consortia (ERIC), like:

- Euro-Argo for marine profiling floats.[29]
- Integrated Carbon Observing System for carbon flux stations.[30]
- EuroFleets for co-ordinating marine research vessel sharing.[31]
- Svalbard Integrated Observation System (SIOS) for connecting and sharing infrastructure around Spitsbergen.[32]

Two of these consortia will begin operations in 2014. EuroFleets2 has secured project funding through 2017. SIOS is trying to secure member countries for establishing a legal entity. Other research infrastructure initiatives (INTERACT, PanEurasian EXperiment) make significant contributions to Arctic monitoring, but the ERIC groups have made the greatest progress in stepping up their operations from pure research campaigns to continuous operational observations. The cryosphere is poorly addressed on the current ESFRI (European Strategy Forum for Research Infrastructures) roadmap, although it would have the potential to warrant specific actions.

To have a stronger impact, a research infrastructure project should prepare a more robust planning and implementation mechanism for Arctic observation activities. This action could effectively be arranged with Horizon 2020 infrastructure funding, but it would need to include partners from all Arctic countries to produce a full Arctic Observing System. For example, continuous observations on the ice and in the sea should be extended and sustained. This project could also set up continuous information production processes for EU Arctic policy needs.

As current satellite-based earth observation (EO) systems are not fulfilling user needs for communication and monitoring, the EU should take remedial measures. EO is crucial for Arctic monitoring, as the ground-based station networks are sparse and lined up on the edges of the Arctic area. Current development of the third-generation geostationary (GEO) satellites will provide an image of the whole earth every 15 minutes, from 60° south to 60° north at 0.5-2.0 km spatial resolution, which is standard in modern state-of-the-art meteorology. However, the spatial resolution degrades above 60° due to the earth's curvature, leaving the Polar Regions without coverage.[33] On polar orbiting satellites most Arctic-specific data is gathered as a secondary target as the prime targets are over populated areas.[34]

28. European Commission (2014), Regulatory Fitness and Performance Programme (REFIT).

29. See Euro-Argo: *http://www.euro-argo.eu/*. Accessed 13 February 2014.

30. See ICOS: *http://www.icos-infrastructure.eu/*. Accessed 13 February 2014.

31. See Eurofleets: *http://www.eurofleets.eu/*. Accessed 13 February 2014.

32. See SIOS: *http://www.sios-svalbard.org/*. Accessed 13 February 2014.

33. See Polar Communication and Weather Mission: *http://www.asc-csa.gc.ca/eng/satellites/pcw/*. Accessed 18 March 2014.

34. There are plans for Canadian and Russian satellites in highly elliptical orbits that would have a major impact on monitoring in the Arctic. Unfortunately

Both for decision-making in the next few years and for long-term guidance for Arctic adaptation and sustainable development, climate indicators should be identified and corresponding data obtained. The indicators should be derived for both recent monitoring and predicted futures. This is a clear goal in the Copernicus climate change service plans and should be a priority reflecting the strong nature of change in the Arctic.

3.9.2 Highlighting the Arctic in International Co-operation and Acting via EU Energy Policy

The stakeholders agreed that the EU should promote a precautionary approach regarding Arctic climate change. The EU should work together with Arctic countries to address Arctic concerns within the UNFCCC process. In practical terms, the EU could call for the Arctic perspective to be taken up in the UNFCCC process by inviting information related to "dangerous climate change" thresholds in the region and highlight such information in the context of the ongoing 2013-2015 review of the global long-term goal.

The EU could reiterate its willingness, as an Arctic Council observer in principle, to "support the work of the Arctic Council, including through partnerships with member states and Permanent Participants bringing Arctic concerns to global decision making bodies" (in accordance to the Arctic Council Observer Manual).[35] Moreover, the EU should ensure that the outcomes of EU-funded Arctic research are fed into the UNFCCC process. In more ambitious terms, "Arctic interests" within the UNFCCC could be facilitated by the Arctic Council becoming an observer at the UNFCCC. If such a proposal comes from the Arctic states, the EU could play a supportive role.

The EU's own actions need to accelerate progress to a competitive low-carbon future. This includes increasing support to alternative energy sources and showing leadership in technology innovation and uptake to make energy use more efficient. The Arctic could be the showcase for intelligent carbon neutral solutions that are not dependent on resource extraction.

3.9.3 Support Regional and Local Adaptation

As the rate of warming in the Arctic is two to three times faster than the global average, the European Arctic is among the first parts of the EU where widespread climate change adaptation is needed. The EU should promote regional adaptation, including appropriate early planning and reliable risk analysis, in order to decrease the possible costs of adaptation.

National-level adaptation plans are common practice for EU member states, while regional and local plans are only starting to emerge. The EU should strengthen its efforts to build local capacities and facilitate local and regional strategic planning and actions. Local governance levels face challenges in applying current climate change data. Current prediction information is generally too broad in terms of spatial and temporal resolution. Downscaling and extracting target data should be improved. Many elements of adaptive actions need expert guidance for reaching optimal efficiency. Tracking local adaptation plans would be useful to the EU both for ensuring that decisions are based on knowledge and for identifying information gaps. Analysis of the first adaptation activities should discover effective means for making efficient decisions. For example, the Arctic Council is currently implementing the Adaptation Actions in Changing Arctic project, which the EU could support. Scientific dialogue with local authorities, inhabitants and indigenous peoples is needed. Arctic adaptation-related education in schools and universities would lead to wider public dissemination of information.

Flora and fauna are affected by ecosystem changes triggered by climate change. This requires effective EU policy responses, including the need to adjust conservation policies to the paradigm of "habitats in change" and to support the monitoring and reporting of species on a more frequent and detailed basis.

neither the Canadian Polar Communication & Weather (PCW) mission nor the Russian ARKTIKA missions are close to launch, as their funding remains uncertain. By 2030, a multilateral Joint Arctic Weather Satellite system could be envisaged. Such a system would provide near real-time weather and ice data for ensuring safe maritime transport and other human activities in the Arctic.

35. Arctic Council, Arctic Council Observer Manual for Subsidiary Bodies, *www.arctic-council.org*. Accessed 10 March 2014.





WAGENBORG

Chapter 4

CHANGES IN ARCTIC MARITIME TRANSPORT

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Key Messages:

- Shipping in the Arctic is increasing, mostly due to destinational traffic linked to extraction of resources. This is expected to be the major factor for future traffic growth.
- Trans-Arctic shipping is emerging slowly. There are major constraints to its rapid expansion.
- Harsh natural conditions and serious lack of adequate infrastructure pose substantial risks.
- Major environmental issues are accidental oil spills, introduction of alien species, emissions to air and disturbance to wildlife.
- The EU may gain access to new resources, growing trade and economic benefits to ship owners and maritime industries.
- Measures must be taken before traffic builds up and as a prerequisite for harvesting the gains.

Recommendations to the EU:

- Improve the governance of Arctic shipping by supporting a Polar Code with high safety and environmental standards and additional measures to supplement it.
- Support the development of critical maritime infrastructure.
- Improve the knowledge needed for safer and environmentally responsible maritime activities.

"The Polar Code has no provisions related to Heavy Fuel Oil use or carriage regulation, mandatory ballast water or hull fouling requirements (concerning invasive species introduction) or black carbon restrictions. These are three of the most pressing and important matters concerning Arctic shipping, and the Code is severely wanting in all three areas."

Environmental NGO, US

"There is a lack of sufficient infrastructure on communication, navigation and search and rescue, among others."

Respondent from the shipping industry, Norway

"The most significant policy issues are to develop uniform shipping regulation that will be applied equitably throughout the Arctic Ocean."

Academic, US

"The Arctic is a common natural heritage area, not the property of an individual country. It is the responsibility of the EU to take an active role in ensuring its protection to secure the ecosystem services that the Arctic provides."

Environmental NGO, Russia

The quotes come from respondents to the online questionnaire – an element of the consultation process within the 'Strategic Assessment of Development of the Arctic'

Chapter cover image: Polar sea icebreaker. Bottenviken, Norrbotten, Sweden.
Photo: GettyImages

4.1 Introduction

The recent melting of the sea-ice and several highly publicised ship voyages in the Arctic have sparked greater interest in Arctic maritime transport. This chapter provides an overview of current traffic development, its drivers, impacts and relevance to the European Union.

4.2 Where Are the Ships Going?

There are two main sea routes in the Arctic Ocean today. The Northeast Passage (NEP) follows the coasts of Norway, Russia and Alaska. The major part of its Russian section is called the Northern Sea Route (NSR). The other traditional route is the Northwest Passage (NWP), which runs along the northern coast of North America. The Central Arctic Ocean Route in international waters is sparking interest as a future trans-Arctic transport corridor (Figure 4.1).

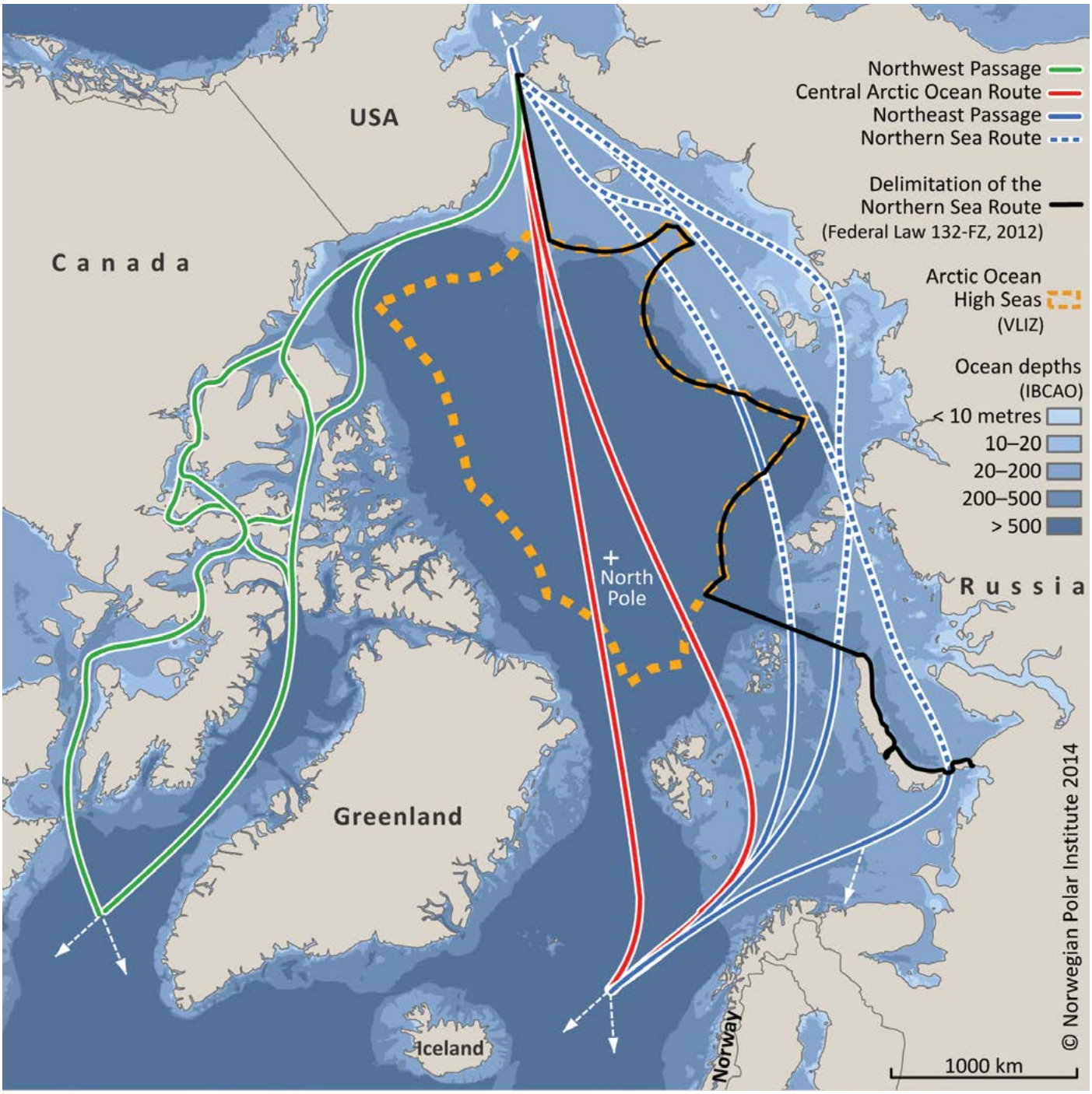

Figure 4.1: *Arctic Maritime Transport Routes.*
Source: G. Sander/A. Skoglund, Norwegian Polar Institute, 2014.

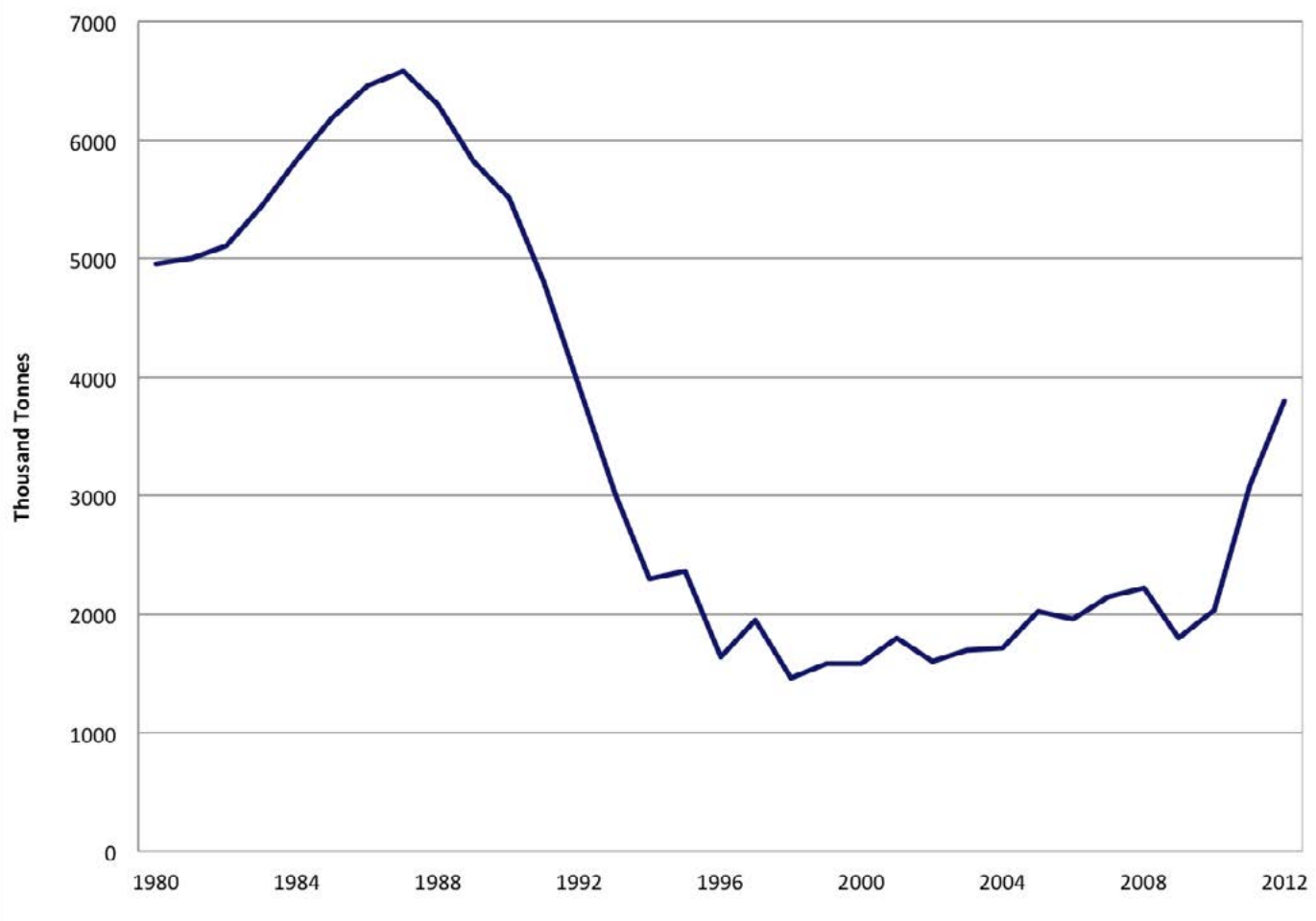

Figure 4.2: *Total Annual Cargo Volumes on the Northern Sea Route. Data include intra, destinational and transit traffic.*
Source: NSR Information Centre, 2013.

Maritime transport along these routes can be:

- *Internal* for shipping between ports in the Arctic region, or for transport activities in the ocean area such as cruise tourism, research and transport related to fisheries, offshore oil and gas, etc.
- *Destinational* for all types of ships sailing to and from the Arctic.
- *Trans-Arctic* for traffic that uses the Arctic as a transport corridor between the Pacific and Atlantic Oceans.

For the sake of simplicity, internal and destinational traffic are discussed jointly, with an emphasis on freight transport.

Today the Northeast Passage/Northern Sea Route is the most attractive option due to the more favourable ice conditions and infrastructure available, including nuclear-powered icebreakers. The Russian government has high ambitions for the NSR both as a means of developing its northern regions and as an international trade route. In the NWP, the narrow sounds are more frequently clogged by sea-ice, the infrastructure for shipping is scant and there is no clear political commitment to develop the route. This chapter therefore focuses on the NEP/NSR.

4.3 What Changes Are Observed?

4.3.1 Growth in Both Destinational and Internal Traffic in the Arctic

The Northern Sea Route was developed as part of the Soviet industrialisation of Siberia and was closely linked to an internal transport system that included inland waterways and the Trans-Siberian railway. Shipping activity peaked in 1987 and declined sharply with the dissolution of the Soviet Union. The route was opened for non-Russian flagged ships in 1991.

In recent years, the volume of cargo transported along the route has risen, though traffic has not reached the levels seen in the Soviet era (Figure 4.2). An emerging pattern is that Russian raw materials such as gas condensate and iron ore from the northwest are being exported eastwards directly to Asia.

Activity in the Northwest Passage is mostly linked to services for remote communities and a few mining projects. Most of the growth in traffic is accounted for by non-commercial craft such as yachts and Canadian government ships, not freight vessels.

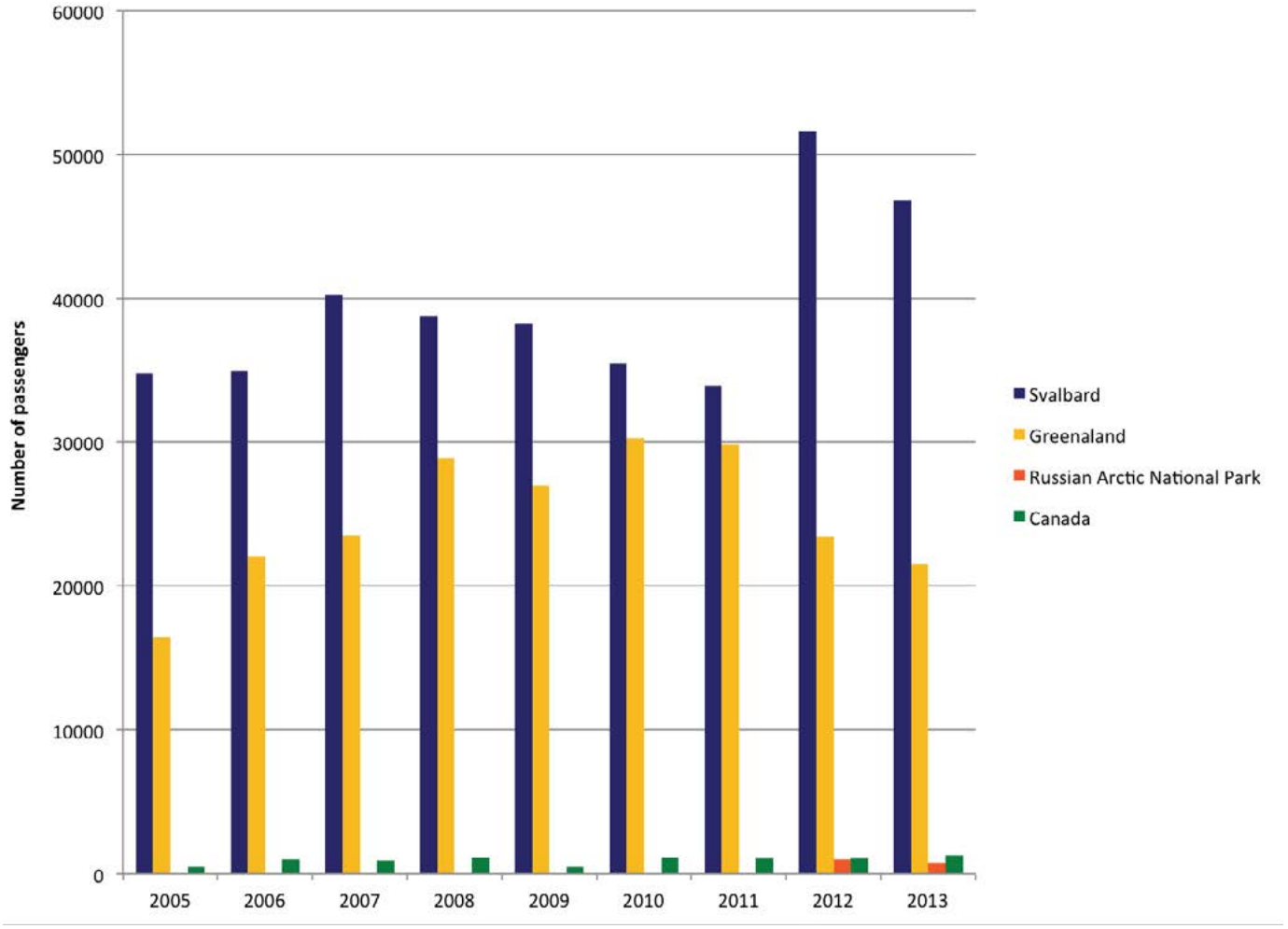

Figure 4.3: *Cruise Tourism in Some Arctic Areas by Number of Passengers*

Source: Association of Arctic Expedition Cruise Operators based on data from the Governor in Svalbard, Visit Greenland, National Park Russian Arctic and NORREG

4.3.2 Trans-Arctic Shipping is Emerging

The number of ships using the Northeast Passage as a transport corridor between Europe and Asia is on the upswing, though the numbers are still small (Table 4.1). In the Northwest Passage, the first bulk carrier transited the whole route in September 2013. Compared with the 18 000-20 000 ships that pass through the Suez Canal each year, Arctic shipping today holds minor global significance. Yet, recent developments represent a major shift in the Arctic that signals future development and requires attention and action prior to the build-up of activities.

	2009	2010	2011	2012	2013
Transits of NSR	4	5	33	44	40
Transits of NEP	2	1	10	4	18
Transits of NWP	0	0	0	0	1

Table 4.1: *Number of Arctic Transit Voyages by Freight Carriers, 2009-2012. Note that the numbers for NEP transits are lower than for NSR since NEP is a longer voyage (Figure 2.1).*

Sources: Midgard M, et al. (2009 - 2011); NSR Information Centre (2012, 2013). Numbers of NSR transits are lower than in original source because destinational voyages have been excluded.

4.3.3 Uneven Regional Developments of Cruise Tourism

Worldwide, the number of passengers carried by cruise ships has grown about 7% per year since 1990, and continued growth is expected[1]. However, the passenger volumes in the Arctic vary from region to region, with Svalbard and Greenland having the largest number of cruise tourists (Figure 4.3). Cruise ships have become larger; the biggest vessels in Svalbard can carry 3 300 passengers. At the other end of the spectrum, the region is frequented by smaller expedition cruises using vessels carrying anywhere from five to 300 passengers. In Svalbard, this segment accounts for approximately 20 – 25% of the total number of visitors. In Franz Josef Land and Canada, the cruise market is significantly smaller and dominated by the smaller vessels.

1. Cruise Market Watch website at *www.cruisemarketwatch.com*

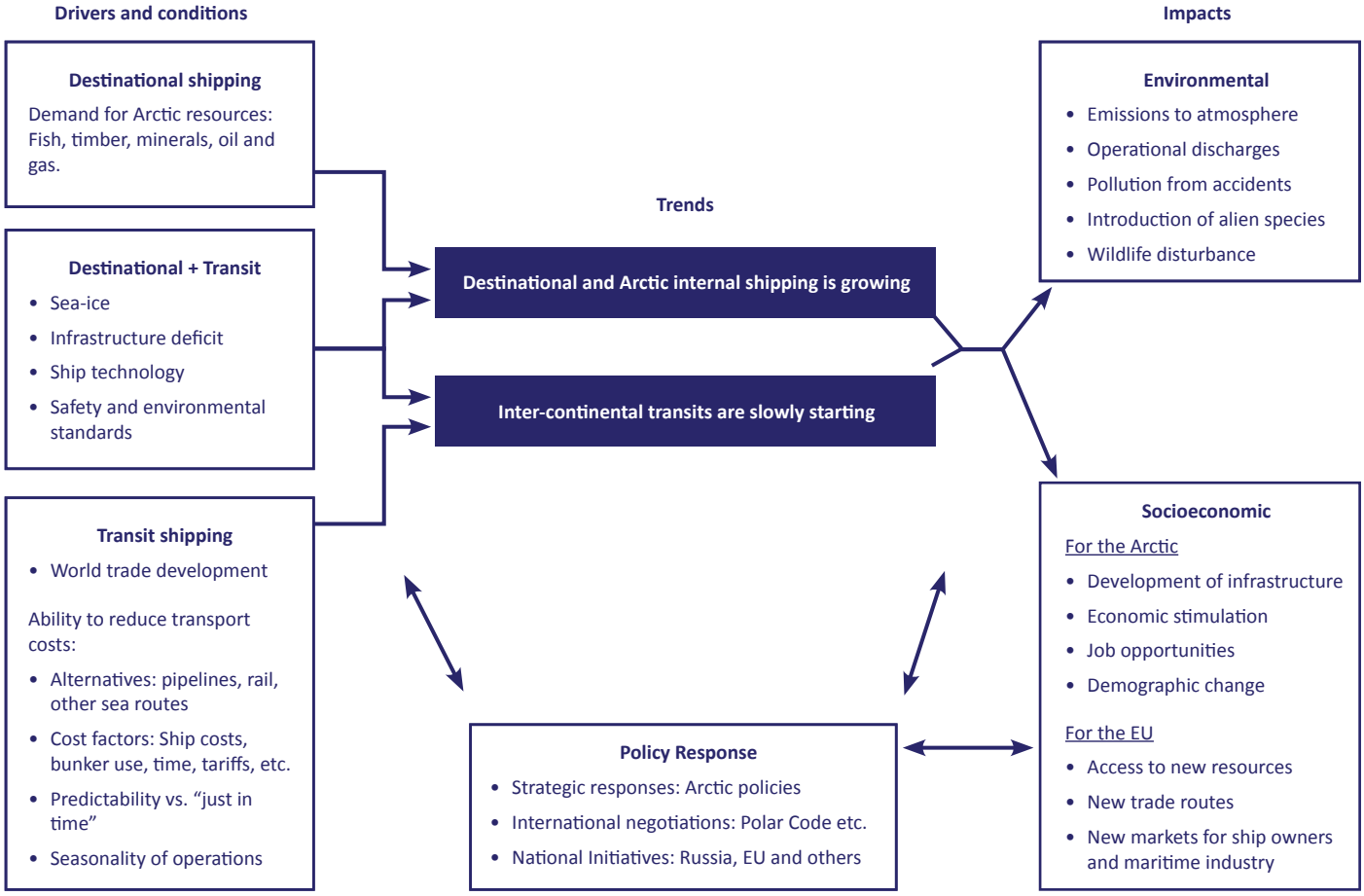

Figure 4.4: *Trends and Shaping Factors for Arctic Shipping*

4.4 What Is Shaping Change in Arctic Maritime Transport?

Commercial ship operations in the Arctic will expand if they are safe, reliable and profitable. This is influenced by a number of framing conditions and drivers, some of them general for all operations, some of them specific, as summarised in Figure 4.4.

4.4.1 Drivers for Destinational Shipping

The rich natural resources of the Arctic, particularly energy and minerals, are increasingly being seen as a new source for meeting growing global demand. Shipments are needed to deliver goods and equipment for exploration and production, and to export the products.

Turmoil in some resource-producing regions such as the Middle East increases the relative attractiveness of the Arctic as a secure source region. On the other hand, the costs of exploiting Arctic resources are often higher than elsewhere. At least in the near term, this may leave Arctic resources largely unexploited (see other chapters). Though quantitative estimates of resource exploitation and their timing are uncertain, increased activity is expected, thereby leading to growth in destinational traffic.

4.4.2 Shaping Elements Common for Destinational and Transit Shipping

Melting sea-ice

The extent of the summer sea-ice in the Arctic Ocean has decreased by about 40% on average since 1979, when satellite measurements started. The decrease in winter is only about 8% (Figure 4.5). Sea-ice has also become younger and thinner. There is large variation between years since the thinning makes the sea-ice more vulnerable to weather events.

In light of the current global warming trend, the Arctic Ocean is likely to become nearly ice-free in summer. It is uncertain when this will happen. The IPCC has estimated before mid-century for a scenario of comparatively high greenhouse gas concentrations (RCP 8.5), but states

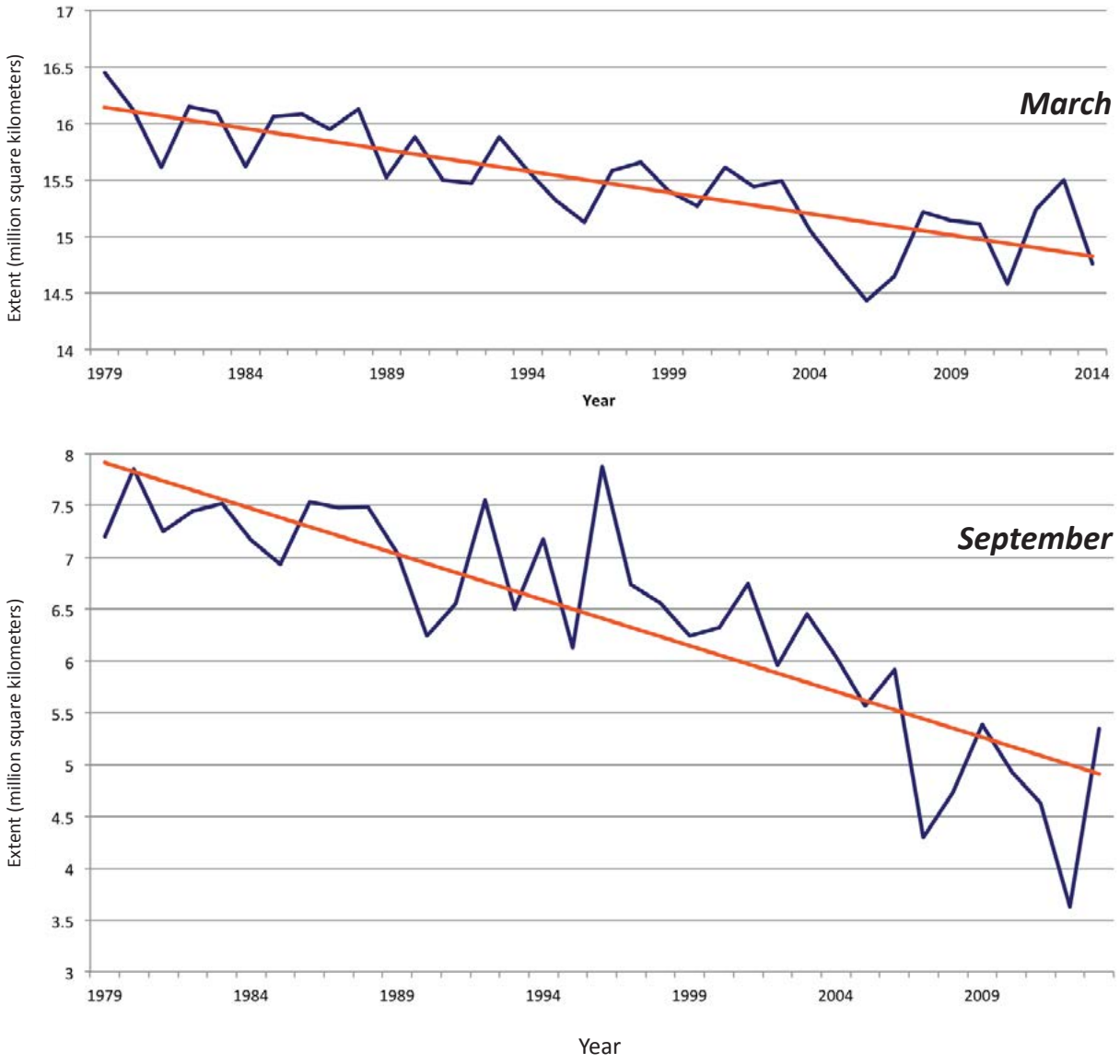

Figure 4.5: *Average Monthly Arctic Sea-Ice Extent in September and March, 1979 – 2013*
Source: National Snow and Ice Data Centre.

that it is not possible to make such projections with confidence for other scenarios.[2]

The large variations in sea-ice conditions between summer and winter, and between years, and the uncertainty in predicting sea-ice on all time scales, complicate the planning of shipping operations.

Reduction of summer sea-ice will expand the navigable area and extend the season. Both the Northwest Passage and the Central Arctic Ocean route could become navigable under summer conditions by mid-century, or even earlier (Figure 4.6). Winter sea-ice will remain, but will gradually be replaced by first-year ice, which is thinner and easier to penetrate for a reinforced ship hull than multi-year ice. The occurrence of winter ice and drifting ice from glaciers in addition to icing from sea spray means that ships will need to always be prepared for ice, even in summer.

Overcoming the infrastructure deficit

There are severe shortcomings to the Arctic marine infrastructure. Hydrographic surveys are needed to improve nautical charts. Better navigational aids, communication systems, ship surveillance and reporting together with better meteorological and ice services are also needed to improve safety of navigation. Search and rescue services capable of serving huge areas must be developed. Protection of the environment requires oil-spill combating equipment that works in ice-infested waters, designation of "places of refuge" and port reception facilities for ship waste. There is also a need to improve services along the routes for bunkering, repair and maintenance. A significant dilemma is who should finance the necessary infrastructure.

2. Intergovernmental Panel on Climate Change (2013). "Summary for Policy-makers", in Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the IPCC, Stocker, T., Qin, D., Plattner, G., Tignor, M., Allen, S., Boschung, J., Nauels, A., Xia, Y., Bex, V. and Midgley, P. (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY, US.

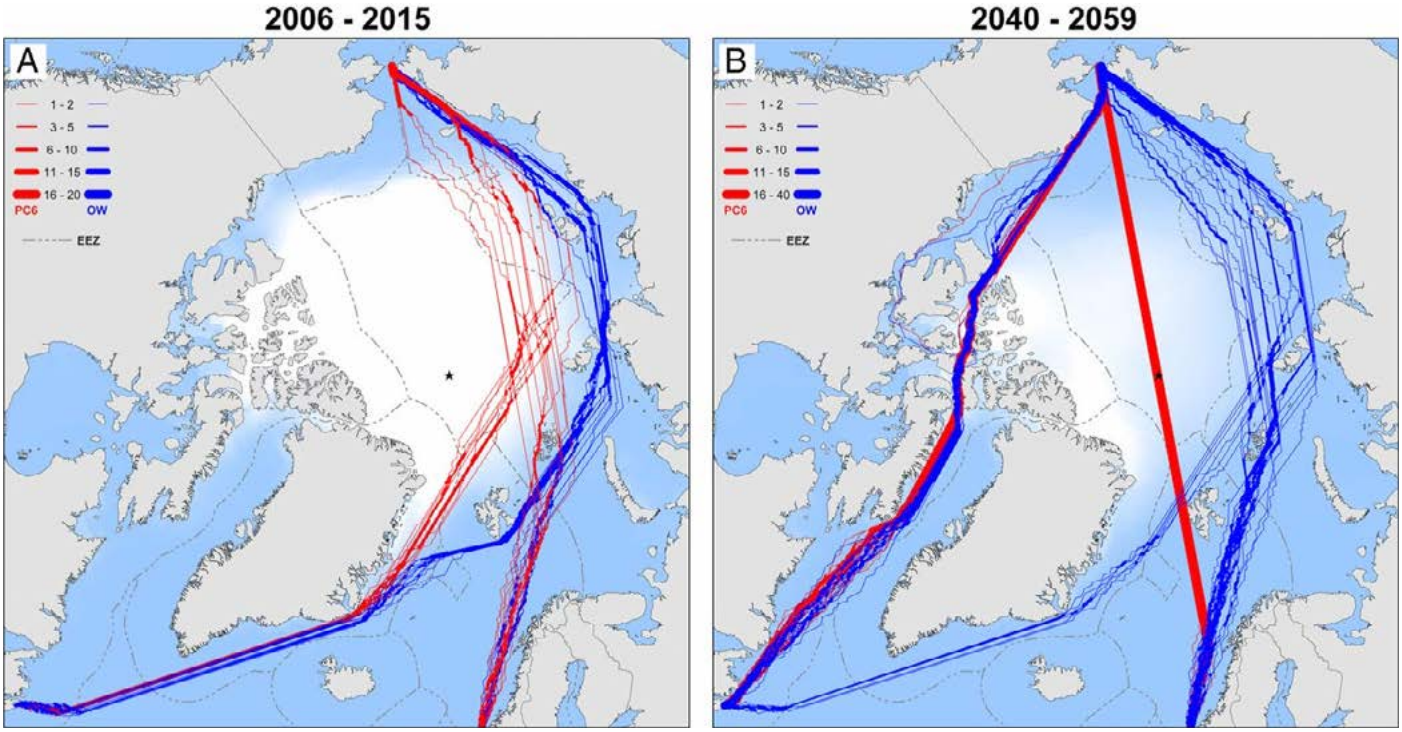

Figure 4.6: *Modelled Routes Physically Accessible for Ships Sailing in September Between the Bering Strait and St. Croix in Canada or Rotterdam in the Netherlands. Current conditions are on the left, mid-century conditions under a modest climate scenario (RCP 4.5) on the right. Red routes are for moderately ice-strengthened ships, blue routes for ordinary vessels. The lines do not indicate traffic levels, just physical accessibility.*

Source: Smith and Stephenson, 2013.

The Russian government wants to upgrade the services along the NSR, which decayed after the dissolution of the Soviet Union. Investments are being made in ports, search and rescue centres have been designated and a programme for investments in new icebreakers has been approved. Changes have also been made to legislation, tariffs and application procedures for foreign ships.

Ship technology

Shipping technology for ice conditions has evolved, with advances in areas such as new propulsion systems, winterisation of equipment and workplaces, and concepts for oblique icebreakers. For example, the double-acting container vessel shown in picture 4.2 can traverse ice that is up to 1.5 m thick, and moves stern-first in ice and bow-first in open waters. Further technology advances are expected and may increase Arctic accessibility and safety margins. Investments in new ice-class vessels with modern technology are necessary to accommodate more Arctic maritime transport.

Picture 4.1: *Double-acting Cargo Vessel Used for Shuttle Transport between Murmansk and Dudinka*

Photo: Aker Arctic.

Availability of competent crew

Sailing in harsh Arctic waters puts the competence and endurance of marine crews to the test and increases the risks of fatigue, injuries and lower decision-making capacity. Today there is a shortage of qualified sailors. Special skills must be achieved through education and training and will be more formalised in new international standards.

Interlinkages and competition with other modes of transport

Maritime freight transport competes with – and interacts with – other modes of transport. For transporting Arctic oil and gas, ships or pipelines are the main alternatives. However, railways, waterways and trunk pipelines are used internally in Russia for transport to the coast, where oil is loaded onto ships for export.[3] Similar chains of transport ending up in ships are common in Arctic mining, whereas fish may be exported via ship, train, trucks or planes.

3. Bambulyak, A. and Frantzen, B. (2011). Oil transport from the Russian part of the Barents Region. Status per January 2011. The Norwegian Barents Secretariat and Akvaplan-niva, Norway.

The Trans-Siberian Railway and a few other rail connections are alternatives to shipments between Asia and Europe, particularly from inland areas. Trains seem to offer faster connections for containers, but at higher costs, making railways an appealing alternative for high-value commodities.[4]

4.4.3 Shaping Elements for Transit Shipping

Volume and direction of global trade flows

Macroeconomic factors will shape the size and direction of trade flows globally and hence the demand for transport.

Reducing maritime transport costs

Cutting transport costs is a primary driver. The competitiveness of the Arctic routes is assessed against other modes of transport and other shipping routes, primarily the Suez Canal. Important factors include:

- **Size and draft restrictions:** Larger ships reduce costs per unit of cargo transported. Today's Arctic sea routes accommodate only limited ship sizes as they follow the shallow continental shelf and must pass through narrow straits. Reduced sea-ice will gradually allow greater access to deep-water routes (ref. Figure 4.6).
- **Combining multiple hubs and destinations en route:** Operational patterns, particularly for container shipping, use hub ports and intermediate stops to load/unload and redistribute cargo. These are dispersed along the traditional sea routes. Since there are no such services in the Arctic, even a full-year accessible Arctic route would face disadvantages compared to current shipping networks.
- **Predictability:** Container ships in particular are part of integrated logistical chains where goods must arrive "just-in-time". Variable sea-ice and weather conditions and navigational challenges pose risks of delays in the Arctic. This will limit the attractiveness of Arctic routes until more reliable services can be established.
- **Seasonality:** Thus far, the Arctic sailing season is limited to late summer. This makes the route less attractive for ships operating on fixed routes, as is the case with much of the container market, since they would have to change logistics twice a year as long as the Arctic winter is not navigable. Most ship owners so far have considered this an unattractive business proposition.[5] Operations where route flexibility is an option, for example spot market transports, may be able to take advantage of the late summer Arctic routes.
- **Distance and time:** For transits between ports in northern Asia and northern Europe, the distances through the Arctic are shorter than via the Suez Canal; further south, the Suez route is shorter (Figure 4.7). Nonetheless, speed is reduced when sailing in ice, so savings in distance may not deliver the same time savings. Sailing times in the Arctic also depend on weather conditions, regulatory approvals and waiting times for convoys or icebreakers.
- **Fuel consumption:** Sailing shorter distances saves fuel. Breaking ice, however, requires extra energy. So does moving a heavy, ice-reinforced vessel with a hull and propulsion system optimised for ice when sailing in open water. This is a disadvantage, particularly for Polar class vessels, whereas the design of ships with a lower ice class strikes a compromise between ice and open water requirements.

  "Slow steaming" has become increasingly accepted as a way of reducing the energy costs of individual vessels, though not necessarily for a whole fleet. One implication is that delays in the Arctic may not pose the same disadvantage compared to the Suez route as under normal modes of sailing.
- **Costs of ice-classified vessels:** Ice-classified ships are more expensive to build, particularly Polar class vessels. The extra fuel consumption also adds to the operational costs. Since vessels that are specialised for operations in heavy ice will not be competitive in worldwide trade, the outcome might be that they would only be in seasonal use unless combinations are found, such as operating in the Baltic in winter and the Arctic in summer. Suspending operations for a season adds negatively to the costs.
- **Tariffs:** Ships using the Northern Sea Route pay tariffs based on the use of services such as ice pilotage and icebreakers. Ship owners must also pay tariffs in the Suez and Panama Canals.

4. Tavasszy, L., Minderhoud, M., Perrin, J. and Notteboom, T. (2011). A strategic network choice model for global container flows: Specification estimation and application. Journal of Transport Geography, 19(6), 1163-1172.

5. Lasserre, F. and Pelletier, S. (2011). Polar super seaways? Maritime transport in the Arctic: an analysis of ship owners' intentions. Journal of Transport Geography 01/2011; 19(6):1465-1473.

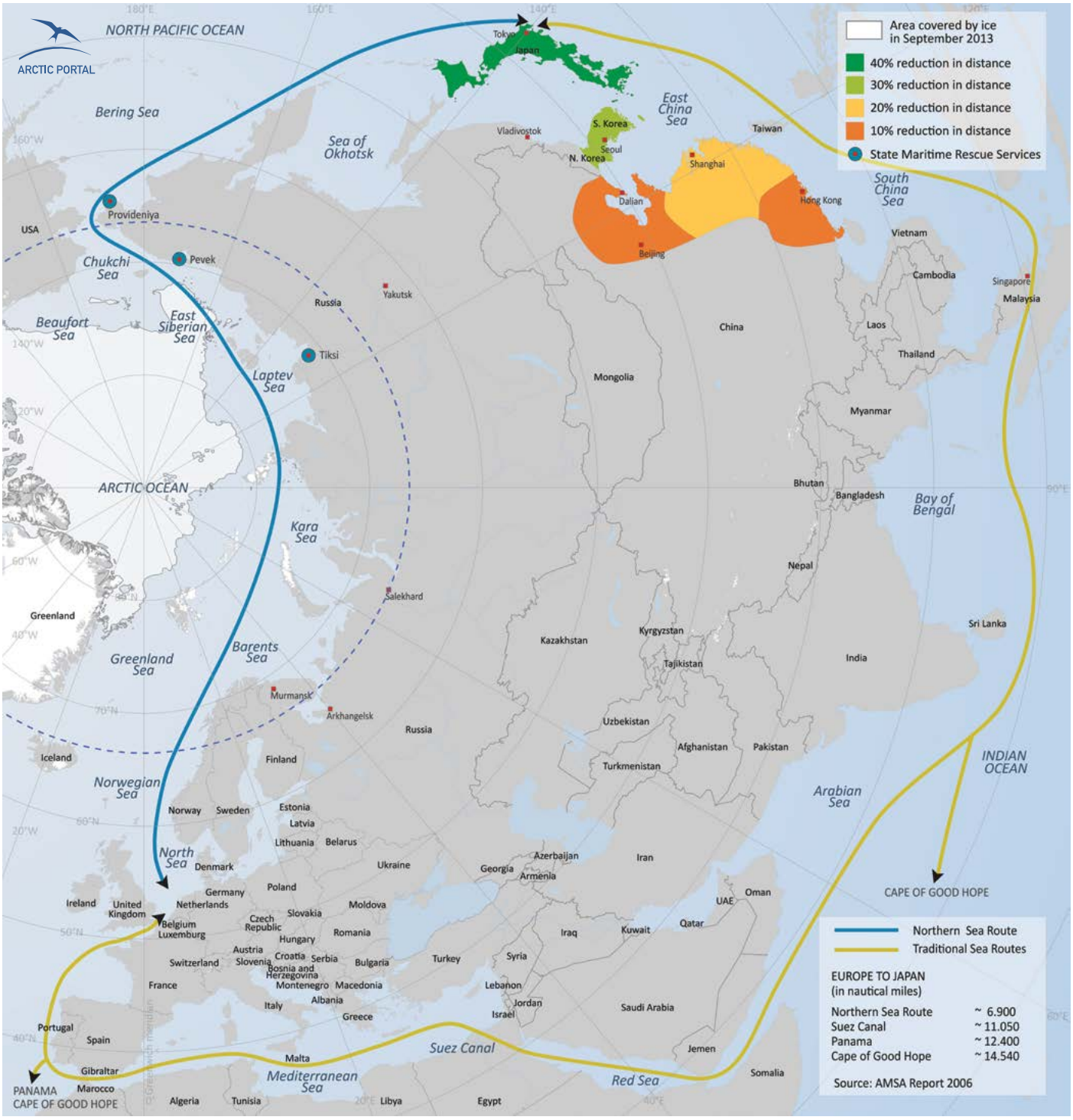

Figure 4.7: *Distance Savings for Voyages along the Northeast Passage Compared with the Suez Canal*
Source: Arctic Portal, based on DNV GL.

4.5 Outlook to 2030

Many Arctic voyages are still trial shipments to test the viability of new routes and destinations, types of ships and technology, and safety schemes. The Arctic Marine Shipping Assessment in 2009 projected that the main increase in maritime transport in the next decade would be destinational rather than trans-Arctic.[6] This still seems to be a sound outlook. Within this broad picture, what types of shipping will grow and when, where and to what extent, will depend on the activities in different industries: mining, offshore oil and gas, tourism and scientific research, among others (see outlooks in other chapters).

Future Arctic transit traffic crucially depends on its attractiveness to container ships, which account for the largest share of global marine shipments. The few models used to project Arctic transits involve a high degree of uncertainty, but generally indicate that the number of ships will be rather modest. For example, DNV has estimated that the number of transit voyages with container ships will amount to 450 in 2030 and 850 in 2050.[7]

6. Arctic Council (2009). Arctic Marine Shipping Assessment 2009 Report. Protection of Arctic Marine Environment working group, Akureyri.

7. Det Norske Veritas (DNV), 2010: Shipping across the Arctic Ocean. A feasi-

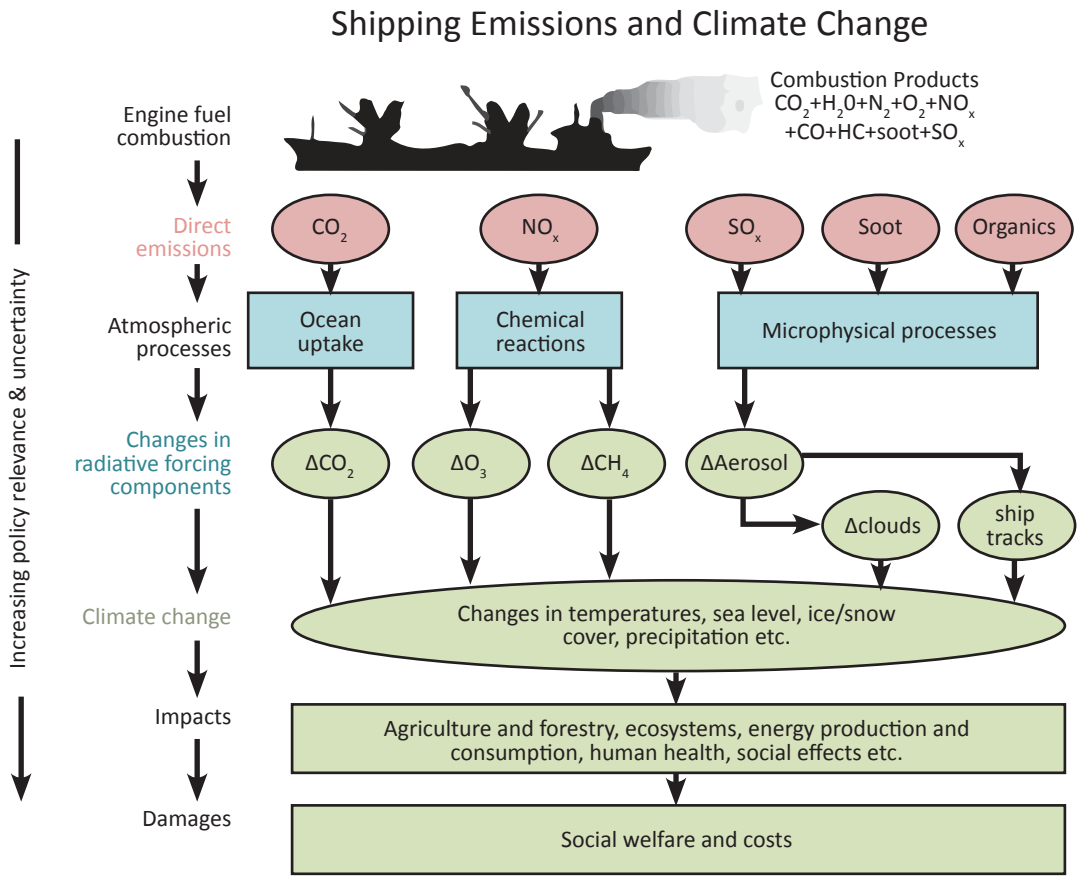

Figure 4.8: *Shipping Emissions and Climate Change*
Source: Second IMO GHG Study.[8]

4.6 Impacts

4.6.1 Environment

Ship emissions affecting the environment and human health[8]

Ship emissions contain many gases and particles with multiple effects caused by their original components and subsequent chemical and physical reactions (Figure 4.8).

Both nitrogen and sulphur components cause acidification that damages vegetation, freshwater fish and materials. Nitrogen also adds to the problem of excessive enrichment of nutrients in ecosystems, whereas surface ozone affects crop yields. These gases and soot (black carbon) have negative effects on health, too. Several estimates have demonstrated that ship emissions significantly contribute to diseases and increased mortality globally.[9]

Ship emissions and climate change

Carbon dioxide (CO_2), nitrous oxides (NOx) and methane (CH_4) are greenhouse gases that result from ship emissions and contribute to global warming. Soot has a warming effect both in the atmosphere and when it is deposited onto white snow and ice surfaces. On the other hand, other shipping emissions have a cooling effect (e.g. sulphur dioxide that forms aerosols). The net global effect of shipping emissions has been shown to be an initial cooling on timescales of decades to centuries and thereafter a warming due to accumulation of long-lived greenhouse gases, mainly carbon dioxide.[10] Calculating the net climate effect of growth in Arctic shipping is not easy and depends on the scenarios envisaged, the time horizon and location of emissions. However, emissions of short-lived climate pollutants in the Arctic have a stronger effect than at more southern latitudes, meaning that the warming effect of moving traffic may increase despite the shorter routes.[11]

ble option in 2030 - 2050 as a result of global warming? Research and Innovation, Position Paper 04 – 2010, DNV, Oslo.

8. Buhaug, Ø., Corbett, J., Endresen, Ø., Eyring, V., Faber, J., Hanayama, S., Lee, D., Lee, D., Lindstad, H., Markowska, A.., Mjelde, A., Nelissen, D., Nilsen, J., Pålsson, C., Winebrake, J., Wu, W. and Yoshida, K. (2009). Second IMO GHG Study 2009, International Maritime Organization, London, April 2009.

9. Corbett, J., Winebrake, J., Green, E., Kasibhatla, P., Eyring, V. and Lauer, A. (2007). Mortality from Ship Emissions: A Global Assessment. Environ. Sci. Technol., 41, pp. 8512–8518.

10. Eide, M., Dalsøren, S., Endresen, Ø., Samset, B., Myhre, G., Fuglestvedt, J. and Berntsen, T. (2013). "Reducing CO2 from shipping – do non-CO2 effects matter?", Atmos. Chem. Phys., 13, 4183-4201.

11. Ødemark, K. et al. (2012). Short-lived climate forcers from current shipping and petroleum activities in the Arctic. Atmos. Chem. Phys. 12, 1979-1993; Dalsøren, S. B., Samset, B. H., Myhre, G., Corbett, J. J., Minjares, R., Lack, D. and Fuglestvedt, J. S. (2013). Environmental impacts of shipping in 2030 with a particular focus on the Arctic region, Atmos. Chem. Phys., 13, 1941-1955.

Operational discharges

The Convention on the Prevention of Pollution from Ships (MARPOL) restricts emissions from ships. Nevertheless, oil residues, garbage, sewage and cargo may be legally discharged when diluted and away from shore.

Pollution from accidents

Common pollution resulting from an accident is the discharge of bunker oil. Tankers loaded with petroleum products may cause much larger discharges, whereas other toxic goods on board may also pollute. Cleaning up oil spills in ice-covered waters is even less effective than in open waters.

Introduced alien species

Ships are the most common vector for introducing alien marine species to other ecosystems, not only from ballast water tanks and hulls, but also from the cargo. Alien species may alter marine ecosystems and cause economic losses. Transports from the relatively species-rich Pacific to the Atlantic along the same latitudes and hence temperature gradients may pose a particular risk. Warming of the Arctic Ocean reduces the temperature barriers that have prevented species survival en route.[12]

Wildlife

Noise, collisions and the mere presence of humans may disturb Arctic wildlife, e.g. birds and whales at chokepoints and in sensitive areas.

4.6.2 Economic and Social Impacts in the Arctic

- Upgrading of existing ports and construction of new ones will stimulate economic activity, but entail substantial costs. Public investments in maritime transport infrastructure, and search and rescue capabilities will require long-term government commitments even if done in partnership with the private sector.
- Increased demand for supply services for ships like bunkering and repairs. This will favour service operators currently active in the region, whereas others may enter the Arctic market.
- Increased accessibility and lower transport costs could increase goods availability and decrease prices in remote settlements. This would directly benefit local communities and raise welfare levels.
- Improved transport could also lower the costs of export and import, thereby facilitating more trade with other (non-Arctic) partners. Manufacturing centres in the region might see an improvement in their competitive position if transport costs were lower.
- Whether or not Arctic regions will benefit from employment growth depends on the type of demand/skills needed and the available skill base. As the current Arctic population is small, the specific skills needed may not be present. Importing skilled labour from elsewhere (short term) or raising education levels/tailoring skills to the new needs (long term) would be necessary.
- More economic and social opportunities in Arctic port communities could stimulate migration from rural areas, causing shifts in local economies. This may have negative impacts both on the rural side (reduced population, possibly below levels that allow sustainable maintenance of public services like schools and healthcare) and in urban areas (lack of housing facilities, pressures on local infrastructure).
- The fact that the Arctic sea routes will remain seasonal for some time may mean that impacts are seasonal. This poses issues about seasonal labour migration and off-season economic activities.

4.7 Governance

The United Nations Law of the Sea (LOS) Convention provides a fundamental framework for the governance of navigation, also in the Arctic.[13] A coastal state has full rights to set the conditions for ships in its ports and internal waters, but has less authority in its territorial sea where ships enjoy the right to innocent passage (Figure 4.9). In the exclusive economic zones (EEZ), navigation can mostly take place under the principle of freedom of navigation, as on the high seas. Under this sailing regime, the main rule is that only the flag state has authority over a vessel, with the duty to enforce customary laws and all international conventions to which it is a party.

When the EEZ is ice-covered, Article 234 of the LOS Convention makes an exception to this general division of responsibilities. Then coastal states have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution. Canada and Russia have developed the most comprehensive regulations based on this article and their drawing of baselines whereby parts of their maritime areas are designated as internal waters.[14] Until ships can sail on the high seas along the Central Arctic Route (Figure 4.7), Canadian and Russian rules to a large degree set the standards for ships operating in the high Arctic.

12. Ware, C., Kirkpatrick, J., Sundet, J., Jelmert, A., Berge, J., Coutts, A., Floerl, O., Pellissier, L., Wisz, M. and Alsos, I. (2014). "Climate change, non-indigenous species and shipping: assessing the risk of species introduction to a high-Arctic archipelago". Diversity and Distributions, 20, 10-19.

13. See e.g. VanderZwaag, D. et al. (2008). Governance of Arctic Marine Shipping, Marine & Environmental Law Institute, Dalhousie University, and Molenaar, E. 2009: "Arctic marine shipping: Overview of the international legal framework, gaps and options", Journal of Transnational Law & Policy, 18 289-325.

14. See Brubaker, D. (2001). Straits in the Russian Arctic, Ocean Development and International Law, 32:263-287, Kraska, J. (2007). The Law of the Sea Convention and the Northwest Passage, International Journal of Marine and Coastal Law, Vol 22, No 2, 257 – 282 and VanderZwaag, D. et al. (2008) op.cit.

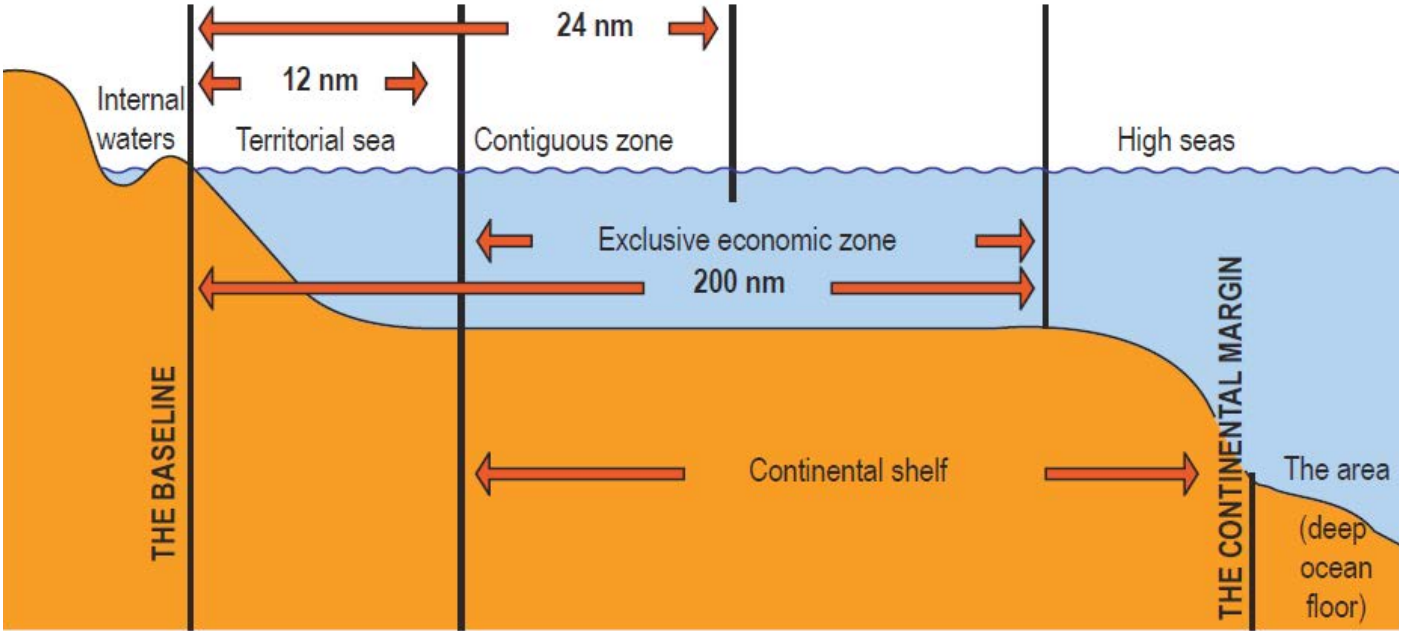

Figure 4.9: *Maritime Zones. The right to regulate navigation of ships varies between the maritime zones, as defined in the UN Law of the Sea Convention.*

Source: Norwegian Polar Institute.

The International Maritime Organization (IMO) is the specialised United Nations agency responsible for important regulations related to maritime safety and environmentally sound and efficient shipping. The MARPOL Convention and the Convention on the Safety of Life at Sea (SOLAS) are prominent results of its work. The IMO has been proactive in developing voluntary guidelines, initially for ships operating in Arctic waters, later adjusted for ships in polar waters (Arctic and Antarctica). These will be replaced by a mandatory Polar Code that is being negotiated in the IMO and is expected to enter into force in 2016. The goal is to provide for safe ship operation and prevention of pollution from ships by addressing risks in polar waters that are not adequately mitigated by other IMO instruments.

For the global shipping industry, the preferred option is to have uniform Arctic standards. This could be achieved through the Polar Code, but also by means of a harmonised set of national standards from the Arctic coastal states. Uniform regulations can also be strengthened by adding to current relevant port state agreements – the Paris and Tokyo Memoranda of Understanding (MoU) – or creating a new one for the Arctic region.[15]

The Arctic Council influences Arctic shipping through assessments such as the Arctic Marine Shipping Assessment with follow-up activities and non-binding guidance for its member states.[16] Moreover, under the auspices of the Arctic Council, eight Arctic states negotiated the Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic and the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic.

4.8 How Changes in Arctic Maritime Transport May Affect the European Union

Changes in Arctic maritime transport may affect the economic, political and environmental interests of the European Union (EU). Their implications and magnitude will depend on the pace and extent of the changes and may differ for destinational and transit shipping. Some potential effects are:

- Access to trade routes.
- Access to new sources of energy and other natural resources at relatively close distances from politically stable countries, serving to enhance security of supply in line with EU policies regarding raw materials and energy security.
- Potential cost savings related to shorter shipping routes, contributing to lower logistics costs for the European economy.
- Greater demand for ice-class ships, icebreakers and related technology. This is a market in which the EU already has a significant position, primarily companies and shipyards in Finland. Estimates of the

15. Molenaar, E. (2007). Port state jurisdiction: Towards comprehensive, mandatory and global coverage. Ocean Development and International Law, 38, 225-257.

16. Arctic Council (2009). Arctic Marine Shipping Assessment 2009 Report. PAME working group, Akureyri, Iceland, April 2009.

annual potential for this market amount to EUR 500 million.[17]

- European ship owners who want to operate in the Arctic may be expected to have a share of the market to be served as well as substantial shares of the required investments in ice-strengthened vessels.
- Within Europe, the availability of a trans-Arctic shipping route may affect competition between ports.

4.9 How the European Union Influences Arctic Maritime Transport

4.9.1 European Union International Activities

Competence in maritime transport is shared by the EU and its member states. Member states cannot act in a manner that is detrimental to EU competence or interests, or adversely affect the effective implementation of EU policies. In areas where the EU internally regulates maritime transport, the EU also acquires external competence. This means that member states cannot act internationally without taking into account established EU policies and common positions.

This is relevant for instance in the IMO, where the EU is not a member, but its member states are. Due to extensive EU regulations on shipping-related issues, the European Commission and the European Maritime Safety Agency co-ordinate with the member states in the IMO committees, for example with regard to the Polar Code. As the co-ordination involves 28 out of 170 members of the IMO and represents considerable tonnage, the EU has significant influence. It is thus a potentially strong mechanism for EU influence to co-ordinate positions in the IMO and other international organisations that can set conditions relevant for Arctic shipping. The EU clearly supports the development of a strong mandatory code, but attempts to balance the interests of ship operators with concerns for the environment and safety.[18]

Within the Arctic Council, the EU has been active in the Protection of the Arctic Marine Environment (PAME) Working Group, contributing substantial input to a number of topics particularly from the European Commission's DG Mobility and Transport. The European Maritime Safety Agency and PAME are currently exploring possible areas of co-operation.

The EU has also developed an Integrated Maritime Policy that includes the Arctic Ocean. It is one of the sea basins for which a separate policy is to be developed.

4.9.2 EU Regulations Affecting Flag State and Port State Measures

Many ships traversing Arctic sea lanes are either owned by companies based in Europe or have European ports of departure or destination. The EU member states therefore can influence Arctic shipping via requirements on vessels flying their flags and through port state control. The European Union affects this when setting common standards that the member states must follow.

The EU has developed a comprehensive regulatory framework regarding shipping safety and environmental standards, in particular in the aftermath of major accidents.[19] Relevant EU regulations include maritime safety and pollution prevention, ship inspection, improved flag state performance, liability of carriers and training of seafarers. Selected examples that may be relevant for the Arctic are:

- The directive on vessel traffic monitoring and information system[20] is one of few EU regulations referring directly to sea-ice. Member states are required to provide information on ice conditions, recommend routes and icebreaking services, and request certification documents commensurate with the ice conditions.
- The directive on sulphur in marine fuels limits the maximum content according to MARPOL requirements.[21] Additional legislation affects maritime emissions that contribute to acidification, eutrophication and the formation of ground-level ozone.[22]
- The EU framework for port state control is mainly the 2009 directive, which builds on the Paris MoU.[23] The Paris MoU includes a new inspection regime for all ships calling at MoU ports seen as a whole instead of the previous goal of controlling 25% of ships calling at the ports of an individual state. The European Maritime Safety Agency hosts an information system for selecting which ships should be inspected in Europe.[24]

17. Ecorys (2012). Green Growth Opportunities in the EU Shipbuilding Sector. Final Report. Commissioned by the European Commission, DG Enterprise and Industry, *http://ec.europa.eu/enterprise/sec tors/maritime/files/green_growth_shipbuildingfinal_report_en.pdf.* Accessed 20 February 2014.

18. See e.g. answer to the Member of European Parliament question (17 June 2010), Kallas on behalf of the Commission. E-2863/2010, OJ C 138 E, 07/05/2011, *www.europarl.europa.eu/sides/getAllAnswers.do?reference=E-2010-2863&language=EN*. Accessed 20 February 2014.

19. See: DG Transport, *www.ec.europa.eu/transport/modes/maritime/safety/third_maritime_safety_package_en.htm*. Accessed 24 February 2014.

20. Directive 2002/59/EC, 27 June 2002 establishing a Community vessel traffic monitoring and information system, amended by Directive 2009/17/EC.

21. Directive 2012/33/EU, 21 November 2012 amending Council Directive 1999/32/EC regarding sulphur content of marine fuels.

22. Directive 2001/81/EC, 23 October 2001 on national emission ceilings for certain atmospheric pollutants, Official Journal L 309, 27.11.2001. The directive had required the Commission to prepare reports, inter alia, on ship emissions.

23. Directive 2009/16/EC of 23 April 2009 on port state control.

24. THETIS, a new targeting system for selecting ships for inspections set up by European Commission regulation. See also *http://ec.europa.eu/transport/modes/maritime/safety/actions_en.htm*. Accessed 25 February 2014.

Picture 4.2: *Vladimir Tikhonov (160 000 DW tons) is the largest vessel so far to transverse the NSR. It established a new sea lane outside the New Siberian Islands in 2011.*
Photo: Maritime Executive.

4.9.3 Supporting Improved Infrastructure and Services for Arctic Maritime Transport

EU policy documents express interest in supporting Arctic-relevant maritime infrastructure. For instance, the Galileo satellite system, whose first services are expected to be introduced in 2014, will increase the accuracy of satellite-based positioning in the Arctic, thereby making Arctic navigation safer. Galileo also has a dedicated search and rescue function that will locate ships in distress more efficiently.

The Copernicus earth observation programme is soon to enter the operational phase.[25] This will increase observation capabilities in the Arctic and could provide a wide array of improved services like more accurate meteorological data, better ice forecasts, detection of oil spills and increased understanding of many climatic and environmental issues.

Surveillance is useful in tracking ships and has multiple applications in preventing collisions and monitoring whether ships discharge oil or engage in illegal fishing, for example. The EU has developed SafeSeaNet and CleanSeaNet[26] and given practical support to IMO initiatives such as Automatic Identification System (AIS) and Long-Range Identification and Tracking. Satellite-based AIS is necessary for the Arctic marine areas where terrestrial AIS cannot cover vast ocean areas.[27]

4.9.4 Research

EU-funded research projects inter alia help to support the safety and environmental performance of Arctic shipping and improve the understanding of its driving forces and implications. Annex 2 contains several relevant examples of projects.

4.9.5 Indirect Effects of EU Regulations and Policies

The EU can have indirect effects on the volume and pattern of maritime transport in Arctic waters via other policies and actions. Examples include general transport policies, engagement in Arctic resource development and trade or consumer-related actions that affect the demand for Arctic resources.

25. Copernicus website at *http://www.copernicus.eu/*. COPERNICUS was formerly known as Global Monitoring for Environment and Security. See also *http://europa.eu/rapid/press-release_IP-14-257_en.htm*. Accessed 25 February 2014.

26. See *http://emsa.europa.eu/operations/cleanseanet.html* and *http://emsa.europa.eu/operations/safeseanet.html*.

27. Polar View (2012). The contribution of space technologies to Arctic policy priorities. Report for the European Space Agency.

4.10 Critical Factors for EU Decision-making

Stakeholders were asked during consultations about the most important factors for EU policy- making related to Arctic maritime transport. The responses show strong interest in issues that can be clustered into three areas that constitute key challenges.

4.10.1 Minimising Risks in Arctic Shipping

The Arctic is a frontier region for shipping. Sea-ice and environmental conditions such as polar lows, temperatures and darkness are challenging. There is scant infrastructure to service maritime transport. Vast areas must be covered by search and rescue capacities and preparedness to cope with accidents and incidents. Seafarers with sufficient training are scarce. Discharges of oil and the introduction of alien species are environmental risks of particular concern. These additional risks must be overcome for Arctic shipping to become safe and secure.

Picture 4.3: *Icing of Vessels Due to Sea Spray is a Serious Challenge.*

Photo: William Mowitt, NOAA.

4.10.2 Insufficient Governance System

The governance of Arctic shipping should be improved. There is a clear recommendation from stakeholders to focus on international regulations, highlighting the Polar Code in particular. Concerns have been expressed about whether its standards will be sufficient to safeguard the Arctic and whether the full suite of environmental issues will be addressed. Another concern was the need to ensure uniform regulations and harmonised standards ("level playing field").

4.10.3 Need for Supporting Research, Data Collection and Technology Improvements

Stakeholders emphasised many outstanding science questions that need to be addressed to underpin safe and efficient shipping and better governance. The key topics they identified are better mapping and understanding of environmental conditions, better predictions of ice and weather conditions, better knowledge about the impacts of Arctic shipping and how to address them, and technological developments to boost safety and reduce the environmental footprint of ships.

4.11 Recommendations

The following recommendations are built on analyses carried out by the report authors, taking input from stakeholders as a starting point. Though structured under three headings, there are overlaps and inter-linkages. It is emphasised that measures to improve the regulation of Arctic shipping and develop maritime infrastructure must be taken before the traffic increases to levels that may pose unacceptable risks to safety and the environment. That is also a prerequisite for taking advantage of the economic gains that Arctic shipping may bring.

4.11.1 EU Contribution to Good Maritime Governance

The EU could use its influence in the IMO to show leadership in Arctic maritime transport. The Polar Code is by far the most important current process. The EU should develop unified positions to support high safety standards and effective measures against pollution.

The EU should also address issues that are not taken care of adequately in the Polar Code:

- Invasive species are an increasing risk to Arctic ecosystems as traffic grows and the Arctic Ocean becomes warmer. The global Ballast Water Convention needs additional ratifications to enter into force. The EU should urge all its member states to become parties and to implement it.[28] Urgent

28. See IMO status of ratifications, *http://www.imo.org/About/Con ventions/*

action is also needed on measures to prevent the introduction of invasive species via ship hulls.[29] Another option is to support regional measures in the Arctic, by means of either the early implementation of the convention in a similar way as for European seas or co-ordinated measures based on port and coastal state jurisdiction.[30]

- The IMO addresses emissions from ships to air as a global issue through MARPOL annex VI, partly motivated by its Arctic impacts. However, the Arctic states and the EU should also consider a regional approach by establishing an IMO Emission Control Area within the Arctic Ocean. Research so far indicates that short-lived climate forcers emitted in the Arctic atmosphere have a stronger impact than elsewhere, which could justify a regional approach.
- Measures pertaining to heavy fuel oil are currently discussed in PAME in the Arctic Council. The EU should follow these discussions and be active in finding solutions that could reduce this risk to the marine environment.

The Polar Code and other IMO instruments will be important for ensuring a level playing field for all operators. The EU should also support recommendations from the Arctic Council with a view to harmonising Arctic coastal state regulations.[31] This will be an emerging issue when the Polar Code is adopted and its standards can be compared to the existing coastal state regulations. The EU could also strengthen joint Arctic regulations, both by IMO and the Arctic coastal states, by supporting their inclusion in the Paris MoU.

The EU and the Arctic Council share the goal of basing their ocean policies on ecosystem-based management. Themes for collaboration could include exchange of experience in this field and marine spatial planning including marine protected areas. Designation of ecologically sensitive sea areas and marine protected areas for the Arctic are also brought up in OSPAR and the Convention on Biological Diversity, where the EU could support relevant developments.

Stakeholders also highlighted the need for fostering effective cross-border co-operation on Arctic maritime transport, particularly stepping up collaboration with Russia and Nordic countries.

StatusOfConventions/Pages/Default.aspx. Accessed March 2014.

29. Ref IMO 2011: 2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of aquatic species. Resolution MEPC.207(62),*http://www.imo.org/blast/blastDataHelper.asp?data_id=30766*. Accessed March 2014

30. See: "Joint Notice to Shipping from the Contracting Parties of the Barcelona Convention, OSPAR and HELCOM on: General Guidance on the Voluntary Interim Application of the D1 Ballast Water Exchange Standard by Vessels Operating between the Mediterranean Sea and the North-East Atlantic and/or the Baltic Sea. (Agreement 2012-04)". Such regional arrangements are encouraged by the Ballast Water Convention. However, these guidelines are voluntary, which seems to have limited their application.

31. Recommendation I C in Arctic Marine Shipping Assessment (ibid).

Picture 4.4: *High class cruise tourism, Magdalenefjord, Spitzbergen, Svalbard.*

Photo: Peter Prokosh, GRID-Arendal, 2012.

4.11.2 Minimising Risks by Developing Improved Maritime Infrastructure

Ship accidents in the Arctic may have severe consequences for humans, ships and the fragile environment. Prevention of accidents and incidents therefore should have the highest priority. At the same time, response capabilities for search and rescue and oil spills must be improved. However, such systems cannot be realistically expected to deliver the same level of protection as in more densely trafficked seas. A ship's readiness in the Arctic will therefore depend largely on its own resources; ship operators must carefully assess the risks of operations and select the equipment and procedures necessary for avoiding problems and handling them on their own if they should occur. Large cruise ships are probably the most prominent example.

Reducing risks will require better maritime infrastructure. The Arctic coastal states are responsible for improvements in their ports and many services in their waters. They have also taken on major responsibilities for search and rescue operations in the whole Arctic marine area, including the high seas.[32] This responsibility entails a high financial burden. The European Commission has signalled its willingness to collaborate with the Arctic countries in this respect.[33] Possible mechanisms include bilateral collaboration, partnership agreements with Greenland and the Northern Dimension. Such EU contributions to improved infrastructure and services gained strong support from stakeholders involved in the SADA dialogue.

There will be a need for international collaboration on much of the maritime infrastructure. It is suggested that the EU and its member states may contribute with:

- The Galileo and Copernicus programmes: The challenge for the EU is to develop better services for

32. The Arctic Search and Rescue Agreement divides the responsibility between six coastal states.

33. EU (2012). Developing a European Union Policy towards the Arctic Region.

Maksim Gorkij Accident in 1989

The cruise ship Maksim Gorkij hit an ice floe SW of Svalbard in perfect weather 19 June 1989 and sprang a leak. A Norwegian coast guard vessel happened to be just 4 hours away. When arriving, almost 400 passengers had been evacuated, some of them waiting for rescue on ice floes. Due to a series of fortunate circumstances, all 954 passengers, the crew and the ship were salvaged.

Picture 4.5: *Sinking Maksim Gorkij, 1989.*
Photo: Scanpix, STT Lehtikuva.

Picture 4.6: *Maskim Gorkij passengers waiting for the rescue on an ice floe.*
Photo: Odd Mydland.

the maritime community based on these satellite platforms and find ways of sharing the information with other systems.

- A common monitoring system for ships in the Arctic providing an overview of ships and cargo transport en route would improve safety. SafeSeaNet could be one model for such collaboration.
- Supporting wider operational networks of meteorological and oceanographic observations and communication of weather, ice and wave forecasts.
- Supporting the coastal states in their hydrographic mapping by using merchant vessels as observational platforms. Ships can also collect and share data on meteorology and ice, for instance.
- Supporting targeted technology innovation to advance ship design and operation to improve efficiency and safety, and to reduce emissions.
- Supporting training on Arctic conditions for seafarers within the EU.
- Working with industry to disseminate best practices in Arctic marine shipping and transport.
- Pooling of resources for search and rescue and oil spill prevention with European states and agreements in areas bordering the Arctic. CleanSeaNet is an example of a European system that could be used as a model.

4.11.3 Better Knowledge Through Research, Monitoring and Assessment

The EU and its member states have long-standing engagement in Arctic research. There is a need for a better understanding of the region's environmental conditions:

- Observational data should be shared in the scientific community and be made easily available for ships. The EU countries have practical solutions that could be useful for Arctic collaboration.[34] Research is needed to advance predictive capabilities and develop forecasting services.
- EU mapping and research could also contribute to identifying valuable and vulnerable areas as a basis for establishing marine protected areas.
- Improve knowledge about the Arctic-specific environ¬mental impacts of shipping and what may be done to address them efficiently. Steps should be taken to determine which species are actually being carried by ships and how they survive en route. This information should then be used in risk assessments, supplemented by targeted baseline inventorying. Better technologies for cleaning hulls and ballast water under low temperatures are also needed. Impacts of ship emissions on the Arctic atmosphere need more attention. There is also a need to improve knowledge of the Arctic-specific impacts of discharges of oil and other harmful substances, and improvements in abatement technologies.

34. One example is the European Environment Information and Observation Network (EIONET) of the European Environment Agency, *https://www.eionet.europa.eu/*

There are also needs for many technological developments. Stakeholders have suggested working with states and the maritime industry towards achieving zero-waste and zero-emissions targets. Shipping technologies could be improved on issues like hull design, energy efficiency, new fuels and winterisation. Ships should be supported with better systems for communication under high Arctic conditions, tracking and assistance in voyage planning.

Stakeholders agreed that there is a need to follow the drivers behind Arctic shipping, such as developments in extractive industries and competition with other sea routes. While this could be a task for strategic collection of information, it also involves research questions of understanding the importance of different drivers and using this information to predict future developments in Arctic marine transport.

Chapter 5

CHANGING NATURE OF ARCTIC FISHERIES

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Key Messages:

- Fisheries continue to be a key industry across the Arctic. They are based on relatively few fish species located in rich marine ecosystems in the low and sub-Arctic and characterised by major fluctuations.
- Aquaculture production is growing fast and becoming a crucial part of the economy in many Northern communities.
- Climate change increases the uncertainties faced by Arctic fisheries. Adjusting to possible changes in the migration patterns of stocks poses a major challenge.
- Arctic countries have well-established resource management regimes, including production of knowledge required for management.
- The Central Arctic Ocean is only partly covered by regional fisheries management organisations (RFMOs). Arctic coastal states are considering the adoption of a binding agreement, even though future fisheries in the area seem unlikely.
- The EU influences Arctic fisheries and aquaculture as a significant consumer and important participant in international and regional regulatory frameworks.

Recommendations to the EU:

- Improve management, co-operation and research.
- Continue to combat illegal, unreported and unregulated (IUU) fisheries.
- Reduce fishing capacity.
- Secure inflow of Arctic seafood into EU markets.

"Important fish stocks currently harvested and regulated might change their distribution to cover areas outside current regulatory areas due to warming and more hospitable conditions further north. This can lead to challenges to continued good fisheries management involving such stocks. Clearly, disagreement on management between parties and the threat of IUU activities are of concern."

Representative of large-scale commercial fisheries, Iceland

"Preventing new or speculative fisheries in the Central Arctic Ocean is in the interest of Arctic and non-Arctic states interested in co-operation. A new international Arctic fisheries agreement would prevent unregulated commercial fisheries, simplify enforcement, and allow time for scientific research to establish what is there and how the ecosystem is changing."

Charitable Trust, US

"A well-managed fishery (fishing in line with scientific advice, no discards and minimum illegal landings) should be able to respond to changing environmental conditions, reducing or increasing catch as the conditions dictate. A poorly managed fishery (fishing above scientific advice through high quotas, unrestricted discarding or black landings) combined with environmental pressures could be disastrous ... support in research and restricting markets for illegal fish would be most helpful ..."

Representative of a state agency, Norway

The quotes come from respondents to the online questionnaire – an element of the consultation process within the 'Strategic Assessment of Development of the Arctic'

Chapter cover image: Fish drying outside of the house in Norway.
Photo: GettyImages

5.1 Introduction

Fisheries and aquaculture make crucial contributions to the world's well-being and prosperity. In addition to serving as an important food source, the fisheries sector provides livelihoods and income, both directly and indirectly. According to the UN Food and Agriculture Organization (FAO), fish and fishery products are among the most traded food commodities worldwide. While the production of capture fisheries remains stable, aquaculture production is expanding.[1] Arctic fisheries represent more than 10% of the global marine fish catch by weight and 5.3% of the crustacean catch.[2] In the North Atlantic, Arctic fisheries represent about 4% of the global catch.[3] The marine Arctic, as defined by the Arctic Human Development Report (AHDR) and the Conservation of Arctic Flora and Fauna (CAFF), extends south of the Faroe Islands, and includes all of Hudson Bay and Alaska.[4]

5.2 Arctic Fisheries Sector

Fisheries have been and still are a key industry and employer across the Arctic. In fact, the economies of some communities and countries are almost wholly reliant on the sector.[5] For instance, fisheries and related activities are the single most important component of the economy in Iceland, accounting for 27% of GDP in 2011.[6] In Norway, fish and fish farming accounted for 0.7% of GDP in 2010 with production of about 3.5 million tonnes of seafood, of which 25% was from aquaculture. The regional impact is significant as the majority of fisheries are located in northern Norway. On a regional basis, the fisheries sector around the Barents Sea is estimated to contribute about 8% of GDP in the Murmansk area and 0.3% in Russia. Fisheries generated more than 90% of export earnings in Greenland and the Faroe Islands, around 40% in Iceland and about 6% in Norway in 2010. In Canada, Russia and the United States, countries with larger and more diversified economies, fish account for less than 1% of export earnings. That said, the sector is an important source of employment and food in many rural communities in northern Canada, Arctic Russia and Alaska.[7]

5.3 Arctic Fisheries Ecosystems

Arctic fisheries are mostly located in the low and sub-Arctic – the marine ecosystems and the shelf areas off the coasts of Labrador, Greenland and Iceland, and the Bering and Barents Seas below the central Arctic Ocean (Figure 5.1).[8] These areas are part of the Arctic region in social, economic and political terms as defined by the AHDR and have also been identified as "Arctic gateways" – the seas that connect the Atlantic and Pacific Oceans with the Arctic Ocean and the continental shelves along Arctic Eurasia, Siberia and North America.[9] The ecosystems, including the Central Arctic Ocean, are characterised by large annual and seasonal fluctuations. The seas above the continental shelves in the sub-Arctic are rich marine ecosystems, whereas the Central Arctic Ocean has low biological production.

The marine species in the Arctic are highly specialised to cope with long- and short-term environmental variations. Annual migration patterns and slight changes in spatial distributions[10] as well as recruitment and growth variations are natural responses enabling these species to adapt to such changes. As an example, Figure 5.3 shows the variability of three-year-old cod recruitment in the Northeast Atlantic (Norwegian and Barents Sea).[11] Distribution areas of benthic (bottom dwelling) species such as cod and pollock are limited to the shelf areas. Pelagic (dwelling above the benthos) species are in principle not limited. Yet the pelagic species are constrained by food availability, which is richer in the shelf areas.[12]

In the Bering Sea fisheries, pollock is the dominant species, while the Barents Sea is dominated by a cod-capelin system occasionally disturbed by inflow of herring from the Norwegian Sea. Groundfish dominate in Icelandic and Faroese fisheries, with the addition of pelagic species such as capelin, herring and mackerel. In the colder Greenlandic waters, crustaceans are of most importance, along with Greenland halibut. Cod is the most highly prized species for human consumption caught in the Arctic.[13] Fisheries' catch abundance and biological productivity are illustrated in Figure 5.2.[14]

1. FAO, The State of World Fisheries and Aquaculture 2012.

2. Christiansen and Reist, "Fishes." in Arctic Biodiversity Assessment. Status and Trends in Arctic Biodiversity, Akureyri, Iceland, Conservation of Arctic Flora and Fauna (CAFF), 2013.

3. Rudloff, The EU as Fishing Actor in the Arctic: Stocktaking of Institutional Involvement and Existing Conflicts.

4. Arctic Human Development Report, 2004, Stefansson Arctic Institute.

5. AMAP, AMAP Assessment 2013: Arctic Ocean Acidification; Duhaime, AHDR.

6. Sigfússon, Þ. and Gestsson, H. (2012). Iceland's Ocean Economy: The Economic Impact and Performance of the Ocean Cluster in Iceland in 2011. Iceland Ocean Cluster. *http://www.sjavarklasinn.is/wp-content/uploads/2012/12/IcelandsOceanEconomy2011.pdf*. Accessed 15 February 2014.

7. FAO, "Fisheries and Aquaculture Topics. Geographic Profiles."

8. Arctic Portal, Interactive Data Map.

9. Sigfússon, Þ. and Gestsson, H. (2012). Iceland's Ocean Economy: The Economic Impact and Performance of the Ocean Cluster in Iceland in 2011. Iceland Ocean Cluster. *http://www.sjavarklasinn.is/wp-content/uploads/2012/12/IcelandsOceanEconomy2011.pdf*. Accessed 5 February 2014.

10. Christiansen and Reist (ABA) (2013).

11. ICES, Report of the Arctic Fisheries Working Group 2012.

12. Large Marine Ecosystems of the World (LME).

13. Christiansen and Reist (2013); Vilhjálmsson, H., Hoel, A., Agnarsson, S., Árnason, R., Carscadden, J., Eide, A. and Fluharthy, D. (2005). "Chapter 13: Fisheries and Aquaculture" in Arctic Climate Impact Assessment: Scientific Report, 691–780. Fairbanks, Alaska: Cambridge University Press.

14. National Oceanic and Atmospheric Administration (NOAA), 2013.

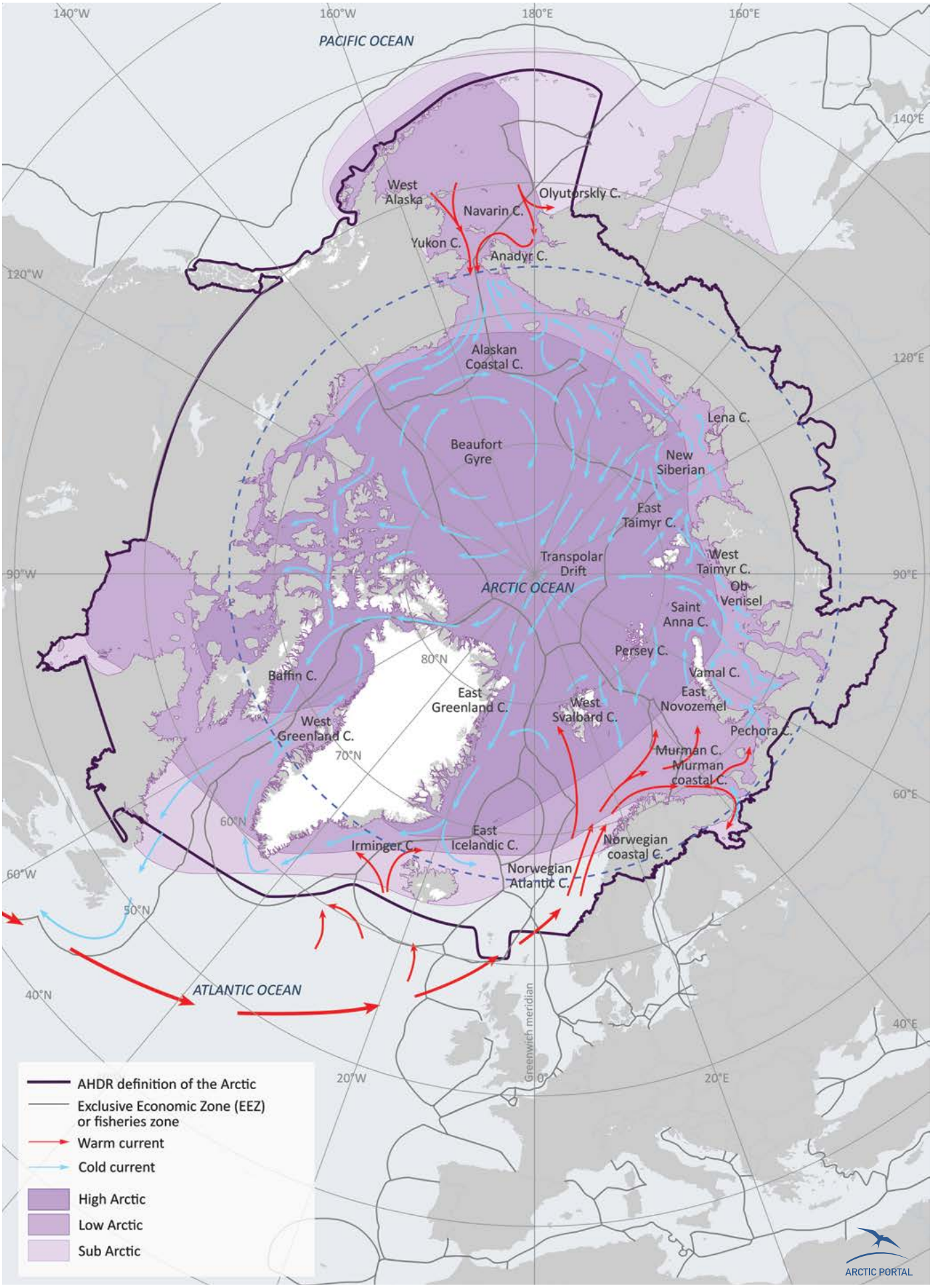

Figure 5.1: *Arctic Characterisation: High, Low and Sub-Arctic and Ocean Currents*

Sources: Arctic Portal: Based on Arctic Human Development Report; AMAP Assessment: Arctic Ocean Acidification, 2013.

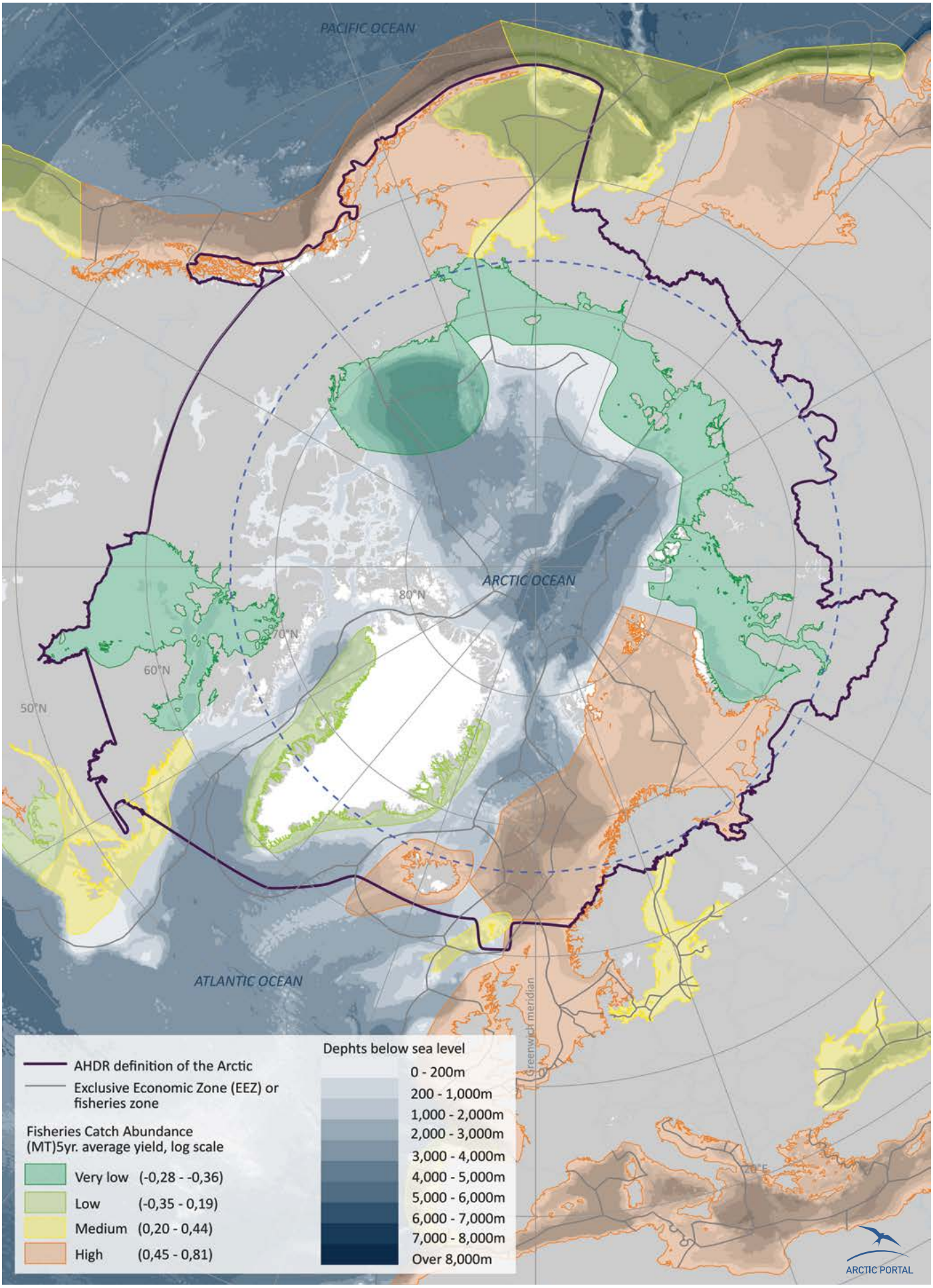

Figure 5.2: *Large Marine Ecosystems – Catch Abundance*

Source: Arctic Portal 2014.

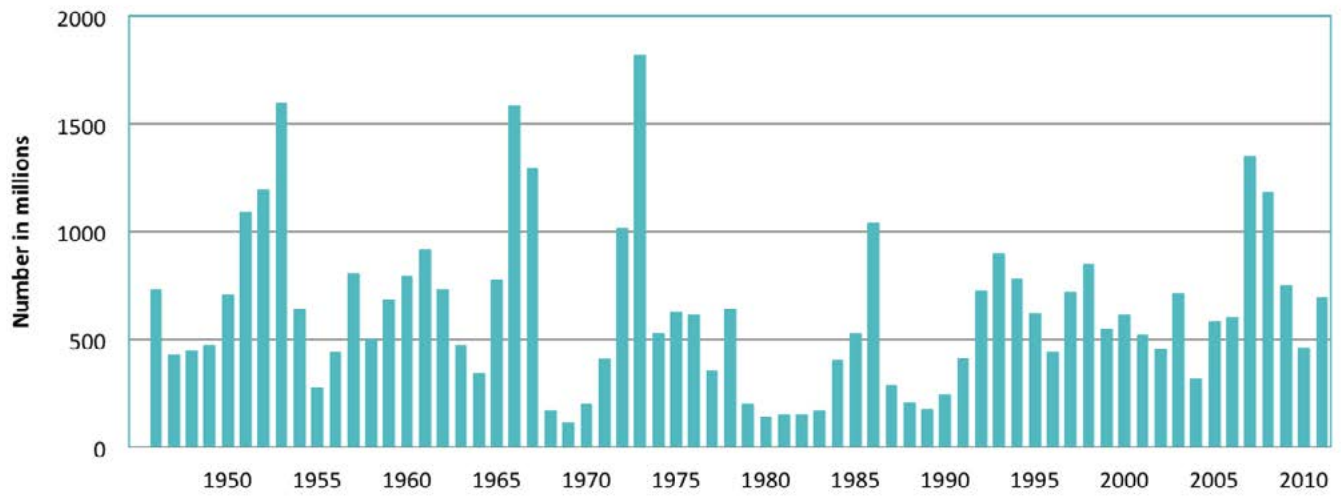

Figure 5.3: *Variability of Northeast Atlantic Cod Recruitment (three-year-old cod), 1946-2010*
Source: ICES, 2012.

5.4 Aquaculture

Aquaculture is a fast-growing food production sector, with an average annual growth rate of almost 9% over the last decade.[15] It is an economic activity that uses and transforms natural aquatic resources into commodities valued by society and in so doing may generate environmental impacts. Aquaculture, along with fisheries, provides important employment opportunities as they are often in remote areas where few other livelihood options are available.

The vast majority of aquaculture in the Arctic region is made up of salmon culture in Norway. This represents 93% of the total value of aquaculture in the Arctic region. Norway is also home to the second- and third-largest species, trout and cod, bringing the Norwegian share of Arctic (in AHDR definition) aquaculture to 98%. Aquaculture in Finland and Sweden produces small volumes of freshwater species. In 2012, the Faroe Islands produced almost 63 000 tonnes, which is significant for a small country. Iceland produces Arctic char, cod and salmon in small volumes, but there is increased interest in expanding production. Aquaculture in the Russian Arctic is also on the upswing with production in the Murmansk and Karelia regions amounting to about 34 000 tonnes and plans are to more than double that by 2020.[16]

Climate change-induced variations in water temperature are a key challenge for aquaculture as they impact on the overall aquatic environment, which is fundamental to the performance of farming operations. Models indicate that aquaculture in the Arctic will be enhanced by warming waters. Other direct effects such as losses due to increases in storm frequency and intensity can be relatively well anticipated, but the uncertainty regarding how these parameters will change is high. The resilience of the aquaculture industry to climate change is higher than that of capture fisheries thanks to the control of production, location, population density and food availability.[17] Impacts will depend on the industry's capacity to adapt to new circumstances, accessibility to new production areas, existing regulations and markets. Significant environmental changes may lead to spatial displacement of aquaculture production, thereby posing other challenges and opening up new opportunities. Increased temperatures could lead to more activity in peripheral areas, such as in Arctic Russia, but could also lead to increased disease risk related to higher temperatures in the southern periphery of aquaculture in the Arctic, along with lower growth rates for cold and temperate water species like salmon.

Picture 5.1: *Aquaculture Site for Salmon in Troms County, Norway*
Photo: Sigmar Arnarsson.

15. FAO, The State of World Fisheries and Aquaculture 2012.

16. Hermansen, Ø. and Troell, M. (2012). Aquaculture in the Arctic; Salmon Faroe Islands, "Salmon Production Hits Record High in 2012"; Staalesen, "Big Bounce for Arctic Aquaculture"; Vigfússon, Gestsson and Sigfússon, Economic activity and performance 2012.

17. This finding is based on recent analysis by the Arctic Climate Change, Economy and Society (ACCESS) project.

	Uniform system	Quota	Restricted # of licences	Transferrable	Community/ Co-operative quotas	Fishing licenses
US	+/-	+/-	+	+/-	+/-	+/-
Faroe Islands	+	+ *(Effort)*	+	+	-	-
Greenland	-	+	+	+/-	-	+/-
Iceland	+	+	-	+	-	+
Canada	-	+/-	+	+/-	+/-	+/-
Norway	-	+	+	+/-	+/-	-
Russia	-	+			+/-	+/-

Table 5.1: *Fisheries Management Systems in the Arctic (+ = yes; - = no)*
Source: Valtýsson, Sævaldsson and Björnsson, 2014.

5.5 Fisheries Resource Management

All Arctic countries with significant fisheries have well-established resource management regimes with comprehensive systems for producing the knowledge base required for fisheries management, promulgation of relevant regulations and compliance measures. They are based on societal goals and objectives – usually sustainable use – through appropriate policies and regulatory instruments. The regimes vary with regard to the design of resource management policies, as harvest control rules differ (Table 5.1).[18] Most regimes have imposed a discard ban or measures to hinder discarding and by-catch.

Most systems provide for a certain degree of flexibility in transferable quotas within the set total allowable catch (TAC). Challenges in fisheries management are to reduce the overcapacity of the fishing fleet, as this hinders the sustainable use of resources, and to establish broad consensus and legitimacy for the regimes in the light of conflicting biological, social, economic and cultural goals inherent in most fisheries.[19]

5.6 Governance

Governance of fisheries has local, national, regional and international dimensions. It is complex, covering long-term strategic planning as well as short-term operational management. Its scope ranges from local fisheries, such as inlets or fjords to whole ecosystems, such as the Barents Sea. Good governance and monitoring is vital for the optimal and sustained use of marine fisheries resources. In the case of aquaculture, effective governance – the sector's use of natural resources to ensure long-term sustainability and employ best husbandry practices – is essential for its continued growth.

Various international frameworks for managing fisheries have been adopted. The most significant are the United Nations Convention on the Law of the Sea (UNCLOS), the Fish Stocks Agreement, the United Nations Food and Agriculture Organization (FAO) Compliance Agreement, the FAO Code of Conduct for Responsible Fisheries and some UN General Assembly resolutions, such as on driftnets and destructive fishing practices.

UNCLOS enshrines the right of coastal nations to extend their exclusive economic zone (EEZ) up to 200 nautical miles and thus decide on how fishing is governed and how TAC is determined. Moreover, UNCLOS made the freedom to fish in high seas conditional on each state's willingness to co-operate with other states to ensure the conservation and good management of the fish stocks concerned.

The United States has enacted proactive regulation regarding Arctic fisheries. The North Pacific Fishery Management Council (NPFMC) plays a crucial role in federal regulation with regard to the maritime zones of the United States in the north Pacific. In 2009, the Council approved a Fishery Management Plan for Fish Resources of the Arctic Management Area (Arctic FMP),

UN Fish Stocks Agreement

The United Nations Fish Stocks Agreement, which came into force in 2001, aims to improve international and domestic management of straddling and highly migratory fish stocks. That is done through regional fisheries management organisations and also includes conservation obligations for the waters within the exclusive economic zones for those stocks. The Arctic states are among the 166 countries that have become parties to this Agreement.

18. Valtýsson, Sævaldsson and Björnsson, (2014), Arctic Fisheries Management Systems.

19. Charles, Sustainable Fishery Systems; Garcia and Rosenberg, "Food Security and Marine Capture Fisheries: Characteristics, Trends, Drivers and Future Perspectives"; Vilhjálmsson et al. (2005).

which closes commercial fishing in US waters off the Arctic coast.[20]

The North East Atlantic Fisheries Commission (NEAFC) is the regional fisheries management organisation for the northeast Atlantic, one of the most abundant fishing areas in the world. The aim is to manage the high seas, and straddling and highly migratory fish stocks. The regulatory area of NEAFC is outside of the 200-mile EEZs (Figure 5.4). It is the only fisheries convention that extends to the North Pole and covers about 8% of the high seas in the central Arctic Ocean. Its aim is to ensure the long-term conservation and optimum use of the regional fishery resources to provide sustainable economic, environmental and social benefits. It adopts management measures for various fish stocks and control measures to ensure that they are properly implemented, along with other measures to protect the marine ecosystems. In addition, NEAFC is a venue for dispute settlement.

The International Council for the Exploration of the Sea (ICES), the world's oldest inter-governmental science organisation, is the leading forum for the exchange of scientific information, stock assessment and management advice for the north Atlantic fisheries. ICES provides member states (as well as NEAFC) with advice based on an ecosystem management approach. This implies a higher focus on uncertainty than in the former single species management scheme. Harvest control rules have been developed for the fish stocks assessed by ICES, which incorporate an ecosystem perspective even though full knowledge of the dynamics of these systems is lacking.[22]

20. Cavalieri et al., (2010). EU Arctic Footprint and Policy Assessment: Molenaar, E. Status and Reform of International Arctic Fisheries Law.

21. Vilhjálmsson et al., ACIA (2005).

22. International Council for the Exploration of the Sea (ICES).

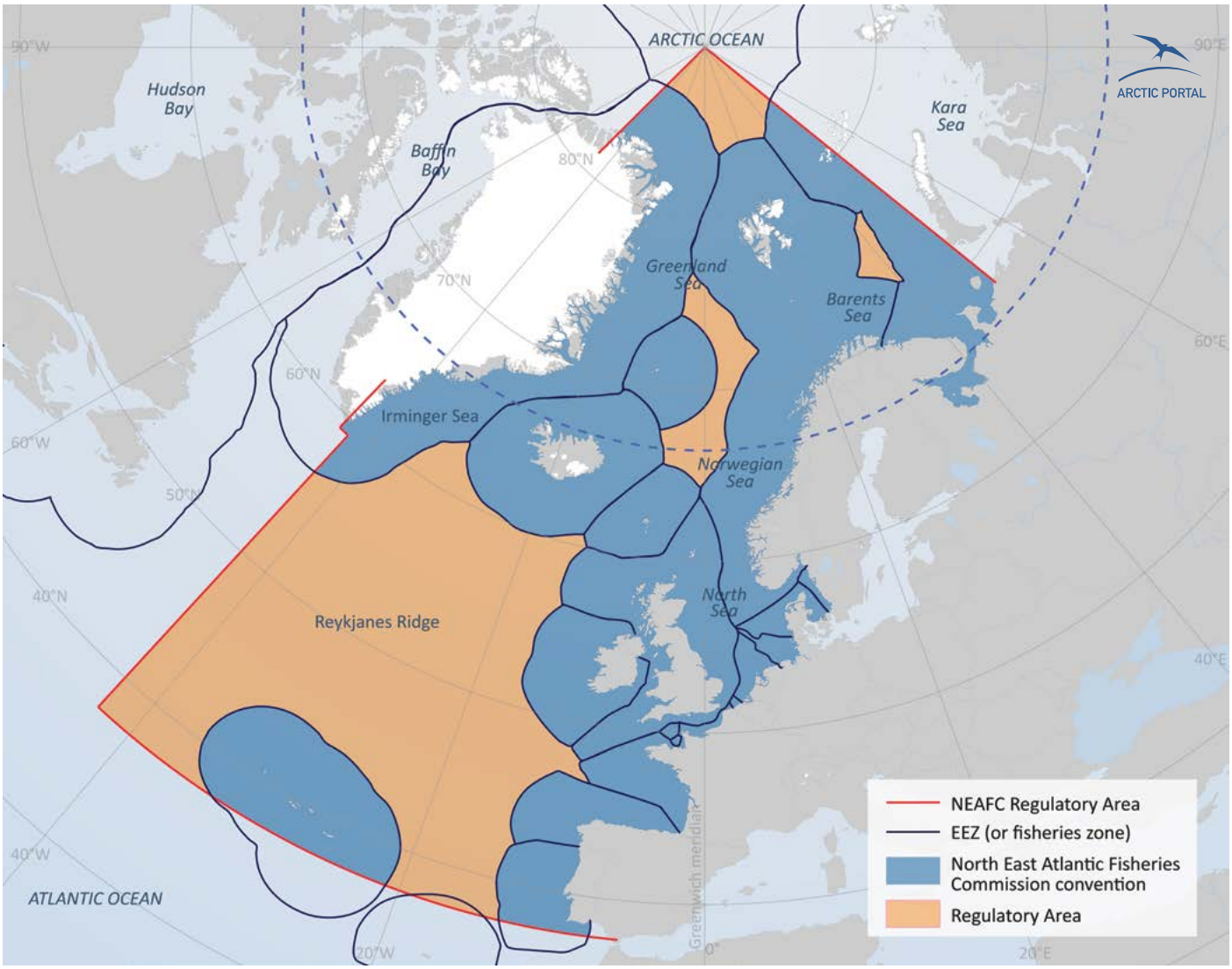

Figure 5.4: *North East Atlantic Fisheries Commission Convention (Convention on Future Multilateral Cooperation in Northeast Atlantic Fisheries) (dark blue) and Regulatory Area (orange, international waters beyond EEZs).*

Source: NEAFC, www.neafc.org and Arctic Portal, www.arcticportal.org.

Gap at the Top

That the centre of the Arctic Ocean was unregulated was hardly a concern when it was an ice-bound backwater. This is changing. In summer 2012, 40% of the central Arctic Ocean ice cover melted. Only 8% of the Central Arctic Ocean is within the area under fisheries regulation overseen by NEAFC.

Five national governments with coastline on the Arctic believe that the future establishment of a regional binding international agreement for the Central Arctic Ocean could be considered because enough of the polar ice cap now melts regularly.

There is consensus among officials from Norway, Denmark, Canada, United States and Russia (who met in February 2014) to acknowledge the desirability to improve scientific understanding of the Arctic marine environment in part to determine whether fish stocks of commercial interest may in the future occur in the Central Arctic Ocean and assess their potential ecosystem impacts. The unique opportunity to protect the Central Arctic Ocean from unregulated fishing was recognised, as there are currently no fisheries management regulations in place in this high seas area outside of national EEZs. It was recognised that there is a need for (and agreement to commence work towards) interim precautionary measures to prevent future commercial fisheries in the absence of appropriate regulatory mechanisms.

Based on available scientific information, it is generally understood that commercial fishing in the high seas area of the Central Arctic Ocean is unlikely to occur in the near future, due to physical constraints such as depth, cold water and habitat loss for species currently present in the area. Nevertheless, even the possibility of future commercial fishing in the Central Arctic Ocean triggers the need for more research and better understanding.

5.7 Drivers

Commercial fisheries in Arctic regions are based on the use of relatively few fish species. The dynamics of many of the ecosystems are not well understood. The impacts of climate change on these ecosystems add to the already significant uncertainty.

Physical changes are perhaps easier to predict, but significant uncertainties remain. Climate change shifts warmer Atlantic water into the Arctic region. But at the same time, the influx of Atlantic water may be reduced, moderating an overall warming effect. The picture is different in the Bering Sea, which may experience slightly more warming than the Barents Sea. With sea-ice cover also expected to decline, marginal fishing grounds will become more accessible. Invasive species may increase and compete for habitat with resident species.[23]

There is increasing worldwide demand for fish and fish products that provide important food supply. Over the last fifty years, the world fish food supply has outpaced global population growth. The sector also provides livelihoods and income. Fish and fishery products are among the most traded food commodities worldwide, with trade volumes and values reaching new highs in recent years. This trend is expected to continue. While capture fisheries production has remained stable over the last decades, aquaculture production has expanded to meet growing demand. It is not possible to accurately predict how climate change may affect supply and demand of fish products globally, given all the dynamic factors at play.[24]

Aquaculture production in the Arctic is different than that of capture fisheries because its location, population density and food availability are controlled. Variations in the physical environment, however, are essentially not controlled, although aquaculture production may be moved to alternative sites. Significant long-lasting shifts in environmental conditions may therefore lead to changes in the spatial distribution of aquaculture activities.[25]

Effects of climate change are evident in Arctic regions. However, it is not easy to predict how ongoing climate change will affect marine ecosystems and hence the fisheries. Some outlooks foresee greater abundance and limited northward shift of commercial Arctic fish stocks (e.g. Arctic Climate Impact Assessment).[26] Or it could be that climate-driven changes in other parts of the world will result in a shift in global fish supply markets with consequent implications for Arctic fisheries. The challenge for fisheries management remains the same: to use the natural resources in a sustainable manner according to the expressed objectives and due consideration of the inherent uncertainty. There is an indication that the choice of management regimes may have a greater impact on Arctic fisheries than the potential environmental changes caused by climate change.[27] A crucial factor for resource management under conditions of climate change is therefore the development of robust and precautionary approaches and institutions.[28]

23. Christiansen and Reist (ABA) (2013); Vilhjálmsson et al., ACIA (2005).

24. FAO, The State of World Fisheries and Aquaculture 2012.

25. Hermansen and Troell (2012).

26. Vilhjálmsson et al., ACIA (2005).

27. Eide, A. (2007), Economic Impacts of Global Warming.: The case of the Barents Sea Fisheries. Natural Resource Modelling 20(2), 199-221.

28. Vilhjálmsson et al., ACIA (2005)

Conflicts

A major challenge for a fisheries management regime is to adjust to possible changes in migration patterns of stocks. Changes in fish stock migration patterns in the past have disrupted established resource management arrangements and triggered conflicts between countries.[21] A recent example is the northwest expansion of mackerel, which has led to conflict between the EU, Faroe Islands, Iceland, Norway and most recently Greenland. The migration and feeding patterns of mackerel changed in recent years, shifting further northwest into Faroese, Greenlandic and Icelandic waters. Iceland started fishing mackerel and the Faroese increased their catch, which was objected to by the EU and Norway. Some mackerel fishing has been carried out in the Greenlandic EEZ and its volume is expected to increase. Negotiations have been ongoing and the Faroe Islands, EU and Norway have reached an agreement on the quota shares. Greenland and Iceland have not agreed on shares, leaving the total distribution of the quota share unresolved. These coastal states are members of the North East Atlantic Fisheries Commission and have the obligation to co-operate on fisheries conservation and management, and to find solutions to conflicts.

5.8 Impacts of Fisheries

Fisheries impact ecosystems as they can alter species composition and abundance. Sudden stock changes can be related to fish harvesting. Unfavourable natural conditions can multiply the impact of such changes and result in a stock collapse. Fishing has cumulative effects on whole ecosystems and economic systems, as it provides income, food security and livelihood for people and communities. Climate change and resource management will have unknown impacts on both. In the Arctic, communities are highly specialised in dealing with environmental changes due to the interdependence of their socio-economic systems and the biophysical environment. Changes in the marine environment affect the socio-economic systems and in some cases also vice versa.[29] In addition to reliance on unpredictable natural systems, the fishing communities also depend on unpredictable global markets, which can again affect the natural system.[30]

5.9 Outlook to 2030

The Arctic is vibrant and constantly changing. However, it does not appear likely that the changes in Arctic fisheries will be significant in the period to 2030 if the current management schemes are maintained with a precautionary approach as a guiding principle and consensus in distribution of catch quotas of highly migratory species. Minor temperature increases in sub-Arctic areas could lead to increased productivity and access to peripheral fishing grounds, while any major climatic change could have negative impacts.

With growing markets for fish, aquaculture production could expand further into peripheral areas. That may underpin high prices of fishmeal products and provide incentives to exploit fish that are lower in the food chain.

It is not evident that fisheries in the Arctic Ocean, beyond national exclusive economic zones, will be significant in the coming years, due to physical, biological and economic constraints. Deep and cold water conditions in the Central Arctic Ocean pose a barrier to sub-Arctic species northern migration.

Increased utilisation of high Arctic species in the Arctic Ocean and surrounding waters, such as polar cod, is also unlikely since sea-ice reduction and warming will bring habitat loss. In addition, the capital-intensive nature of such fisheries and the fact that the majority of the catch would go into reduction, e.g. fishmeal, would probably render it economically unattractive. Aquaculture could create increased incentives in the long term.

5.10 Implications of Arctic Fisheries Developments for the European Union

Both fish consumption and dependence on imports are growing in the European Union, which is one of the world's top three importers of fish and aquaculture products. Two of its three biggest suppliers (exporters into the EU) are in the Arctic: Norway with 22% of the share and Iceland with 6%. It is further estimated that more than one-third of fish caught in the Arctic are sold on the European market. Across the EU, average annual fish consumption is more than 23 kg per person compared with a global average of about 17 kg per person.[31]

29. Perry and Ommer (2010), "Introduction: Coping with Global Change in Marine Social-Ecological Systems."

30. Daw et al., (2009). "Climate Change and Capture Fisheries: Potential Impacts, Adaptation and Mitigation"; Hovelsrud et al., "Adaptation in Fisheries and Municipalities: Three Communities in Northern Norway."

31. Cavalieri et al., (2010). EU Arctic Footprint and Policy Assessment; FAO, The State of World Fisheries and Aquaculture 2012; Rudloff, B. (2010). The

Picture 5.2: *Pelagic Trawlers in Iceland*
Photo: Sigmar Arnarsson.

The EU is keen to ensure good co-operation with Arctic states in the sustainable management of marine biological resources. Fisheries conservation is a priority, in addition to access and supply. Agreements based on the exchange of fishing opportunities dominate the EU's relations with its neighbours to the north, particularly Norway, Iceland and Greenland. The EU has a long history of mutually overlapping fisheries with these nations. Since the creation of the Common Fisheries Policy, the EU has negotiated the annual exchange of quotas on behalf of its member states, wherein the quotas are shared on the basis of relative stability. These agreements play a vital role in preserving the continuity of traditional fisheries following the establishment of 200-mile EEZs. They enable each fleet to continue to fish in other parties' waters. Indeed, one of the main purposes of these annual negotiations is to enable mutual access to stocks that straddle territorial boundaries, and which shift back and forth between EU waters and those of northern partners according to the time of the year. These agreements are extremely important to a large section of the EU fleet, especially the agreement with Norway, which covers quotas worth more than EUR 2 billion.[32] Good co-operation in international fisheries resource management is therefore important for the EU.

5.11 How Does the European Union Influence Arctic Fisheries?

The European Union influences the development of Arctic fisheries directly and indirectly through a wide variety of policies, practices, market mechanisms, collaborative engagements and research. For example, marine pollution originating in the EU and EU-flagged vessels fishing in Arctic waters can affect fish stocks. The EU may influence Arctic fisheries by way of its participation in regional fisheries management organisations and international developments such as the FAO and NEAFC. Its support for scientific research in the Arctic to underpin improved fisheries management may have implications for Arctic fisheries.[33] The EU has significant influence through its role in resource management, the size of its market, and its trade and regulatory elements – which are highlighted briefly here.

5.11.1 Regulatory Framework

The European Union has extensive experience in setting regulatory standards for fishing with both environmental and socio-economic criteria at a supra-national level through its Common Fisheries Policy (CFP), launched in 1970. Notably, however, no current EU members are coastal states to oceans in the Arctic, which constrains EU policy. The European Economic Area Agreement (EEA, which includes Iceland and Norway) does not cover CFP, although it includes trade in fisheries products and regulates state aid and competition in the sector. EU member states can still act in a wide range of other capacities, e.g. as flag states, port states, market states, or with respect to their natural and legal persons. In a flag state capacity, the EU and its members are able to exercise their rights and discharge their obligations with respect to the Arctic Ocean and adjacent areas, most notably freedom of the high seas, such as marine scientific research, freedoms in the maritime zones of Arctic Ocean coastal states; and obligations relating to the marine environment and living resources connected to these rights and freedoms.[34]

EU as Fishing Actor in the Arctic: Stocktaking of Institutional Involvement and Existing Conflicts.

32. EU, "Northern Agreements"; Rudloff (2010).

33. Cavalieri et al., (2010).

34. Ibid.; European Commission, "Fisheries."

5.11.2 Resource Management

Fish move across borders and seas, and fishing fleets have done the same for centuries. Since the activities of each fishing fleet affect the opportunities of other fleets, the EU countries chose to manage their fisheries collaboratively through the CFP. The CFP may impact on the health of some of the fish stocks that extend into the Arctic, such as Atlantic mackerel and herring.

The EU is revamping the CFP to make it more efficient in ensuring the economic viability of European fleets, conserving fish stocks and providing good quality food to consumers.v[35] Substantial efforts are being made to integrate the objectives of its Marine Strategy Framework Directive within the new CFP as part of an ecosystem-based management approach.[36] Fisheries ecosystem plans have been developed for three major European marine regions (North Sea, north-western waters and south-western waters).[37]

The EU supports the exploitation of Arctic fisheries resources at sustainable levels based on sound scientific advice, while respecting the rights of local coastal communities, as stated in its Arctic communication in 2008. The EU continues to advocate a precautionary approach whereby, prior to the exploitation of any new fishing opportunities, a regulatory framework for the conservation and management of fish stocks should be established for those parts of the Arctic high seas not yet covered by an international conservation and management system.[38] This is in line with the conclusions of officials from the coastal states surrounding the Central Arctic Ocean that it should be protected from unregulated fishing since there are no management regulations in place for high seas outside of national EEZs, except for the regulatory area of NEAFC (see Box: Gap at the Top). The need for joint management of high seas fish stocks has been raised by the European Commission at meetings of the North Atlantic Fisheries Ministers Conference. Regional fisheries management organisations (RFMOs) could in principle extend their geographical scope for this purpose.

5.11.3 Market Size and Proximity

The European Union accounts for about 26% of global fish imports, making it the largest market in the world, with a value of about EUR 36 billion in 2011. The EU's dependence on imports for fish consumption is growing. This is a result of the rising trend in consumption, but also illustrates the constraints within the EU on further expansion of supply. In this respect, the current reform of its CFP aims to rebuild its fish stocks, as well as boost aquaculture production. The results of the reform and the effects on supply and trade will only be felt in the medium-to-long term. Today the EU is an important market for Arctic fisheries, especially those in the North Atlantic. Faroese, Greenlandic, Icelandic and Norwegian fisheries in particular are highly dependent on exports to the EU.[39]

5.11.4 Trading Fish in a Globalised World

In the early days of the CFP, the EU decided on its own trade policy on fish. Since the launch of the GATT/WTO process, trade policy and tariffs are strongly influenced by international developments. The common organisation of the EU market includes measures to ensure a stable and predictable supply of fish as a vital raw material. A relevant tool is the autonomous tariff quotas (ATQs). The aim of ATQs is to enhance access for EU processors to fish from third countries by granting reduced tariff rates on the import of specific products for which domestic production is in deficit. These preferential tariffs are intended to provide balanced incentives, which give priority to EU production where it exists, while ensuring that the European processing industry is not unfairly penalised when it has to compete in the world market.[40]

5.11.5 Combating Illegal Fishing

EU rules to deter illegal, unreported and unregulated (IUU) fishing came into force in 2010 and include:

- Only marine products validated as legal by the relevant flag state or exporting state can be imported to or exported from the EU.
- A black list has been established covering both IUU vessels and states that turn a blind eye to illegal fishing activities.
- EU operators who fish illegally anywhere in the world, under any flag, face substantial penalties proportionate to the economic value of their catch.[41]

There is an increasing need for international co-operation among fishing and seafood-importing countries to improve fisheries management of shared marine resources and to preserve the associated employment and other economic benefits of sustainable fisheries. In line with a commitment to prevent IUU fishing, the EU issued a catch certification scheme to ensure full traceability of all marine fishery products traded from and into the EU. The regulation also seeks to ensure that no European Union citizens engage in IUU activities, no matter where they take place. In addition to the

35. Proposal for a Regulation of the European Parliament and of the Council on the Common Fisheries Policy (2011).

36. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy.

37. European Commission, "Fisheries."

38. European Commission, "JOIN (2012) 19 Final."

39. Hagstova Føroya, Faroe Islands in Figures 2013; Rudloff (2010); Statistics Greenland, Greenland in Figures 2013.

40. European Commission, "Fisheries."

41. "Illegal Fishing (IUU)."

certification scheme, the regulation also addresses issues of port state control and mutual assistance. Moreover, it introduces an EU alert system to detect the most suspect cases of illegal practices, the vessels involved and any non-co-operating third countries. Proper enforcement is supported by a harmonised system of proportionate and deterrent sanctions for serious infringements. An agreement between Norway and the EU is an example wherein Norway will issue a catch certificate for all Norwegian landings and exports to the EU.[42]

5.11.6 Food Safety Standards

EU legislation harmonises food safety control across the member countries. A key aspect is that all food and feed business operators, from farmers and processors to retailers and caterers, have principal responsibility for ensuring that food placed on the EU market meets the required food safety standards. The regulations apply at every stage in the food chain, including primary production, i.e. fishing, aquaculture and farming, in line with a "farm to fork" approach to food safety.[43] Traceability is an important factor in implementing such standards.

5.12 Critical Factors for EU Decision-making

Three critical factors for EU decision-making were identified in stakeholder consultations.[44] The inter-linkages of the socio-economic system in relation to the biophysical marine environment are at the forefront of where human decisions and actions face the natural system and vice versa. Sustainable use of renewable resources such as fish is highly dependent on the drivers for their use and management.

5.12.1 Governance and Management

More research is needed to address the uncertainties faced in fisheries management, along with increased co-operation, especially regarding quota setting and distribution. Increased co-operation would also help to control overfishing and fight IUU fisheries. In addition it can help mitigate conflicts with other economic activities, such as aquaculture, oil and gas extraction, shipping and tourism. Creating a more stable system through active co-operation could help establish better inflow of safe and sustainably caught seafood into the EU market.

5.12.2 Climate Change and Species Distribution and Composition

Another issue is species distribution due to natural changes, whether climate-induced or not. Distribution change challenges current management agreements, rules and regulations, both now and in the future, and that could lead to the possibility of overfishing since there is no control over the fisheries. Distribution change could also lead to conflict with other economic sectors, such as oil and gas extraction and aquaculture, as fisheries and other sectors might become more spatially integrated.

5.12.3 Global Demand for Fish

Fisheries in the Arctic are facing changes and uncertainties that might affect the sector in both the short and long term. Global demand for fish products is one of the main drivers of Arctic fisheries, as increasing demand provides a greater incentive for fishing. This affects the EU market as global demand influences market value.

5.13 Recommendations

Recommended steps for the EU in facing challenges and issues in Arctic fisheries include improved management and quota setting, decrease capacity, ensure that IUU measures are effective and secure inflow of Arctic seafood into EU markets. These recommendations are formulated in association with stakeholder input and rankings. They refer the period to 2030.

5.13.1 Improve Management, Co-operation and Research

Improved management and quota setting is an important issue as it helps to create a sustainable system for Arctic fisheries and ensures equitable sharing and avoids over fishing. A well-managed system can help to mitigate climatic impacts. This includes participation in international agreements on quota setting and the development of a mechanism for setting fishing targets in a sustainable manner. The EU could help ensure that Arctic fisheries resources are sustainably managed through a common Arctic regional fisheries agreement in close co-operation with Arctic nations, especially in the north Atlantic. Effective co-operation, discussions and a formal venue could help to mitigate potential conflicts. Wide co-operation and information sharing in applicable areas could benefit Arctic fisheries research to underpin improved management approaches and practices. There is a need for more scientific research, including local and traditional knowledge, of issues relevant to future fisheries in the Arctic, especially the Central Arctic Ocean.

42. Cavalieri et al., (2010); European Commission, "Fisheries."

43. European Commission, EUROPA - Food Safety: From the Farm to the Fork.

44. See Annex 1.1. and 1.2.

5.13.2 Continue to Combat IUU Fisheries

Improved management could also ensure the effectiveness of measures to combat illegal, unreported and unregulated fishing. The EU holds sway as a large market force to continue to combat IUU through best practice measures, such as port state control, document catches, catch certificates, traceability and promotion of sustainable use of fisheries resources. The EU could establish better port monitoring in co-operation with Arctic states and continue efforts to register fish catches. Combating IUU fisheries benefits all Arctic states and the EU by enhancing sustainability and stable markets. In principle, there should be no economic incentives to partake in IUU fisheries. Strengthened IUU measures would boost consumer confidence and give a more positive image to fisheries.

5.13.3 Reduce Fishing Capacity

Measures should be taken to reduce fishing capacity. Abolishing distortionary subsidies, such as those that mask the true costs of operation, could be key as they cloud market signals and can lead to overcapacity. Capacity is already at a high level: more capacity could lead to unsustainable fisheries and spur IUU fishing. A profit-driven market should create ample incentives. This could be encouraged through an improved market-driven and co-operative management system. Distortionary subsidies should be eliminated in order to provide economic and social incentives in fisheries and management.[45] As the EU CFP is being reformed, the phasing out or elimination of subsidies could be implemented in the short term.

5.13.4 Securing Inflow of Arctic Seafood into EU Markets

The EU's enormous seafood market is dependent on imports to meet demand and Arctic fisheries are dependent on this market. Conflicting issues can have negative consequences for both. Trade sanctions have already had drastic effects on the livelihoods of Arctic nations along with limiting the inflow of goods to the EU. Co-operation and open dialogue need to be effective to avoid such developments. Open communication and co-operation in trade could be implemented in the short term for long-term benefits. While EU members are not Arctic coastal states, the scale of its market, where the EU has numerous policy and regulatory influence, provides it with significant opportunity to exercise an influence.

45. Garcia, S. and Rosenberg, A. (2010), "Food Security and Marine Capture Fisheries: Characteristics, Trends, Drivers and Future Perspectives."



Chapter 6

DEVELOPING OIL AND GAS RESOURCES IN ARCTIC WATERS

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Key Messages:

- Advances in offshore technology and maritime transport as well as global markets are major drivers of Arctic oil and gas developments, while climate change plays a secondary role.
- On-the-ground developments in exploitation have been so far limited throughout the Arctic, though there is diversity in this respect between different Arctic regions, with greater intensity of activities in the Barents Region.
- Risk of long-lasting negative impacts from catastrophic events, huge distances and gaps in existing capabilities and infrastructure are among the key concerns.
- The EU has limited but multifaceted competencies regarding Arctic offshore hydrocarbon developments, such as through contacts with energy partners, climate and energy policies and research programmes.

Recommendations to the EU:

- Support innovative research and education in the areas of Arctic technology and the Arctic environment.
- Continue and strengthen energy dialogue with non-EU Arctic partners.
- Enhance funding and investment frameworks for environmentally and socially responsible Arctic hydrocarbon projects.

"The continued growth in Arctic offshore oil and gas exploration, coupled with the lack of consideration of environmental impacts (both local and global) defies rational explanation other than simple but blind human greed. (...) What rights do the Arctic coastal states and the oil companies have to destroy the future of millions of people, species and ecosystems, for short-term profit? This region has long been identified as highly vulnerable to damage by the hydrocarbon industry, is victim also to the dramatic impacts of climate change. (...) To allow even more extraction of oil and gas from the Arctic is little more than stupidity, rather than ignorance."

Respondent from an international environmental NGO

"We recognise the environmental challenges of working in the Arctic, as we recognise the challenges of hydrocarbon development in other parts of the world. Our approach to Arctic exploitation is a step-wise one; we will not enter an area before the necessary technology has been developed and tested, and the necessary organisational capabilities are in place. (...). In all global hydrocarbon operations there is an element of risk. However such risks, which are carefully weighed and planned for, should not overshadow the potential economic and social benefits to the local communities, particularly in a region with few opportunities for economic advancement."

Representative of the hydrocarbon industry, Norway

"I don't think anyone or any institution should be excluded from the debates about the developments of energy resources in the Arctic, or across the globe. The responsibilities here lie with everyone – not just the eight Arctic states. Of course, this does not mean breaching sovereignty, but that the discussions are open and accessible. I think the main institution to play a role is the Arctic Council with which the EU needs to find a working relationship as a non-primary player (which is still an important role)."

Researcher, Norway

The quotes come from respondents to the online questionnaire – an element of the consultation process within the 'Strategic Assessment of Development of the Arctic'

Chapter cover image: LNG plant in Norway.

Photo: GettyImages

6.1 Introduction

Production of hydrocarbons in the Arctic region has many faces. Most of the region's oil reserves are in Alaska while reserves in Russia are dominated by natural gas. Onshore resources have been produced for decades, while in terms of offshore extraction the Arctic is largely a frontier region (Figure 6.1).[1] The common thread is that prospects for hydrocarbon exploitation in the Arctic are uncertain, particularly offshore.[2]

Some parts of the Arctic waters are becoming more accessible due to improved technologies and changes in sea ice related to climate change.[3] Concurrently, interest in offshore hydrocarbons in the Arctic has increased in recent years. Largely untapped to date, the estimated offshore resource base is significant. Yet the technical and environmental aspects and high costs of operating in severe conditions present many challenges.[4] Investments in exploration and production are influenced by dynamic variables including global markets and prices, energy demand and policies concerned with economic development, energy security and environmental protection.[5] The timing and extent of Arctic hydrocarbon developments is not easy to predict.[6] Extraction may influence the Arctic environment, economies, geopolitics and societies. Arctic oil and gas exploitation also has implications for the economic, political and environmental landscape of the European Union (EU).

The main focus in this chapter is offshore oil and gas hydrocarbon exploitation in a broadly defined European part of the Arctic region. It looks at recent trends, their drivers and possible economic, environmental and social impacts with relevance to the EU. Further, it highlights EU policies and actions relevant for oil and gas developments in the Arctic. Drawing on previous research and input from stakeholders, the chapter discusses critical issues for EU decision-making and proposes recommendations for EU action.

1. Crandall, R. & Thurston, D. et al. (2010). Oil and Gas Activities in the Arctic. In Arctic Council: Arctic Monitoring and Assessment Programme (AMAP), Assessment 2007: Oil and Gas Activities in the Arctic – Effects and Potential Effects, vol. I; International Association of Oil & Gas Producers (2013). Environmental management in Arctic oil and gas operations: Good practice guide. International Association of Oil & Gas Producers. *www.ogp.org.uk/pubs/449.pdf*. Accessed 15 February 2014.

2. Koivurova, T. & Hossain, K. (2008). Offshore Hydrocarbon: Current Policy Context in the Marine Arctic. Arctic TRANSFORM. www.arctic-transform.org/download/OffHydBP.pdf. Accessed 10 March 2013.

3. Harsem, Ø. et al. (2013). Oil exploration and sea-ice projections in the Arctic. Polar Record, DOI: 10.1017/S0032247413000624

4. Arctic Council, (2009). Sustainable Development Working Group Report on Arctic Energy. Arctic Portal. *www.library.arcticportal.org/1531/1/SDWG_ArcticEnergyReport_2009.pdf*. Accessed 21 April 2013.

5. Harsem, Ø., Eide, A. & Heen, K. (2011). Factors influencing future oil and gas prospects in the Arctic. Energy Policy. DOI: 10.1016/j.enpol.2011.09.058

6. Hong, N. (2012). The energy factor in the Arctic dispute: a pathway to conflict or cooperation? Journal of World Energy Law and Business, 5 (1), 13-26.

Picture 6.1: *Exploration Platform 'Polar Pioneer' in Tromsø, Norway.*
Credit: ©Robert Greiner.

6.2 Overview of Offshore Oil and Gas Trends – Hopes and Doubts

While there has been a surge in interest in exploiting Arctic hydrocarbon resources in recent years, actual developments have been slow to follow. Arctic oil and natural gas have been explored and developed for decades – with onshore production dating back to the 1920s and offshore starting in the 1970s.[7] A decade ago, the Arctic accounted for about 25% of the world's natural gas and 10% of oil production.[8] Yet most parts of the Arctic remain largely untapped. These undiscovered resources could amount to 90 billion barrels of oil, up to 50 trillion cubic metres of natural gas and 44 billion barrels of natural gas liquids (NGLs), according to the U.S. Geological Survey (USGS).[9] That is about 13% of the world's undiscovered, technically recoverable oil and up to 30% of global gas reserves, and some 84% of it is offshore. Undiscovered natural gas is likely to be three times more abundant than oil in the Arctic and is largely concentrated in Russia (Figure 6.2).[10]

In recent years there has been increased business interest in the hydrocarbon potential of the Arctic even in the face of a complex mosaic of challenges and constraints.[11] According to some estimates, investments in the circumpolar north will amount to EUR 75 billion over the next decade.[12] Yet, so far, the intensity of recent discussions concerning hydrocarbon development in Arctic regions has not been matched by a commensurate

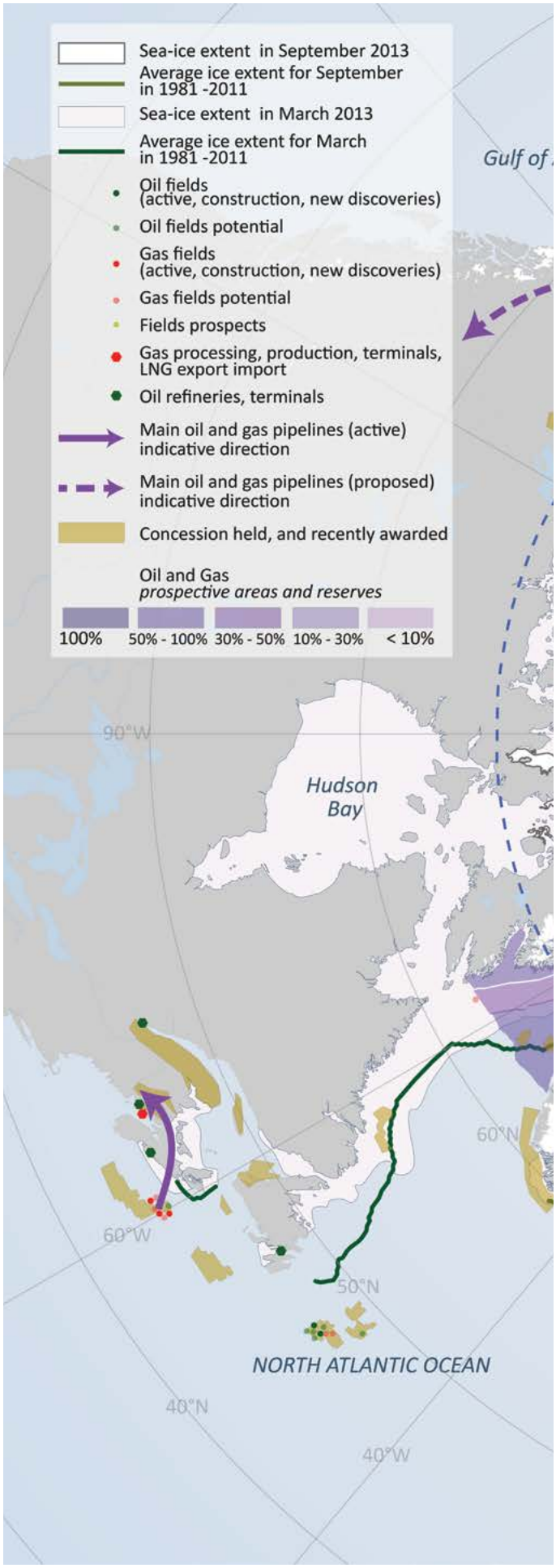

Figure 6.1: *Main Oil and Gas Areas, Mining Sites and Sea-Ice Extent in the Arctic*

7. Ernst and Young, 2013, Arctic Oil and Gas, *www.ey.com/Publication/vwLUAssets/Arctic_oil_and_gas/$FILE/Arctic_oil_and_gas.pdf* More details at: Bishop, A. et al. (2010). Petroleum Potential of the Arctic: Challenges and Solutions. Oilfield Review, 22(4), 36-49; Arctic Council, (2009).

8. Lindholt, L. (2006). Arctic natural resources in a global perspective, in S. Glomsrød and I. Aslaksen (eds.), The Economy of the North. Oslo, Statistics Norway, p. 27. "From 1990–2004, Arctic oil production was dominated by west Russia (79%) followed by Alaska (18%), Norway (3%), and small amounts in the other regions. Gas production was also dominated by west Russia (96%) followed by Alaska (3%) and small amounts from the other regions. (…) Around one-half of cumulative Arctic production is oil (51%), with large regional differences: Canada (59% oil), Alaska (87%), east Russia (9%), west Russia (46%), and Norway (84%)". See: Peters, G. P. et.al. (2011). Future emissions from oil, gas, and shipping activities in the Arctic, Atmos. Chem. Phys. Discuss., DOI: 10.5194/acpd-11-4913-2011, p. 4917.

9. USGS (United States Geological Survey), (2008). Circum-Arctic Resources Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle, Fact Sheet 2008-3049, USGS, Boulder, United States.

10. Another appraisal focused only on the Russian Arctic oil and gas potential suggests that collectively the Arctic regions constitute one of the world's largest petroleum superbasins that could provide markets with energy resources corresponding to those of the Persian Gulf or West Siberian petroleum basins. Bishop, A. et al. (2010), p. 41.

11. Arctic Council (2009).

12. Emersson, C. & Lahn, G. (2013). Arctic opening: Opportunity and Risk in the High North. Chatham House-Lloyd's Risk Insight Report. Potential Arctic hydrocarbon production is ultimately determined by a cumulative factor—profitability. Bishop, A. et al. (2010), p. 41; Nakhle, C. & Shamsutdinova, I. (2012). Arctic Oil and Gas Resources: Evaluating Investment Opportunities. Oil, Gas and Energy Law Intelligence.

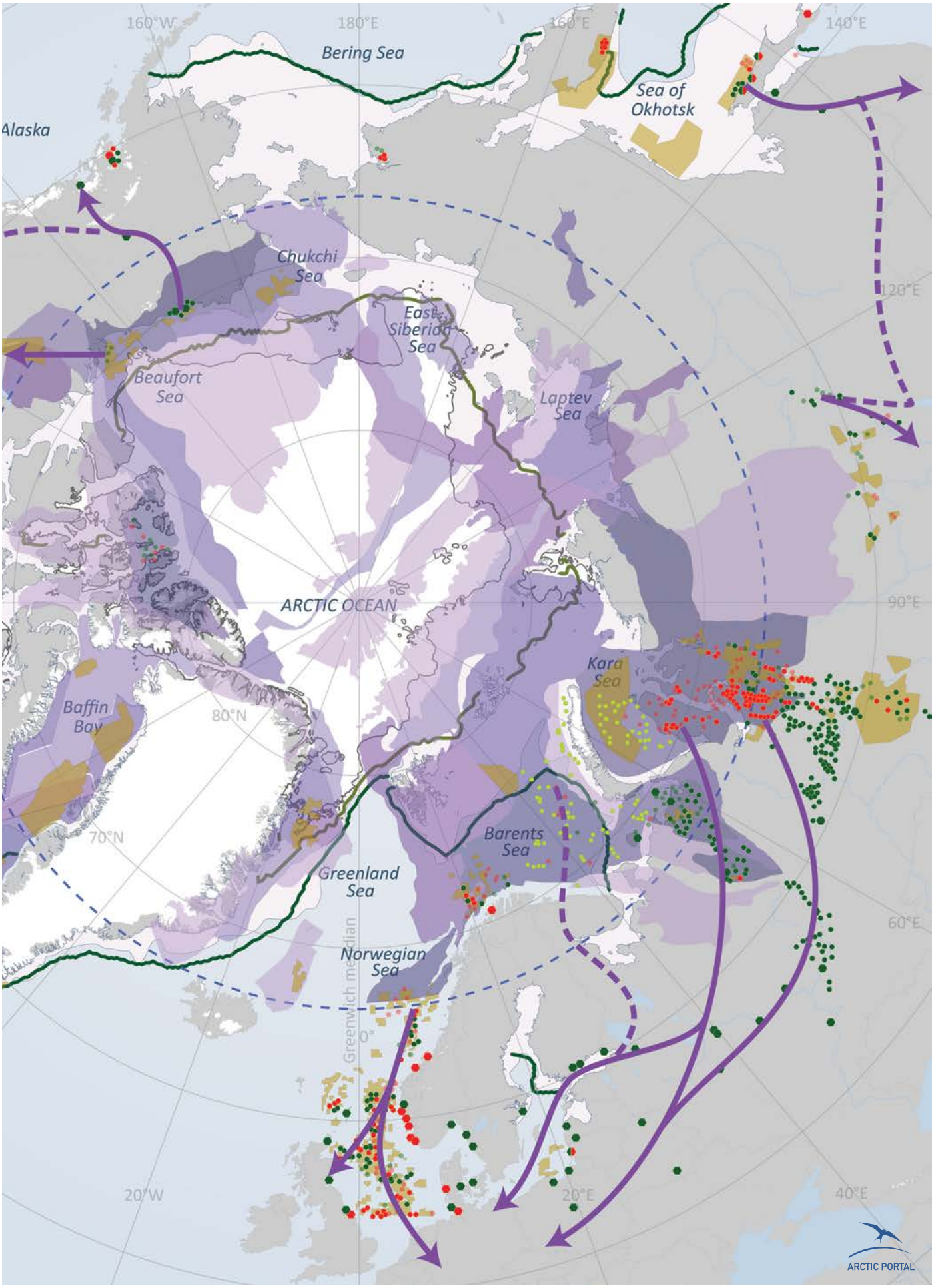

Figure 6.1: *Main Oil and Gas Areas, Mining Sites and Sea-Ice Extent in the Arctic*

Source: Arctic Portal, based on Nordregio; Johanna Roto and José Sterling, 2011, www.nordregio.se/Maps--Graphs/05-Environment-and-energy

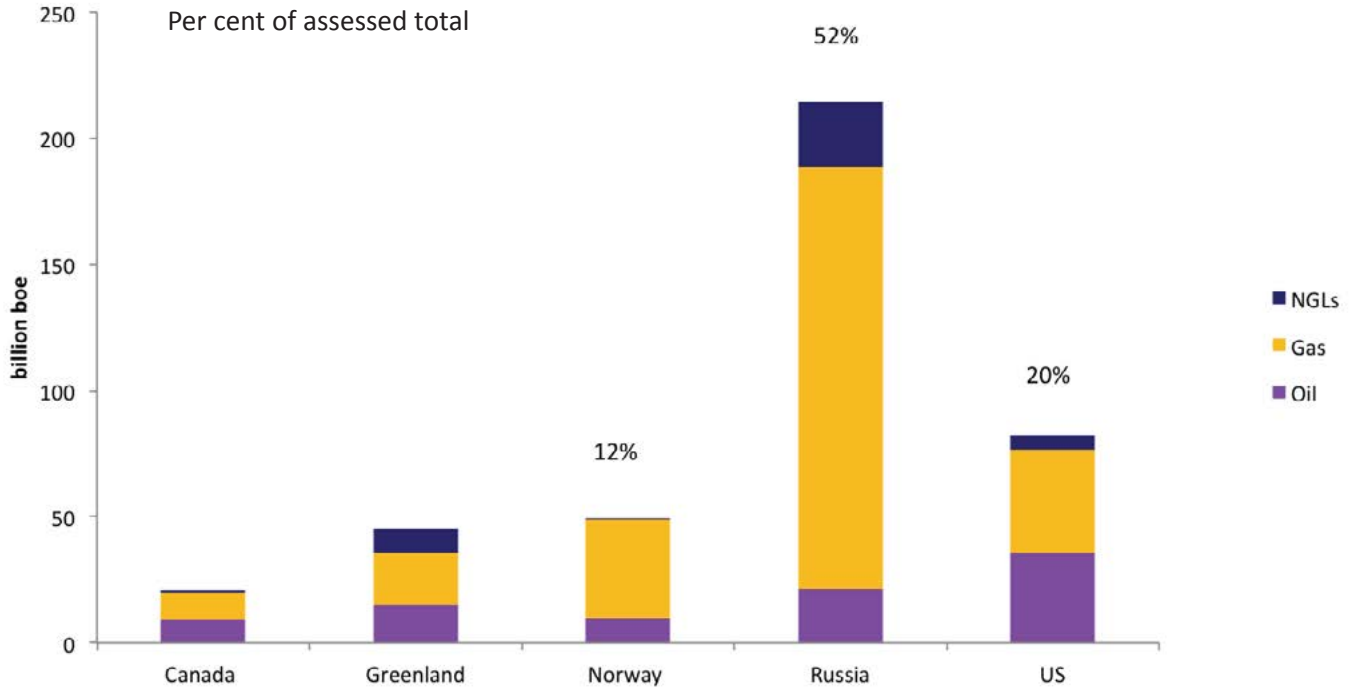

Figure 6.2: *Potential Arctic Oil and Gas Resources. Total assessed resources: 412 billion barrels of oil equivalent (boe). NGLs – Natural Gas Liquids.*

Source: Arctic Gas and Oil, EY Arctic Oil and Gas Report, May 2013 (based on data from USGS and the US Department of Energy).

surge in on-the-ground activities.[13]

Optimistic outlooks for further hydrocarbon development in the Arctic arose following the 2008 USGS estimates of resource potential. It is important to consider the complex multitude of areas, geology, economics, levels of development, governance, multiple interests, etc., that span the region rather than to view potential resource development as homogeneous across the circumpolar Arctic.[14] It is also vital to view Arctic prospects in a worldwide context. The global oil market is dynamic, the best example being the unconventional oil revolution in the United States in the last few years.[15] It is also fundamental to assess possible developments in the context that the Arctic offshore is a frontier region with challenging conditions and fragile ecosystems.

A number of companies are pursuing exploration projects, for example, Shell in the Chukchi and Beaufort Seas; Cairn in offshore Greenland; Rosneft/ExxonMobil in the Kara Sea; and Rosneft/ENI in the Russian Barents Sea. However, the costs are high and the environmental risks substantial, both of which influence companies' plans and activities. Recent developments in different parts of the region illustrate this clearly.[16]

Fourteen test wells have been drilled in Baffin Bay, off Greenland's west coast, though no drilling has been conducted since 2011. A licencing round in 2012-13 for fifteen blocks attracted some interest, but exploration activities are likely to remain on stand-by in 2014. Licences for four blocks have been granted also in the Greenland Sea area in Northeast Greenland. Oil and gas development in Greenland is not viewed as a near-term prospect.[17]

Two areas on Iceland's continental shelf have potential for commercial oil and gas development: Dreki (east and northeast) and Gammur (north). Three licences for Icelandic, Chinese and Norwegian companies have been awarded in 2013-2014, paving the way for the first cases of drilling off Iceland's coast.[18] "Arctic Services" – an initiative of more than 50 companies and institutions in Iceland's north – was launched in 2013 to provide

13. Arctic Council (2009). In the report released by Marsh Risk Management it is claimed that "only 22 of the 174 fields discovered (in the Arctic) have produced hydrocarbons, with an average lag time of 13 years. Just 38 new fields are expected to come into production between 2012 and 2018". Marsh Risk Management Research (2013). Managing Risk on the New Frontiers of Energy Exploration, p. 4. Marsh. *https://uk.marsh.com/Portals/18/Documents/MRMR%20New%20Frontiers%20of%20Energy%20Expl%202013_A4.pdf.* Accessed 18 December 2013. "The actual ongoing and planned development in the Arctic offshore is then still quite limited in extent. It means that the Arctic's designation as a new energy province is built more on anticipated potentials than on significant proven reserves of oil and natural gas and other energy resources". Arctic Council, (2009); cf. Lindholt, L. & Glomsrød, S. (2012). No big bonanza for the global petroleum industry. Energy Economics, 34(5), 1465–1474.

14. See: Østhagen, A. (2013). Arctic oil and gas. The role of regions. IFS Insights 2/2013, Oslo, Norwegian Institute for Defence Studies, p. 22.

15. International Energy Agency (IEA), 2013, World Energy Outlook-2013, IEA/OECD, Paris.

16. Cf. Ermida, G. (2014). Strategic decisions of international oil companies: Arctic versus other regions. Energy Strategy Reviews, 2(3-4), 265–272.

17. As Runi M. Hansen, Statoil country manager for Greenland and the Faroes explains: "Being in a frontier area, this licence (Avinngaq) is a long-term project for Statoil and the company will follow its stepwise approach, not going faster than technology allows (…)". Statoil News (2013). *http://www.statoil.com/en/NewsAndMedia/News/2013/Pages/Dec20Greenland.aspx*., Accessed 19 February 2014.

18. National Energy Authority, 2014.

improved service levels and infrastructure for oil and gas exploration.[19]

The Norwegian Petroleum Directorate estimates that the undiscovered resources in the Barents Sea amount to 6 billion barrels of oil equivalent, most of it in the form of natural gas.[20] While Norway is a leading country in Arctic hydrocarbon production, the outlook for its oil and gas sector faces challenges in terms of rising operating costs; lower gas prices (depending on region); adjustments to the fiscal regime, which inter alia reduces the attractiveness of future projects that require new infrastructure; and availability of qualified workers.[21] Costs in Norway's petroleum sector have roughly doubled between 2005 and 2012, and a tax hike in 2013 put several projects at financial risk.[22]

New developments could help to revive Norway's output, which is at a 25-year low. Both oil and gas production in northern Norwegian fields dropped significantly in 2013. There are also delays in the construction of the floating production unit for the Goliat field (when in production, it will be the northernmost on the Norwegian shelf and the first in the Norwegian Barents sea), where oil production is planned to start in late 2014.[23] In the western part of the Norwegian sector of the Barents Sea, exploration drilling around the Johan Castberg field has been vital in providing knowledge of the area, but so far it has not delivered the expected oil volumes. Statoil as operator has recommended that the investment decision concerning the Johan Castberg field be deleyed.

Nevertheless, there remains considerable interest with 40 energy companies nominating 160 desired blocks in northern Norwegian waters for the licence round expected in the first half of 2014.[24] The northernmost blocks are located 73˚north (the furtherst north to date[25]). About 75% of Russia's estimated offshore hydrocarbon resources are located in Arctic regions, accounting for 22-27% of global offshore resources.[26] Major international oil and gas companies have shown interest in Russia's expansion into the Arctic offshore.[27] Yet, the Ministry of Energy estimates that only 5% of Russia's oil production and 10% of gas will come from the Arctic shelf by 2035.[28] This reflects that there is no current shortage of supply possibilities in Russia before moving into the more expensive resource areas in the Arctic over the longer term.[29] It also reflects shifts in global markets such as the impacts of unconventional resources lowering prices and putting the economic viability of liquefied natural gas (LNG) projects like Shtokman in Russia under scrutiny. The supply outlook in the near term is based on modest growth in domestic demand and weak growth in exports to Europe, and is significantly influenced by the constraints on the pace of securing a meaningful position in Asia-Pacific markets.[30] Russian authorities are taking steps to provide fiscal incentives related to export duties and reduced mineral taxes for projects in the Arctic offshore.

6.3 Primary Drivers of Arctic Oil and Gas Exploitation

Arctic resource development is unique, complex, high cost and high risk. Key determinants can be considered in four clusters that illustrate opportunities and constraints.[31]

1) Scope and pace of climate change in the Arctic

- Changes in sea ice coverage.
- Expanding access and transport routes.
- More difficult weather conditions.
- Increased coastal erosion.
- New and additional pollution sources contributing to climate change, e.g. ozone, black carbon, aerosols.

2) Economic conditions and global markets

- State of national and regional economies.
- Economic potential of hydrocarbon development.

19. IceNews (2014). *http://www.icenews.is/2014/02/26/joint-initiative-in-iceland-offers-services-for-arctic-operations*/. Accessed 26 February 2014.

20. The Arctic Journal. *http://arcticjournal.com/oil-minerals/oil-discovered-barents-sea*. Accessed 15 February 2014.

21. Stolen, H. et al. (2014). Norway's rising oil costs hit Arctic output hopes. Reuter. *http://www.reuters.com/article/2014/01/16/oil-norway-delays-idUSL3N0KP4BB20140116*. Accessed 18 February 2014.

22. Stolen, H. et al. (2014).

23. Staalesen, A. (2014c). Chaos at Goliat. BarentsObserver.com. *http://barentsobserver.com/en/energy/2014/02/chaos-goliat-12-02*. Accessed 18 February 2014.

24. In the 22nd Norwegian Licence Round in 2013, 29 companies got licence rights in Arctic waters, for the first time including two Russian companies - Lukoil and Rosneft. Staalesen, A. (2014a).

25. Staalesen, A. (2014d). Drilling further north, farther east. BarentsObserver.com. *http://barentsobserver.com/en/energy/2014/02/drilling-further-north-farther-east-18-02*. Accessed 18 February 2014.

26. Kobzev, A. (2012). Oil exploration in Russia beyond 2025. Performance Journal, 4(2), p. 54-61. EY Performance. *http://performance.ey.com/wp-content/uploads/downloads/2012/02/Performance-4.2-January-2012-Journal-v13-oil-russia.pdf*. Accessed 15 February 2013.

27. Henderson, J. (2012). Joint Ventures in the Russian Offshore – Positive News but only for the Long Term. Oxford Institute for Energy Studies. *http://www.oxfordenergy.org/wpcms/wp-content/uploads/2012/05/Joint-Ventures-in-the-Russian-Offshore-%E2%80%93-Positive-News-but-only-for-the-Long-Term-.pdf*. Accessed 28 January 2014; Locatelli, C., Rossiaud, S. & Loskot-Strachota A. (2012). POLINARES working paper n. 45 Case 1: Russia, institutionalism and the effect on oil and gas investments. Polinares. *http://www.polinares.eu/docs/d3-1/polinares_wp3_case1.pdf*. Accessed 18 October 2013.

28. Arctic-info. *http://www.arctic-info.ru/News/Page/dola-nefti-s-arkticesko go-sel_fa-k-2035-gody-sostavit-do-5-?id=7090*. Accessed 26 February 2014.

29. It should be also mentioned that after having lain idle in the Pechora Sea since August 2011, the "Prirazlomnaya" platform in late December 2013 started pumping oil in Russia's first oil producing offshore field in the Arctic. Staalesen, A. (2014a). Delayed Arctic breakthrough. BarentsObserver.com. *http://barentsobserver.com/en/energy/2014/01/delayed-arctic-breakthrough-02-01*. Accessed 15 February 2014.

30. IEA, 2013.

31. Harsem Ø., Eide A. & Heen K. (2011).

- Dynamic global energy supply and demand landscape, intensifying interactions between different fuels, technologies, markets and prices.[32]

3) Advances in offshore technology and maritime transport

- Improved technology for offshore oil and gas exploration and development to reduce environmental impacts and enhance safety.
- Infrastructure for production and transport.
- Co-operative approaches and technical capacity to address pollution, oil spill and rescue operations.[33]

4) Policy developments

- Government policies and granting new licences.
- International governance frameworks, regional and national oil and gas regulations.
- Global and regional climate-change agreements.
- Stakeholder influence.

6.4 Overview of the Implications of Arctic Offshore Exploitation

Experience with exploration and extraction of hydrocarbons has shown that they have considerable effects on the vulnerable Arctic environment, as well as regional economy and society, including traditional livelihoods of indigenous people.[34,35] Impacts usually vary depending on the spatial scale of a given offshore development, type of specific activity, stage of development and the required technology and infrastructure.[36] Generalised impacts associated with hydrocarbon development in the Arctic include:

Environmental

- Physical impacts on marine and terrestrial ecosystems, including air pollution and noise.
- Risk of long-lasting negative impacts from catastrophic events, e.g. oil spill.
- Effects on terrestrial and marine biodiversity and habitats: directly on species confronted with pollution and disturbance; indirect effects of pollution that disrupt food chains.
- Production and consumption of additional hydrocarbon resources adding to greenhouse gas emissions.
- Increased concentration of climate forcers, e.g. ozone, black carbon.
- Damage to important ecosystem services of value to humans, e.g. fisheries.

Social

- Demographic trends, e.g. influx of workers, migration patterns.
- Increased economic and employment opportunities.
- Social relations and health.
- Education and training patterns, e.g. new opportunities.
- Increased urbanisation.
- Cultural and economic factors, e.g. indigenous livelihoods, traditional practices, contact with nature.

Economic

- Macroeconomic effects, e.g. projected increase in national and regional GDP.
- Microeconomic effects, e.g. expected increase in economic opportunities, incomes, growth of businesses, increased employment and stimulation of overall economic activity.
- Multiplier effect and improved services.
- Increased public revenues from royalties and other payments or production sharing approaches to fund services and support sovereign wealth funds.
- Risks to traditional livelihoods.

Governance/political

- New geopolitical roles and economic potential.
- New regional and global relations, e.g. energy security.
- Further development of environmental and economic governance for regulation, fiscal regimes, resource management, e.g. development of oil spill preparedness and response regimes.

32. Two major shifts in global energy markets in the last decade have impacts on the prospects and timing of Arctic offshore oil and gas developments. The first is the rise in energy demand in emerging Asian economies that now accounts for more than half of global demand. The second comprises the market shifts in response to unconventional resource production in the United States and global LNG markets leading to a significant drop in natural gas prices in North America while energy prices have remained high in Europe. Solanko, L. & Vilmi, L. (2013). The transformation of global energy markets, BOFIT Online 2013 No. 6, *http://www.suomenpankki.fi/bofit_en/tutkimus/tutkimusjulkaisut/online/Documents/2013/bon0613.pdf*. Accessed 10 January 2014.

33. Martin, A.S. (2012). Deeper and Colder. The Impacts and Risks of Deepwater and Arctic Hydrocarbon Development. Sustainalytics. *http://www.sustainalytics.com/sites/default/files/unconventional-oil-and-gas-arctic-drilling_0.pdf*. Accessed 22 October 2013.

34. Koivurova, T. & Hossain, K. (2008).

35. International Centre for Reindeer Husbandry, (2009). Reindeer Husbandry and Barents 2030: Impacts of Future Petroleum Development on Reindeer Husbandry in the Barents Region, GRIDA. *http://www.grida.no/files/publications/reindeer-husbandry-barents_lores.pdf*. Accessed 15 March 2012.

36. Arctic Council (2010).

Economic and Social Benefits: Snøhvit Case

The first offshore gas development in the Barents Sea is a milestone in developing the hydrocarbon province. About 2 500 people were employed in the five-year construction phase. Operation, maintenance and support services now provide about 400 jobs and 75% of the employees have been recruited from north Norway. Nearly EUR 380 million of the overall deliveries to the field came from companies registered in north Norway. Assessments show that the development of Snøhvit reversed declining population and employment trends in the Hammerfest area. New companies were established in the area, housing construction expanded and municipal revenues increased substantially. Significant investments have been made in upgrading schools and infrastructure and in developing cultural facilities.[37]

Picture 6.2: *State-of-Art Technology in Arctic Conditions: Melkøya LNG Production.*
Credit: Helge Hansen, Statoil.

- Strengthen comprehensive and long-term monitoring and research capabilities.
- Improved stakeholder engagement stemming from regulatory and NGO pressures.

It is important to keep in mind that the impacts and consequences:

- cannot be considered in isolation from one another as they are usually closely interlinked;
- are unevenly distributed, e.g. physical disturbance of the environment from offshore oil and gas activities and onshore infrastructure has a larger impact on people in the specific areas compared to those more distant, whereas financial benefits can extend far beyond the region;
- some impacts may lead to dissimilar outcomes depending on the particular situation or location;
- impacts must be considered in terms of long-term effects on the environment and society.

While climate change is presented as increasing access to offshore oil and gas deposits in the Arctic in the long term, the burning of fossil fuels and resulting greenhouse gas emissions are largely responsible for human-induced climate change. Two-thirds of all proven fossil fuel reserves must stay in the ground if the world is to avoid dangerous climate change (above 2˚ C), according to the International Energy Agency.[38] Building infrastructure for hydrocarbon development in the Arctic is expensive and once in place there is a strong incentive to make the most of such investments during their economic lifespan. This presents a dilemma as climate change triggers Arctic opening options that can exacerbate further climate change.

There are many concerns about the environmental impact of resource developments both onshore and offshore in the Arctic.[39] On the other hand, investment and development of hydrocarbon resources can have positive social and economic effects in remote communities.

37. Government of Norway, (2011). The High North: Visions and Strategies. Meld.St. 7 (2011-2012), Report to the Storting.

38. International Energy Agency (2012), World Energy Outlook – 2012, IEA/ OECD, Paris.

39. Oil spills were indicated as the number one uncertainty regarding offshore oil and gas developments in the Arctic in the Strategic Assessment of Development of the Arctic online stakeholder questionnaire.

Conventions, Agreements, Standards and Guidelines	Year
United Nations Convention on the Law of the Sea	1982
International Convention for the Prevention of Pollution from Ships (MARPOL)	1973/78
International Convention for the Safety of Life at Sea (SOLAS)	1974
Agreement on Co-operation on Marine Oil Pollution, Preparedness and Response in the Arctic	2013
The Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR)	1992
International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC)	1990
Protection of the Marine Environment (PAME) Arctic Offshore Oil and Gas Guidelines	2009
PAME Guidelines for Transfer of Refined Oil and Oil Products in Arctic Waters	2004
International standards for safe exploration, production and transportation of oil and gas, e.g. ISO 19906 – Petroleum and natural gas industries – Arctic offshore structures.	2010

Table 6.1: *Selected International Instruments Relevant to Arctic Offshore Oil and Gas Activities*

Responsible, knowledge-based governance is key to effectively and successfully responding to the challenges and opportunities presented by further development of Arctic oil and gas resources.[40]

It should be emphasised that the resilience of Arctic ecosystems to withstand adverse events, such as incidents during offshore activities, is weak. While particular risk events – such as an oil spill – are not necessarily more likely in the Arctic than in other extreme environments, the potential environmental consequences and costs of clean-up may be significantly greater. These risks have significant implications for governments, businesses and the insurance industry.[41] Given that most Arctic hydrocarbon reserves are located offshore, it is of particular concern that there is little knowledge concerning the suitability of existing methods for oil clean-up in ice-covered waters or in areas of broken sea ice.[42]

The International Association of Oil and Gas Producers launched a four-year, USD 20 million research programme in 2013 to address issues specific to Arctic oil and gas exploitation, including spill trajectory modelling and remote sensing, and oil recovery techniques in sea ice areas.[43]

6.5 Governance and Best Practice for Arctic Offshore Oil and Gas Extraction

Effective governance, regulations, international standards and best practices are crucial factors to reduce the risks of negative environmental and socioeconomic effects of oil and gas activities.[44] Many international conventions and agreements relevant to hydrocarbon extraction are applicable in the Arctic (Table 6.1). They address the following key areas:

- Nature conservation and environmental protection, including environmental impact assessments.
- Rights of indigenous peoples.
- Oil spill preparedness, response and co-operation for ships and offshore facilities.
- Occupational safety and health requirements.
- Marine pollution from ships.
- Liability and compensation for damage from pollution incidents.
- Minimum standards for the construction and operation of ships; training and certification of seafarers.
- Rules to prevent collisions at sea relevant to the transport of oil.

A study of the current international framework at global level related to offshore oil exploitation highlights both its fragmented and incomplete nature.[45] To some extent, the

40. Hasle, J. R., Kjellén, U. & Haugerud, O. (2009). Decision on oil and gas exploration in an Arctic area: Case study from the Norwegian Barents Sea. Safety Science. DOI: 10.1016/j.ssci.2008.10.019

41. Sydnes, A. K. & Sydnes, M. (2013). Norwegian–Russian co-operation on oil-spill response in the Barents Sea. Marine Policy. DOI: 10.1016/j.marpol.2012.12.001.

42. Potter, S. et al. (2012). Spill Response in the Arctic Offshore. American Petroleum Institute and the Joint Industry Programme on Oil Spill Recovery in Ice. *http://.api.org/~/media/Files/EHS/Clean_Water/Oil_Spill_Prevention/Spill-Response-in-the-Arctic-Offshore.pdf.* Accessed 27 February 2014.

43. Arctic Oil Spill Response Technology Joint Industry Programme (JIP): *http://www.arcticresponsetechnology.org*. Accessed 20 January 2014.

44. Koivurova, T. & Hossain, K. (2008); Barry-Pheby, E.A. (2014). The international law and governance of the Arctic's offshore oil industry: Inert or altered? OGEL 1 (2014) Special: Offshore Petroleum Exploration and Production: Challenges and Responses, *https://www.academia.edu/5632614/Ov12-1-article03*. Accessed 20 February 2014.

45. Rochette, J. (2012). Towards an international regulation of offshore oil exploitation. IDDRI. *http://www.iddri.org/Publications/Collections/Idees-pour-le-debat/WP1512_JR_workshop%20offshore.pdf*. Accessed 17 June 2013; Humrich, C. (2013). Fragmented International Governance of Arctic Offshore Oil: Governance Challenges and Institutional Improvement. Global Environmental Politics, 13(3), 79–99.

Health, Safety and Environmental Protection Industry Standards

Recognised technical standards are used worldwide by the oil and gas industry. Accumulated experience over many years and from all parts of the world influence the standards through systematic updating and issuance of new standards. The standards represent best international practices for achieving an acceptable level of safety. Yet, updating standards is a time-consuming process requiring consensus from many parties.

Existing regulations and technical standards generally have not been developed to address the Arctic's harsh offshore conditions. Existing technical standards need to be supplemented for the Arctic challenges with:

- Definition of societal and company safety objectives.
- Risk assessment from concept to execution, operation and decommissioning.
- Acquisition and analysis of site-specific environmental data and loads.
- Definition of additional or modified functional requirements.
- Adaptation for site-specific and project-specific conditions.

Adapted from Barents 2020, Det Norske Veritas, 2012.

lack of adequate international and regional governance contributes to a shortage of current, comprehensive and effective enforcement of rules covering the Arctic marine area. Part of the solution could be to combine governance norms – both national and international – with the corporate social responsibility standards of operating companies.[46]

There are major differences between regulatory regimes, standards and governance capacity across the Arctic states.[47] The challenges of Arctic development call for co-ordinated responses where viable, common standards are possible, along with an ecosystems-based approach, transparency and best practice. The Arctic Council continues its efforts to facilitate fundamental regional solutions that could become a framework supporting sustainable development and uphold the public trust. The Arctic coastal states have signed two agreements with particular relevance to oil and gas development. The 2011 Search and Rescue Agreement, a legally binding instrument that is now in force, establishes a framework for co-ordination of international maritime and aeronautical coverage and response across an area of about 34 million km2.[48] In May 2013, the Arctic states concluded a legally binding Agreement on Co-operation on Marine Oil Pollution Preparedness and Response in the Arctic to improve oil spill management.[49]

46. Koivurova, T. (2013). Resource exploitation in the Arctic: incorrect diagnoses, misinterpretations and wrong solutions – how to avoid these? Baltic Rim Economies, Special Issue On The Future Of The Arctic, Issue No. 2

47. Dagg, J. et al. (2011). Comparing the Offshore Drilling Regulatory Regimes of the Canadian Arctic, the U.S., the U.K., Greenland and Norway. Pembina Institute. *http://www.pubs.pembina.org/reports/comparing-offshore-oil-and-gas-regulations-final.pdf*. Accessed 20 December 2013.

48. Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic. See: Kao, S., Pearre, N.S. & Firestone, J. (2012). Adoption of the Arctic search and rescue agreement: A shift of the Arctic regime toward a hard law basis? Marine Policy. DOI: 10.1016/j.marpol.2011.12.001; Łuszczuk, M. (2014, forthcoming). The Regional Significance of the Arctic Search and Rescue Agreement. Rocznik Bezpieczeństwa Międzynarodowego.

49. Boyd, A. (2013). Binding oil spill agreement signed. BarentsObserver.com. *http://www.barentsobserver.com/en/arctic/2013/05/binding-oil-spill-agreement-signed-15-05*. Accessed 15 June 2013.

6.6 How Oil and Gas Development in the Arctic May Affect the European Union?

The European Union is a major energy market with a variety of producers and consumers. In 2012, the EU's oil and gas imports amounted to more than EUR 400 billion or approximately 3.1% of the Union's GDP.[50] EU policies relevant to, inter alia, economy and trade, energy and the environment alongside national policies of its member states make for a complex policy landscape.[51] For example, the growing demand for transport fuels, now largely based on oil, versus EU policy approaches to reduce greenhouse gas and other emissions, and to curb the use of fossil fuels. The EU energy market is increasingly relying on imports to meet energy demand.

Energy imports increased from less than 40% (of energy consumption) in the 1980s to 54% in 2010. In that year, the highest dependency rates were for crude oil (85%) and natural gas (63%). Russia is the main supplier, accounting for 35% of the EU's crude oil imports in 2010. Almost 65% of EU imports of natural gas in 2009 came from Russia and Norway. The International Energy Agency projects a big increase: net gas imports into the EU will rise from 302 billion cubic metres (bcm) in 2011 to 525 bcm in 2035, with the share of imports in total consumption jumping from 63% to 85%. EU policy aims

50. European Commission (2014). A policy framework for climate and energy in the period from 2020 to 2030. p. 2.

51. Cavalieri, S. et al. (2010). EU Arctic Footprint and Policy Assessment. Final Report. Berlin: Ecologic Institute. *http://arctic-footprint.eu/sites/default/files/AFPA_Final_Report.pdf*. Accessed 20 June 2013; Airoldi, A. (2008). The European Union and the Arctic: Policies and actions. Nordic Council of Ministers. *http://www.norden.org/fi/julkaisut/julkaisut/2008-729. Accessed 15 June 2013*; Airoldi, A. (2010). EU and the Arctic. Main developments 2008-2010. Nordic Council of Ministers. *http://www.norden.org/fi/julkaisut/julkaisut/2010-763*. Accessed 15 June 2013.

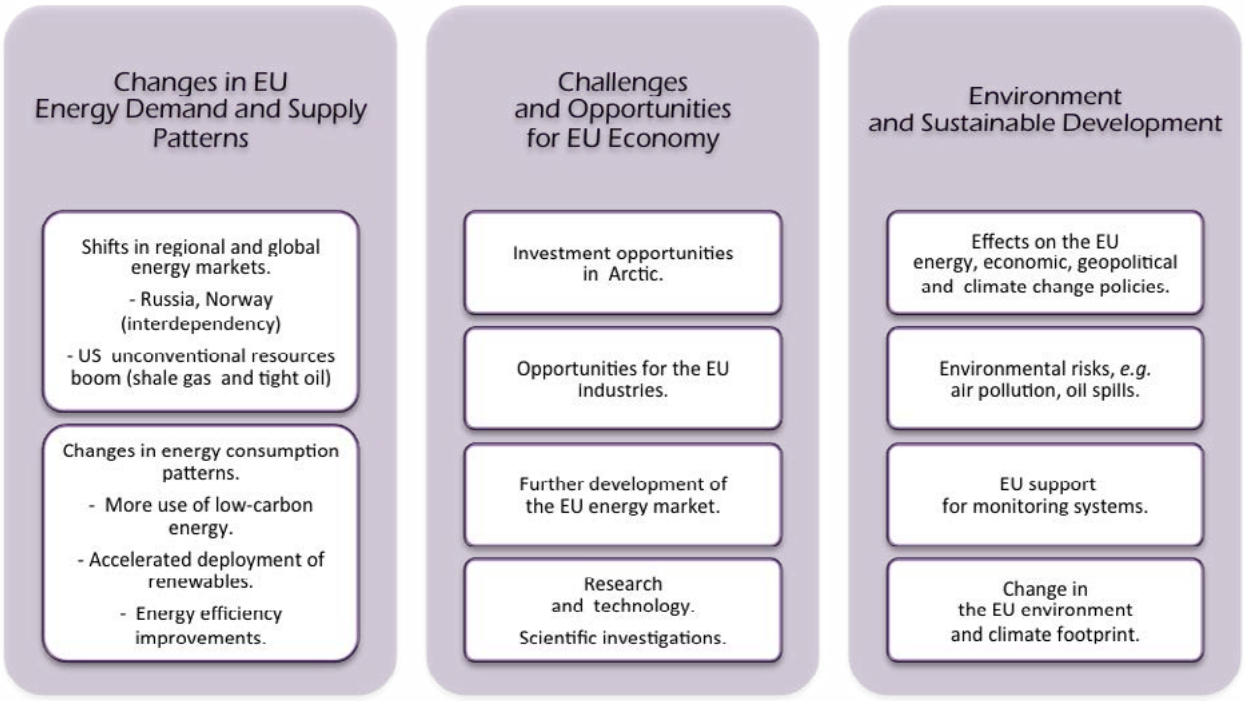

Figure 6.3: *Arctic Oil and Gas Development: Significance for the EU*

to improve energy security, while delivering a low-carbon and competitive energy system, through common action, integrated markets, import diversification, sustainable development of indigenous energy sources, investment in the necessary infrastructure, end-use energy savings and supporting research and innovation.[52]

Meeting the growing demand of EU citizens for energy in a safe and environmentally responsible manner is a key challenge for EU institutions.[53] The Arctic region has the potential to play an important role. As security of supply becomes a concern when a high proportion of imports are concentrated among relatively few partners, the EU has begun to look to the Arctic as a potential source of hydrocarbons. In March 2014 European leaders called on the European Commission to conduct an extensive study of EU energy security and to submit by June 2014 a comprehensive plan for the limitation of EU energy dependence. An increased focus on EU energy security in the coming decades will also have an effect on energy trade relationships with Russia and Norway.[54,55]

The development of hydrocarbons in the Arctic influences a broad scope of policy fields within the EU. Selected issues, which are highly correlated, are shown in Figure 6.3.

6.7 Outlook to 2030

Continued interest in the opportunities to exploit oil and gas resources in the Arctic, particularly the "lower Arctic", are expected to be driven by growing global demand, shifting market conditions, increased physical access and geopolitics. Effective governance and infrastructure, including search and rescue, are required framework conditions. A step-wise approach is expected as resources are defined through exploration techniques, experience is gained in the extreme conditions, environmental and social protections are put in place and companies assess their investment strategies.

It is likely that the Arctic states will be able to delineate and delimit their continental shelves in the foreseeable future in an orderly manner, on the basis of the law of the sea and UN Convention on the Law of the Sea. In the context of expected gradual improvement of the governance framework for Arctic resource exploitation, this may enable gradual development of resources in these areas.

Hydrocarbon development in the Arctic will depend on technological and economic feasibility, as well as environmental protection and social acceptance, even if new technologies will help to reduce current risks. Stricter regulations for safety standards for development, transport and shipping activities, and more attention

52. European Commission (2014), p. 4.

53. See the Joint Research Centre Institute for Energy and Transport, which supports the development and implementation of offshore safety legislation analysing past accidents in order to identify the existing conditions related to sharing of information, transparency and lessons learned. It contains also useful statistical information on the frequency and severity of accidents. Christou, M. & Konstantinidou, M. (2012). Safety of offshore oil and gas operations: Lessons from past accident analysis. Ensuring EU hydrocarbon supply through better control of major hazards. European Commission JRC IET.

54. Boussena, S., Locatelli, C. (2013). Energy institutional and organisational changes in EU and Russia: Revisiting gas relations. Energy Policy. DOI: 10.1016/j.enpol.2012.11.052; Harsem, Ø. & Claes, D. (2013). The interdependence of European - Russian energy relations. Energy Policy. DOI: 10.1016/j.enpol.2013.04.035.

55. European Commission (2011). Energy Roadmap 2050 [COM/2011/885]

to local benefits, social and corporate responsibility are also expected. More worldwide attention to the environmental aspects of potential development is anticipated. The importance of Arctic oil and gas resources for European countries will be important, although not vital.

6.8 Relevant EU Policies

The EU has numerous, albeit limited, functional competencies that enable it to play an important role in supporting effective co-operation and to help meet the challenges that confront the Arctic region. It has earned broad recognition for its strong international efforts to address climate change, expand renewable energy sources, promote energy efficiency and support polar research in order to contribute to addressing global challenges. The EU's most important Arctic energy partners are Russia and Norway. The EU conducts regular energy dialogues with both partners. Because the EU's dependence on energy imports is expected to continue to grow, these dialogues will become increasingly important for the EU in influencing the environmental footprint of its energy consumption.[56,57]

About 24% of Arctic oil and gas output went to the EU-27 in recent years.[58] Market influence and co-operation with Arctic partners such as through the European Economic Area (EEA) Agreement enable the EU to influence hydrocarbon exploration and development.[59] Existing EU policies, particularly related to energy and the environment, affect oil and gas developments in the Arctic in direct and indirect ways.[60] Selected mechanisms are highlighted below.

- Directive on Safety of Offshore Oil and Gas Operations,[61] adopted in June 2013, calls for special attention to ensure environmental protection taking into account the risk of major accidents and the need for effective responses. The directive contains provisions for licencing, monitoring, reporting and risk management for oil and gas extraction in EU waters. The EU considers the directive to be applicable to the EEA, but this position has been challenged by Norway (as of March 2014). The new legislation encourages EU members of the Arctic Council to actively promote the highest environmental safety standards, such as through the creation of international instruments on prevention, preparedness and response to Arctic marine oil pollution (currently in the process of development in the Arctic Council). The directive obliges the Commission to promote high safety standards for hydrocarbon operations taking place across the world, in relevant global and regional fora, including those relating to Arctic waters as well as to facilitate exchange of information with countries adjacent to EU waters.
- EU Offshore Oil and Gas Authorities Group, established in 2012, is a forum for national authorities and the EU to exchange experiences and expertise relevant to major accident prevention and response for offshore oil and gas operations within EU waters and beyond its borders, where appropriate.[62]
- Environmental Impact Assessments (EIA) framework provides minimum standards for assessments based on several directives. Energy installations and related infrastructure subject to EIAs include oil refineries, road construction, extraction of petroleum and natural gas, and petroleum storage facilities. The EIA Directive is EEA relevant.[63]
- Fuel Quality Directive[64] seeks to reduce life-cycle emissions from transport fuels by 10% by 2020. Petroleum products must meet quality requirements concerning sulphur and lead content.
- Measures to safeguard security of natural gas supply.[65] This Directive establishes a common framework within which member states define general, transparent and non-discriminatory security of supply policies compatible with the requirements of a competitive internal gas market; it also clarifies the general roles and responsibilities of the different market players and implements specific non-discriminatory procedures to safeguard security of gas supply.
- Limits on air pollutants from large combustion facilities[66] aims to reduce acidification, ground level

56. See: Roadmap EU-Russia Energy Cooperation until 2050, March 2013, p. 10 and 17.

57. European Parliament and Council, (2010). Regulations concerning measures to safeguard security of gas supply and repealing Council Directive 2004/67/EC.

58. Cavalieri, S. et al. (2010).

59. The EEA Joint Parliamentary Committee, (2013). Resolution on Arctic Policy. Adopted during 41st Meeting 28-29 October 2013, Vaduz, Liechtenstein.

60. Koivurova, T. et al. (2010). EU Competencies Affecting the Arctic. Report completed for the European Parliament. *www.europarl.europa.eu/activities/committees/studies/download.do?language=sv&file=33381*. Accessed 23 March 2013; Cf. Neumann, A. (2012). European Interests as Regards Resource Exploitation in the Arctic: How Sustainable Are European Efforts in This Regard? The Yearbook of Polar Law, 619–645.

61. Directive 2013/30/EU of 12 June 2013 on safety of offshore oil and gas operations.

62. European Commission (2012). Decision of 19 January 2012 on setting up of the European Union Offshore Oil and Gas Authorities Group (2012/C 18/07).

63. Council Directive (2011). On the assessment of the effects of certain public and private projects on the environment. Directive 2011/92/EU of the European Parliament and the Council Directive on Safety of Offshore Oil and Gas Operations (2013/30/EU).

64. Directive 2009/30/EC of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions.

65. Council Directive 2004/67/EC of 26 April 2004 concerning measures to safeguard security of natural gas supply.

66. Directive 2001/80/EC of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants.

ozone and particles by controlling emissions of pollutants (sulphur dioxide, nitrogen oxides and dust) from large combustion plants, e.g. power stations, petroleum refineries, other industrial processes running on solid, liquid or gaseous fuels.

- Renewable Energy Directive[67] sets a goal of renewable energy comprising 20% of total EU energy consumption by 2020 and is EEA relevant.
- Energy Efficiency Action Plan[68] aims to increase total energy savings by 20% in 2020.
- Research projects and facilities that increase knowledge of the Arctic and are very important for oil and gas developments include CryoSat-2, an environmental research satellite launched in 2010 to measure sea ice thickness, and the Copernicus European Earth Observation Programme, which offers marine monitoring services and studies land and sea ice in the Arctic using data from European and Russian satellites.

6.9 Critical Factors for EU Decision-making

An integral part of this project is stakeholder consultation. Through a dedicated workshop and an online questionnaire, stakeholders identified and discussed critical factors for the EU to take into account in decision-making processes relating to oil and gas developments in the Arctic. The top three are summarised here.

6.9.1 Local Benefits of Hydrocarbon Extraction

As was highlighted during stakeholder consultation, all offshore activities are undertaken with essential onshore support. Moreover, they generate huge changes in and challenges for the socioeconomic landscape of neighbouring communities. Therefore adequate facilities and competent capacity building in the communities should be addressed as a significant issue. In addition, social licence and corporate social responsibility should be considered as the basis upon which to build a responsible approach for any kind of planned oil and gas activities. It is also a question of ensuring the appropriate sharing of benefits on a broadly understood perspective and not just in economic terms. For instance, investment in technology advancement, research/education and healthcare services are important, since they can strengthen local communities facing opportunities and threats arising from the development of oil and gas offshore activities.

6.9.2 Risks and Corresponding Regulations

Oil and gas exploration and development are considered high-risk activities (especially in terms of oil spills), so there is a clear need for effective legal frameworks and operational solutions (e.g. search and rescue capabilities). One of the responses to these challenges is the development of adequate and effective regulations targeted at the appropriate aspects of exploration, development and production of offshore oil and gas and its transportation to markets. Adopting and strengthening of cross-border regulations as well as sharing best practices and knowledge are recognised as opportunities to secure the interests, rights and responsibilities of different stakeholders.

6.9.3 Research and Gaps in Knowledge

Since the Arctic is largely a frontier region for hydrocarbons, there is a clear need to gain more comprehensive knowledge that is required in all dimensions or phases of extraction activities. Research should be comprehensive and cover various dimensions of human activity in the Arctic, and not only those connected with oil and gas extraction.

6.10 Recommendations

Taking into consideration the specificity, diversity and scope of the oil and gas offshore developments in the Arctic, as well as their implications for Europe, there are several opportunities for new or enhanced forms of EU activities that correspond with the interests of the EU and its role in hydrocarbon developments. The following propositions have been developed by the authors, taking the ideas proposed by stakeholders as a point of departure.

6.10.1 Support innovative research and education in the areas of Arctic technology and the Arctic environment

While further development of oil and gas offshore exploration and development should be focused on multi-dimensional risk reduction, broader and more advanced knowledge about the Arctic environment is required as are advances in offshore technologies. In this respect the key actions for EU support include ensuring long-term cross-disciplinary research programmes (e.g. 2020 Horizon), development of the relevant capacities and infrastructure, as well as supporting more educational projects.

67. Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources.

68. European Commission (2011). Energy Efficiency Action Plan 2011. Communication. COM(2011) 109 final.

6.10.2 Continue and strengthen energy dialogue with non-EU Arctic partners

Developments over the last three years on global energy markets underscore that the EU should continue to encourage transparent and competitive relations with energy suppliers, including those in the Arctic region. These dialogues could promote expanding the Northern Dimension to energy fields and new forms of co-operation with Norway. However, previous EU experiences in the nexus of energy security indicate that this could be a challenging task. Nevertheless, these efforts should be continued.

6.10.3 Enhance funding and investment frameworks for environmentally and socially responsible Arctic hydrocarbon projects

Successful offshore oil and gas developments (including construction of pipelines and transport of resources) can be achieved with improved funding and investment opportunities. Development of offshore oil and gas resources entails the obligation to pay strong attention to environmental and social risks, for instance by developing and experimenting with new technological solutions and environmentally and socially responsible business models. International co-operation in this field would combine both political partnerships and long-term financial relationships. The EU has a potentially strong position to participate in such initiatives. One idea would be to establish – in close collaboration with major partners, including bilateral, multilateral and local financial institutions – an international finance institution or financing framework to provide loans and make capital investments, and which would incorporate a strong emphasis on environmental and social responsibility in Arctic hydrocarbon-related projects.

Chapter 7

MINING IN THE EUROPEAN ARCTIC

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Key Messages:

- The upsurge in mining activity is a clear trend in the region but developments are highly dependent on the fluctuating prices of minerals on the world market.
- The European Arctic is seen as a politically and economically stable region, characterised by high-quality regulation.
- Both industry and (indigenous) Arctic communities ask for better and improved communication and decision-making processes throughout the entire mining life cycle.
- The EU is a major consumer of Arctic raw materials and is promoting domestic mineral extraction to increase security of supply.
- Mining activities take place within a framework of EU regulations, including mitigation of environmental impacts.

Recommendations to the EU:

- Facilitate the collection and sharing of data, knowledge and information.
- Develop an integrated view on the mining sector and transparent policies.
- Harmonise environmental, economic and social assessments.
- Improve dialogue and meaningful consultation, particularly with indigenous and local people.
- Support international governance and cooperation to enhance responsible mining.

Mining's role is crucial in creating employment in areas of high unemployment. Industrial activities always have some impact on their close surroundings, but the footprint of mining operations is relatively small comparing to many other activities, and modern mining can be done in a way that is causing minimal impact on the environment.

Representative of the mining industry, Finland

The environmental impact assessments are sufficient, but there is need for developing social impact assessments that mirror the land use needs by indigenous people. Their land use and the conditions for reindeer herding are threatened by different interests and exploitation activities (not only mining).

State agency, Sweden

Mining lasts only some tens of years but the nature forever, and that is why the nature and the local inhabitants must be respected.

State agency, Finland

In the case of indigenous peoples and their livelihood, they are seen as local people and the matters such as local/regional employment is rated higher than traditional indigenous economy. [on the consideration of social and cultural issues in decision-making regarding mining activities]

Reindeer herder and a member of Sami Parliament, Sweden

The quotes come from respondents to the online questionnaire – an element of the consultation process within the 'Strategic Assessment of Development of the Arctic'

Chapter cover image: Mine in Kirovsk, Russia.
Photo: GettyImages

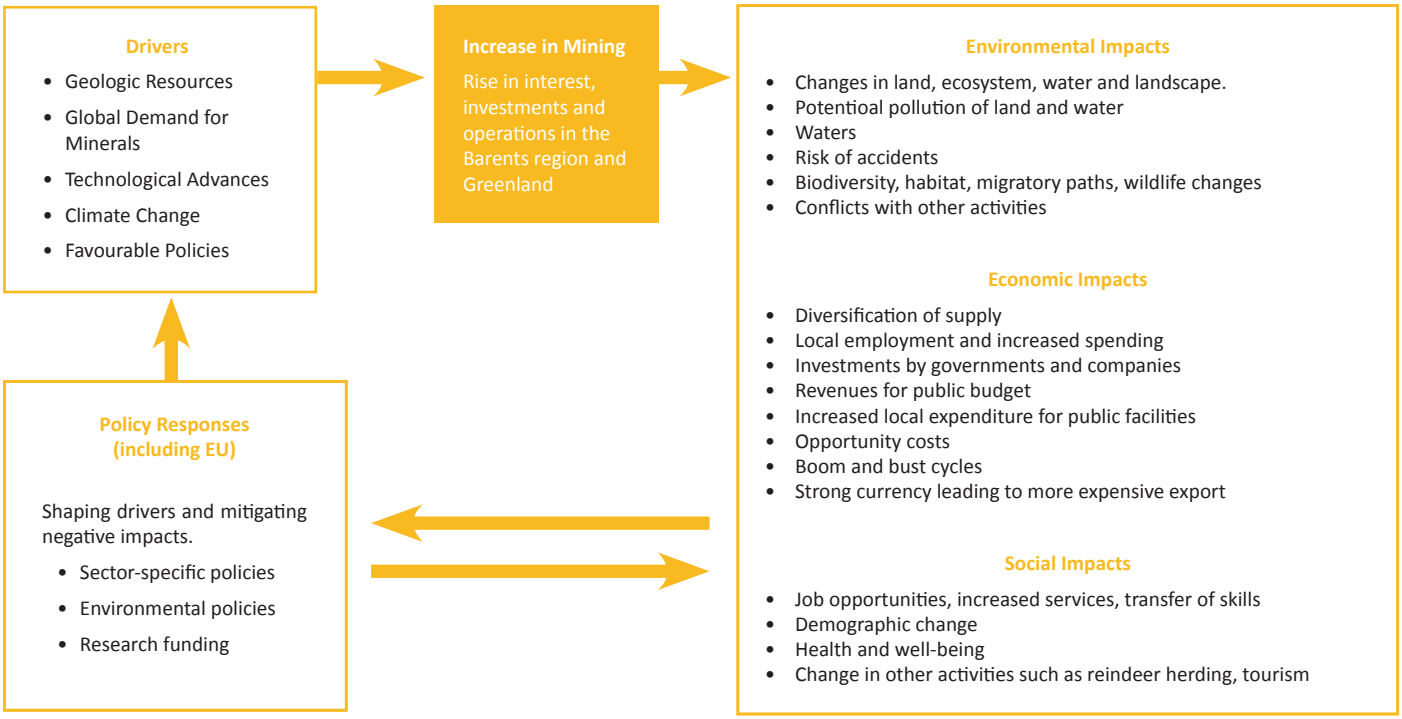


Figure 7.1: *Increase in Arctic Mining Activities: Drivers and Impacts*

7.1 Introduction

The European Arctic contains vast amounts of mineral resources. Extracting minerals in the Arctic appears to be both challenging and expensive. Yet today the region is experiencing an upsurge in mining activity as high market prices and improved technology have triggered interest and action by mining companies. Mining may be viewed as not only an opportunity for wealth creation, but also a threat to people's livelihoods.

This chapter deals with the current increase in mining activity – with a focus on traditional metallic ores and rare earth elements – in the European Arctic, including Greenland and to a lesser extent Northwest Russia.[1] It provides a general overview of mining and its impacts on the environment, economy and society. In addition, the implications for the European Union (EU) are discussed through the identification of EU interests regarding extraction of minerals and by assessing relevant EU policies.

7.2 Current Upsurge in Mining Activity

The upsurge in mining activity is a clear trend in most Euro-Arctic regions.[2] The states of physical infrastructure, regulatory and administrative frameworks, human resources and the societal awareness of mining vary from one country to another. There is a long history of mining in regions such as Fennoscandia, Svalbard and Northwest Russia. These regions have well-established social and physical infrastructure accompanied by regulatory frameworks to ensure that mining is a well-integrated part of the economy. In contrast, large-scale mining in Greenland is a relatively new activity, where there is little infrastructure and the technical challenges are sizable.[3]

Until recently, mining in Fennoscandia was thought to be in decline or stable at best. Today, greater private sector interest and government attention are giving clear signs of a rapid increase in mining activity. At the end of 2013, there were more than 40 active mines in Sweden, Finland and Norway, including mines that were reopened in the last decade and projects in the early phases of development (see Figure 7.2.)

1. The focus here is mainly on traditional metallic ores (base and precious) and rare earth elements (REEs). Industrial minerals and gemstone mines are generally excluded. The geographical coverage is the broad Arctic area as defined by the Arctic Human Development Report (2004). However, some examples and data from the Barents region are used. Some statistics refer to entire Nordic states.

2. The mining activities are developing so quickly that reliable and comparable data are hard to obtain.

3. Haley, S., Klick, M., Szymoniak, N. & Crow, A. (2011), 'Observing trends and assessing data for Arctic mining', Polar Geography, 34:1-2, 37-61.

Figure 7.2: *Mining Activities in Northern Fennoscandia and Greenland.*
Credit: Ricardo Prevettoni, GRID-Arendal 2014.

Picture 7.1: *Testing prior to the possible reopening of the Hannukainen mine, Finland.*

Photo: YLE, yle.fi

Many Nordic communities are both excited and concerned by the planned developments, particularly in areas where traditional activities such as Sámi reindeer herding take place. Most Nordic countries recently revised their mining legislation or adopted strategies to stimulate mining development by focusing on economic opportunities. Moreover, in response to social concerns, there are numerous regulatory and research efforts (both by public authorities and the industry) to ensure responsibility in mining activities. For example, Sweden is investing considerably in infrastructure projects and in research and development. In 2011, the Finnish government issued a new Mining Act explicitly aimed at promoting mining in a socially, economically and ecologically sustainable manner.[4] Nordic governments and agencies have also started initiatives focused on research and co-operation, such as the Finnish Funding Agency for Technology and Innovation's Green Mining programme[5]; the Norwegian state programme for gathering geophysical data; and the establishment of a Nordic network on mining expertise – NordMin (with the participation of Greenland).[6]

Russia is among the world leaders in mineral production. In northwest Russia, the mining industry has a significant presence on the Kola Peninsula, the Komi Republic and the Republic of Karelia. However, the Russian mining industry has several obsolete plants, a comparatively slow rate of innovation and low labour productivity. Nevertheless, Russia is expected to invest in new exploration activities and strengthen business relations with neighbouring countries.[7]

Greenland has major potential for mining in the known geological occurrences along the coast.[8] In this typical frontier region with limited mining infrastructure and challenging physical circumstances, the number of mining licences issued increased from 39 in 2000 to 115 in 2013.[9] In 2013, Greenland had one operating gold mine (Nalunaq Angel Mining) and a number of projects in advanced stages of development.[10] This includes the rare earth oxides deposit at Kvanefjed, which is second in size only to rare earth element (REE) deposits in China. As mining is not yet well integrated into the overall economy, Greenland will be particularly sensitive to the boom and bust character of the industry and the risks of economic decoupling, that is, a situation in which economic benefits are exported to other regions.[11] Recent policy and regulatory changes instituted by the Greenland government favour mining development, expecting that revenues will help finance expansion of its autonomy and possible independence. However, it has been estimated that Greenland would require 24 large-scale and profitable mines in order to cover the current budget transfer from Denmark.[12] In the final quarter of 2013, amid much controversy domestically, the Greenland government lifted its ban on uranium mining.[13]

7.3 Drivers

Having the **appropriate geology** is a condition for development. The European Arctic has significant mineral occurrences: the Fennoscandian Shield[14] contains minerals that are found in limited locations around the world and Greenland holds great potential for many minerals, including REEs and uranium. A number of drivers can be identified to explain the present trend.

4. Koivurova, T. & Stepien, A. (eds.) (2008), Reforming Mining Law in a Changing World, with Special Reference to Finland, University of Lapland, Rovaniemi, Finland.

5. Green Mining Programme, TEKES, *www.tekes.fi/en/programmes-and-services/tekes-programmes/green-mining/*. Accessed 5 November 2013.

6. See: Nordic Council of Ministers, *www.norden.org/en/nordic-council-of-ministers/council-of-ministers/nordic-council-of-ministers-for-business-energy-regional-policy-mr-ner/nordmin/project-description-nordmin*. Accessed 13 February 2014.

7. Safirova, E. (2012), US Geological Survey Minerals Yearbook 2010 – Russia, advance release. U.S Department of the Interior, U.S. Geological Survey, *http://minerals.usgs.gov.* Accessed 10 July 2013.

8. What is under the ice sheet is largely unknown.

9. This includes both active prospecting and exploration licences. BMP, List of Mineral and Petroleum Licences, *http://www.govmin.gl/images/stories/minerals/list_of_licences/list_of_licences.pdf* . Accessed 16 March 2014.

10. See: Geological Map *http://www.geus.dk/minex/green-min-2010.pdf*. Accessed 9 December 2013. The Nalunaq Mine is expected to close in 2014.

11. Duhaime, G. (2004), in Haley et al. (2011).

12. Committee for Greenlandic mineral resources to the benefit of society (2014). To the Benefit of Greenland.
http://nyheder.ku.dk/groenlands-naturressourcer/rapportogbaggrundspapir/To_the_benefit_of_Greenland.pdf. Accessed 3 November 2013.

13. McGwin, K. (24 October 2013). Uranium ban overturned. Arctic Journal at *http://arcticjournal.com/oil-minerals/uranium-ban-overturned.* Accessed 20 November 2013.

14. Geologically, the Fennoscandian Shield is an exposed portion of the Baltic Shield and includes territories of Norway, Sweden, Finland, and Russian Kola Peninsula and Karelia.

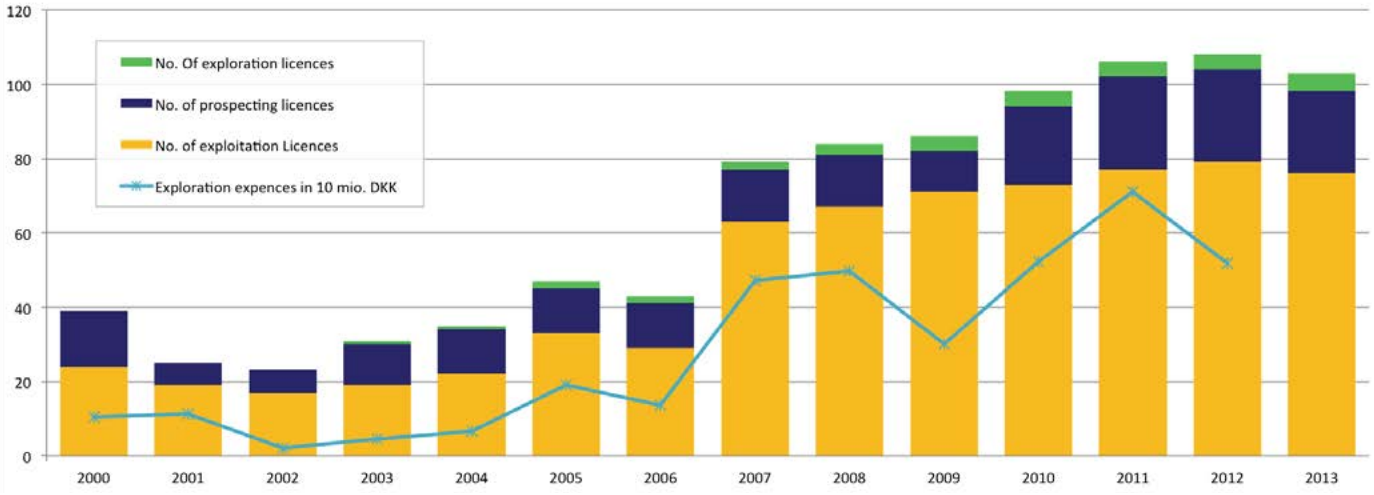


Figure 7.3: *Mineral Licences in Greenland, 2000-2013.*

Note: A prospecting licence is non-exclusive permission to explore in a given area, and thus permits more than one company to conduct exploration activities. An exploration licence has an exclusive character.

Source: Arctic Portal, based on Bureau of Minerals and Petroleum, Government of Greenland, www.bmp.gl

The main driver of the current upsurge is growing **global demand for mineral resources**, pushed by modernisation in emerging economies such as China and India, as well as by the deployment of advanced technologies such as wind turbine generators, mobile phones and hybrid cars, which require REEs and other critical minerals.

Advances in technologies that serve exploration, operation and transportation in mining are making Arctic resources more accessible and less expensive.[15] Examples include improved seismic exploration and mapping technologies and methods to mine in permafrost.

Further, the **legal, administrative and political landscape** supports development, although there is resistance from some stakeholders such as reindeer herders and tourism organisations. Of relevance is also the role of consulting companies conducting environmental impact assessments or economic feasibility analyses in terms of their competence and interaction with mining companies and administrations. The investments of states and the private sector, including junior companies, determine the extent of geological knowledge and new discoveries.

To a modest degree, physical changes due to **climate change** influence mining activities through easier (or cheaper) sea access to resources (in particular in Greenland), longer operating seasons, and possibly via lower transportation costs due to shorter shipping routes.[16] However, climate change also ushers in new challenges and hazards for the industry.

7.4 Impacts

The impacts of mining activities differ depending on the stage of mine development, the type of mining activity and the existing infrastructure. The decision on whether or not to explore and mine should ideally be based on an integrated assessment of the inter-related environmental, economic and social impacts. Importantly, exploration and exploitation result in different impacts and are usually regulated differently, also in terms of taxation or impact assessment requirements. Exploration, even if successful, is not always followed by extraction activities.

7.4.1 Environmental Impacts

Besides visible changes in the landscape, the environmental effects of mining can include the pollution of water, air and land. These impacts may continue long after the operative phase of the mine. Mining may alter the landscape, destroy reindeer grazing grounds, migratory routes and jeopardise fishing in rivers, lakes and seas. Sensitive Arctic ecosystems require long recovery times after environmental degradation. The nature of impacts varies depending on local conditions, type of resource and applied technology.

In particular, many communities have long-term concerns about what will happen after mine closure. As the boom-and-bust cycles of mining can turn active mines idle, there is concern about environmental management during periods of inactivity. A critical question is how to manage waste, decommissioning and rehabilitation when a mine ceases operation.[17] Nowadays, operators are legally required to have a mine closure and

15. Haley, S. et al. (2011), p. 55.

16. Rasmussen, R. et al. (2011). Megatrends. Nordic Council of Ministers, Copenhagen, p. 73. See Chapter 2 Changes in Arctic Maritime Transport.

17. MMSD (2002), Breaking new ground: the report of the Mining, Minerals, and Sustainable Development Project, International Institute for Environment and Development and World Business Council for Sustainable Development, London.

Picture 7.2: *Abandoned mine in Pyramiden, Svalbard.*
Photo: Frits Steenhuisen, Arctic Centre, University of Groningen.

environmental restoration plan in place, but this is the most difficult phase to monitor.[18] Environmental impact assessments (EIAs) are intended to identify impacts and mitigation measures for the likely environmental and social impacts of the proposed mining activity, but they may not adequately address all the concerns of local and indigenous communities, tourist operators and environmental NGOs. Many stakeholders express particular apprehension regarding hazards and accidents during mine operations. For example, at the Talvivaara nickel mine in Finland, large quantities of contaminated water leaked into surrounding rivers and lakes in 2012 and 2013.

Assessments of ecosystems and socioeconomic impacts must take account of other activities, such as wind power, infrastructure and other mine developments, and measure the cumulative impacts. Importantly, environmental performance is more and more connected to the economic feasibility of mining operations. Companies are required to uphold high environmental standards. These standards are increasingly an important factor in investment decisions as major environmental accidents put companies in a difficult financial situation and adversely affect the perception of the whole industry (as is the case with the Talvivaara mine).

7.4.2 Economic Impacts

Developing a mine involves investment flows, employment opportunities, trade and transport spending. Local employment can have positive impacts also at the national level. It generates multiplier effects as local consumption increases and demand for goods and services boosts economic activity. Several mining companies now have stringent local content requirements, which may improve local employment.[19] These benefits should continue after a mine closes, in particular with regard to minimising the impact of job losses. Many mining companies have adopted a Corporate Social Responsibility (CSR) agenda as part of their strategy to acquire their social licence to operate (trust, acceptance and support of communities). In addition, there are also general company and government investments, such as education, infrastructure and healthcare.[20] Royalties, fees or taxes can generate significant revenue for regional and national budgets. Royalties as such have not been introduced in Nordic countries and mining-specific fees or taxes are comparatively low. As a result, the main budget income is from general tax systems or (e.g. in the case of LKAB) profits generated by state-owned companies. However, the economic benefits from tax revenues depend on associated increases in government expenditure.

In order to be economically sustainable in the long term, some negative economic impacts must be mitigated. The costs and benefits of mining may be unfairly distributed between stakeholders, in particular where regulatory frameworks for equitable benefit, tax sharing and social and economic impact assessment provisions are insufficient. For some municipalities the costs of the increased needs for public services, such as health care, are not compensated by the local tax gains associated with mining. In addition, mining may contribute to an overall strategy of economic diversification in some regions and thereby complement the employment structure, with family members being able to work in various industries. However, it may also take away jobs from other local economic activities, such as reindeer herding or tourism.[21]

18. Kauppila, P., Räisänen, M. L. & Myllyoja, S. (Eds) (May 2013), (Best environmental practices in metal mining operations). The Finnish Environment 29en/2011 Finnish Environment Institute (SYKE).

19. Mining Association of British Columbia (October 2011). Economic Impact Analysis, *http://www.mining.bc.ca/sites/default/files/resources/pwcmining-economicimpactanalysis_1.pdf*. Accessed 1 July 2013.

20. International Council on Mining and Metals (2003), 10 Principles, *http://www.icmm.com/our-work/sustainable-development-framework/10-principles*. Accessed 1 July 2013.

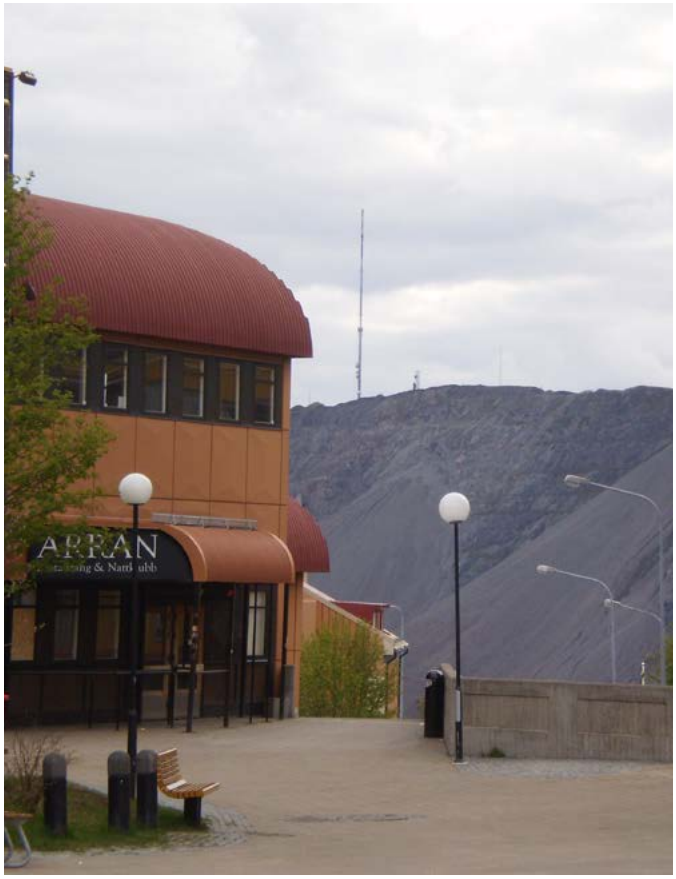
21. European Commission (May 2009), All that Glitters is not Gold, *http://ec.europa.eu/research/sd/conference/2009/presentations/20/jakub_kronenberg_-_opportunity_costs_of_gold_mining.pdf*. Accessed 1 July 2013.

7.4.3 Social Impacts

Social impacts are both the positive and negative changes to many aspects of the culture and livelihoods of local and regional populations and communities, and are closely related to the economic and environmental impacts. The social effects of new and existing mining activities occur mostly at the community level, potentially transforming the local economy, society and cultures, both indigenous and non-indigenous.[22]

Mining activity potentially creates local jobs, infrastructure, services and businesses, and thus helps to address various social problems typically faced by remote small Arctic communities (see Chapter 7). The associated development of transport infrastructure improves the accessibility of places that can benefit the local population and other economic sectors. In addition, local infrastructure and community services may be built or expanded to meet additional demand such as schools, administration, law enforcement, health care and emergency response. This includes the transfer of skills and technology to the local population. Some regions have adopted an active policy for local capacity building. The universities of Luleå (Sweden) and Oulu (Finland) have initiated a Nordic Mining School,[23] and Greenland has opened a mining school in Sisimiut.

In many communities, mining and associated activities interfere with other human activities and land uses such as reindeer herding, tourism, fishing and transport (see Chapter 8). Regions such as Lapland have had a history of out-migration and are now experiencing a localised influx of workers. While this may bring new life to villages,[24] evidence indicates that many temporary newcomers develop only a utilitarian relation to the area.[25] This is often in sharp contrast to the relation that indigenous peoples have with their ecosystem. Mining can also impact the well-being and health of local populations. Impacts on leisure activities may be experienced directly, for example through noise, dust, vibrations, gaseous emissions, water effluents, or indirectly through the appearance of excavations and processing sites. Long-term impacts on the environment may also lead to health problems.



Picture 7.3: *Kiruna town centre with the LKAB iron ore mine in the background, Sweden. As mining activities are planned to be extended under the town's centre, the decision has been made to construct a new centre in a different location.*
Photo: Adam Stępień, Arctic Centre, University of Lapland

7.5 Implications of Arctic Mining for the European Union

The EU is a major consumer and importer of Arctic raw materials. The EU consumes about one-fifth of global metallic metals production, while its own production amounts to roughly 3%, and due to the limited number of new discoveries this reliance on imports is expected to rise in the coming decades.[26] Import dependence has made the security of the supply of raw materials a top policy priority, particularly for critical raw materials with deposits in the Arctic.[27] The European Commission

22. cf Van Schooten, M., Vanclay, F. & Slootweg, R. (2003), "Conceptualizing social change processes and social impacts", in Becker, H.A. & Vanclay, F. (eds), The International Handbook of Social Impact Assessment. Conceptual and Methodological Advances, Cheltenham: Edward Elgar, 74-91; SDWG, Circumpolar Information Guide: 6

23. Nordic Mining School, *http://nordicminingschool.eu/.*

24. Smit, C.A. (2012), Governance of oil, gas and mining development in Greenland and the Arctic, Master thesis WUR, Netherlands; AFPA (2010).

25. Arctic Portal at *http://portlets.arcticportal.org/mining-projects*. Accessed 12 June 2013.

26. European Commission (2008, November 4). The raw materials initiative — meeting our critical needs for growth and jobs in Europe. Commission Communication. COM(2008)699final; European Commission (2008), Staff Working Document accompanying Communication: "The Raw Materials Initiative" SEC(2008) 2741. Weihed, P. (2012) The domestic metallic and mineral resources in Europe, Is the lack geological or political?, Presentation. Lulea University of Technology, *http://www.industrialtechnologies2012.eu/sites/default/files/presentations_session/Par_Weihed.ppt*. Accessed 10 February 2014.

27. Critical raw materials are important in the value chain but subject to high risk of supply interruption. The EU is fully dependent on imports of REEs from China, which are essential in manufacturing many modern technologies. In 2009 China accounted for 95% of the world's supply of REEs. See: Report of the Ad-hoc Working Group on defining critical raw materials (European Commission) *http://ec.europa.eu/enterprise/policies/raw-materials/critical/index_en.htm*. Accessed 16 March 2014.

Importance of Minerals Production in Fennoscandia and the Russian North for the EU

In general, a significant share of EU minerals production takes place in Arctic regions, though data for all minerals is not available. Sweden and Finland together are the principal mining and processing regions for the "EU35" – EU member states, EEA, EFTA and candidate countries including Turkey. In 2011, they accounted for 17.5% of EU35 silver production, 28% of gold, 10.5% of copper and 27% of zinc. In addition, the Russian North has significant mineral deposits and production, with the Murmansk Oblast (over 200 deposits of 40 types of minerals) contributing 80% of rare metals, and the Arkhangelsk Oblast housing the largest bauxite mine in Europe. With regard to the critical raw materials, Finland contributes 62% and Norway 18% of EU35 cobalt production.[33] Surveys in Greenland (primarily in west Greenland) indicate deposits of niobium, tantalum, graphite, platinum and other REEs.[34]

expects that the mining industry will account for as much as 20% of the EU's GDP (directly and indirectly) by 2020.[28] In general, it is estimated that over 30 million jobs in the EU are dependent on a stable supply of raw materials.[29]

A major (and potentially growing) part of the EU's domestic hard mineral supply comes from the Barents region. Further exploitation of European Arctic minerals may significantly influence EU supply by enhancing diversification and decreasing import dependence, especially from regions considered potentially unstable. Prospects for developing important REEs and raw materials further highlight the strategic significance of the Arctic in mineral policy and diplomacy. The European Arctic can therefore be seen as a fairly safe and stable supply region. A survey among mining companies conducted in 2013 by the Fraser Institute pointed to Finland and Sweden as the most promising mining territories in terms of public policies and potential.[30]

Mining is important for the EU's labour market. Notably, mining industries are international in terms of both their ownership structure and workforce. In the Barents region and Greenland, construction and operation of mines involves foreign labour, a noticeable portion of which comes from EU member states, e.g. Poland. Greenland, with its small population of 56 000, is unable to provide the 4 000 to 8 000 skilled workers that are required during the construction phase.

Environmental protection is another key interest of the EU. Mines have significant local environmental impacts. Particular operations are noteworthy for the EU with regard to greenhouse gas emission targets (e.g. nickel) and mercury pollution (e.g. gold).

Sustainable development of the northern sparsely populated regions is an EU interest as defined in treaties and demonstrated by funding programmes.[31] Mining developments would add to economic diversity of these areas, but also increase their dependence on primary resource production. Moreover, the EU emphasises its commitment to the principles of cultural diversity and indigenous rights.[32]

7.6 Outlook to 2030

The global demand for mineral resources, in particular REEs, is likely to rise.[35] Albeit with regional differences, mining in the Arctic is generally challenging, costly and uncertain, and the ongoing expansion of mining activity depends on the feasibility and willingness of investors to risk long-term investments. Technological advances will facilitate mining itself and contribute to increasing demand for certain minerals. The trend is expected to continue, including maintaining the boom-and-bust characteristics and uncertainty. Stricter regulations, for example on shipping, health and safety, and local and indigenous populations, are also expected. This should result in more attention being paid to social issues and social responsibility, and increase the importance of complying with international standards. The importance of Fennoscandia for European industry could potentially be growing due to EU and state policies that are favourable to domestic supply.

28. European Innovation Partnership on Raw Materials, *https://ec.europa.eu/eip/raw-materials/en*. Accessed 15 December 2013.

29. European Commission (2008). Communication 'The raw materials initiative — meeting our critical needs for growth and jobs in Europe', COM(2008) 699 final, 4 November 2008.

30. Wilson, A., McMahon, F. & Cervantes, M. (2013). Survey of Mining Companies 2012/2013. Frasier Institute: Canada. *http://www.fraserinstitute.org/research-news/display.aspx?id=19401*. Accessed 10 March 2014.

31. Treaty on the Functioning of the European Union, art. 174 "particular attention shall be paid to rural areas, areas affected by industrial transition, and regions which suffer from severe and permanent natural or demographic handicaps such as the northernmost regions with very low population density"; See the Northern Periphery Programme 2007-2013, *http://www.northernperiphery.eu/en/home/* and Chapter 7 Social and Cultural Changes in the European Arctic.

32. See: e.g. European Agenda for Culture, http://ec.europa.eu/culture/our-policy-development/european-agenda-for-culture_en.htm and EU External Action service, *http://eeas.europa.eu/_human_rights/ip/index_en.htm*. Accessed 13 November 2013.

33. British Geological Survey (2012). European Mineral Statistics 2007-2011. *https://www.bgs.ac.uk/mineralsuk/statistics/europeanStatistics.html.* Accessed 12 July 2013. See also ÅF-Infrastructure AB (2010). Supply of Raw Materials, Transport Needs and Economic Potential in Northern Europe. Final Report.

34. Bureau of Minerals and Petroleum Greenland website at *http://www.govmin.gl/index.php/minerals/geology-of-greenland/mineral-occurrences*. Accessed 15 July 2013.

35. See: e.g. Keramidas, K., Kitous, A. & Griffin, B. (2012). Future availability and demand for oil gas and key minerals. POLINARES working paper nr. 30.

7.7 EU Influence on Arctic Mining: Assessing EU Policies

The EU influences the mining sector directly and indirectly through legislation and various policy measures. EU policy aims to create favourable conditions for mining in the European north. The Raw Materials Initiative, launched in 2008, identified measures to secure supplies of raw materials for the EU from domestic and international sources.[36] In addition, the EU published a communication aiming to tackle the challenges in commodity markets, specifically concerning raw materials.[37] Raw material supply (current and future) from EU domestic sources is fostered by promoting investment in extractive industries and enhancing knowledge. An EU working group produced a compendium of best practices, including social issues, stakeholder engagement and transparency, as well as considering the societal benefits of minerals extraction.[38] The Commission has encouraged member states to develop national minerals policies, set up comprehensive land-use planning policies for minerals, and to streamline permitting processes.[39] As the focus of the Raw Materials Initiative and its measures is on facilitating mining developments in Europe, surprisingly little attention is given to establishing a comprehensive environmental framework, participatory processes or the broader social dimension of mining.

The Barents region and Greenland can be viewed as secure source areas for minerals. So far, however, EU policy-makers have not given particular attention to the potential of the Barents region – the region with the most recent exploration discoveries. The European Innovation Partnership (EIP) for Raw Materials can be an important element in this respect, as it is intended to support the high-quality performance of the European mining industry. Nordic states already have a strong position – the Finnish Green Mining programme is a good example.[40] However, the EIP membership, which primarily consists of parties from the broader mining industry and academia, is limiting participation in the process.

Various EU regulations, many of which apply to European Economic Area (EEA) countries, contribute to mitigating the environmental impacts of mining and setting limits to resource extraction. Examples include: Water Framework Directive and Groundwater Directive;[41] Mining Waste Directive and Landfill Waste Directive;[42] and more broadly, the Integrated Pollution Prevention and Control[43] and Seveso-III Directives.[44] The Mineral-Extracting Industries – Drilling Directive establishes the minimum requirements for improving the safety and health protection of workers related to drilling.[45]

REACH Regulation 1907/2006/EC (Registration, Evaluation, Authorisation and Restriction of Chemicals)[46] applies to the mining industry both as a user of chemicals (mines have to report the use of chemicals to the supplier) as well as to mining products (ores and concentrates in the case of chemical alteration). While materials occurring in nature are exempted from REACH, they have to be registered under Classification, Labelling and Packaging Regulation.[47] An important framework is created by the Habitats and Birds Directives[48] and the Natura 2000 network of protected areas. The European Commission issued guidance[49] dedicated to reconciling the environmental objectives with the desire to promote mineral extraction. The Commission has also encouraged the mining sector to undertake non-obligatory actions to enhance sustainable development and safe operations.

Since EIAs are critically important for mining projects, the minimum requirements established by the EIA Directive (EEA relevant, revision currently underway) are of major significance for how mining projects are developed.[50]

EU policies regarding transport also influence mining activities in the Arctic. EU initiatives such as the trans-European transport network (TEN-T) play a vital role in

36. European Commission COM(2008)699 final.

37. European Commission, Communication 'Tackling The Challenges In Commodity Markets And On Raw Materials', COM(2011)25 final, 2 February 2011.

38. This report was produced by the working group on the exchange of best practices in land use planning, permits and geological knowledge sharing, *http://ec.europa.eu/enterprise/policies/raw-materials/files/best-practices/sustfull-report_en.pdf*. Accessed 4 March 2014.

39. See: European Commission Report on the implementation of the Raw Materials Initiative, COM(2013)442 final, *http://register.consilium.europa.eu/doc/srv?l=EN&t=PDF&gc=true&sc=false&f=ST%2011876%202013%20INIT*. Accessed 16 February 2014.

40. Green Mining Programme, TEKES, *www.tekes.fi/en/programmes-and-services/tekes-programmes/green-mining/*. Accessed 5 February 2014.

41. Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy (extended later to the EEA) and Directive 2006/118/EC of 12 December 2006 on the protection of groundwater against pollution and deterioration.

42. Directive 2006/21/EC on the management of waste from the extractive industries and Directive 99/31EC

43. Directive 2008/1/EC of 15 January 2008 concerning integrated pollution prevention and control (Codified version).

44. Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances.

45. Council Directive 92/91/EEC of 3 November 1992 concerning the minimum requirements for improving the safety and health protection of workers in the mineral-extracting industries through drilling.

46. Regulation (EC) No 1907/2006 of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

47. Kauppila et al. (2013); Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures.

48. Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora; Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. Also; Regulation (EC) No 1221/2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS III) may be of relevance: although extractive industries are not identified as a priority sector; the directive deals also with waste management.

49. European Commission (July 2010). Guidance on undertaking non-energy extractive activities in accordance with Natura 2000 requirements.

50. Directive 2011/92/EU of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification).

enhancing capacity and multi-modality transport. The network has been recently updated in line with a new financial perspective. As the core EU transport network does not extend to the Barents region apart from the "Bothnian corridor" and Kiruna connection, the EU funding available for transport projects of importance for the Barents mining industry may be limited (see Chapter 9).

The recent amendment to the EU Sulphur Directive[51] (following MARPOL convention[52] amendments) limits the sulphur content in marine fuels after 2015, especially in the specified Emissions Control Areas such as the Baltic Sea. Some industry stakeholders fear that increased fuel costs could influence the economic conditions of mining operations in northern Sweden and Finland, thereby affecting their competitiveness. For example, Finnish industry estimated that the total increase in transport costs would amount to up to EUR 500 million per year.[53] On the other hand, the environmental gains, especially in the Baltic Sea, are appreciated by other stakeholders.

Through its research policies and actions, EU policy has supported Arctic research on innovation and sustainability in mining in the Framework Programme 7 (FP7) and EU regional funds.[54] Mining research projects (dealing with mining technologies, resources and sustainability) are also to be expected (first calls already published) in the Horizon 2020, where raw materials are identified as one of the key societal challenges.[55] The need for a rise in research and development funding for exploration technology will become evident over the coming decade. EIP is currently gathering "commitments" from industry partners that may constitute bases for networking and joint projects, and could support identification of specific research and development needs under Horizon 2020.

The EU has a special relationship with Greenland, which is underlined in the 2007-2013 EU-Greenland Partnership Agreement. Mineral resources were included as one of the six areas for co-operation, although the actual focus was rather limited. Recently, a Letter of Intent between the European Commission and the Government of Greenland enlisted co-operation in: geological knowledge; analysis of infrastructure and investment needs; capacity building; environmental impacts and social impacts.[56] There are expectations that minerals may be one of the key themes of the currently finalised partnership agreement for 2014-2020.[57] Greenland is seen as a potentially significant partner with the EU for REEs. Apart from Greenland, the EU conducts raw materials dialogues and expert workshops with the United States and Russia, but so far with few specific outcomes, especially regarding Arctic issues. Free trade area agreements, e.g. with the United States and Canada, may come into effect in the near term, which may also influence the operations of international mining companies in the EU.

7.8 Critical Factors for EU Decision-making

Critical factors for EU decision-making include uncertainties that should be taken fully into account. Drawing on stakeholder input in the consultation process, several of the critical factors are highlighted below. Land-use conflicts, ranked high by the stakeholders, are covered in Chapter 8.

7.8.1 Global and European Demand for Resources

Mining activity remains highly sensitive to global demand for resources and commodity prices on the global market. This is particularly relevant in the Arctic, where mining is a comparatively highly capital-intensive activity. This causes a high degree of uncertainty, not only for the industry itself, but also for national economies and local communities that can be affected by the boom-and-bust character of mining.

7.8.2 Environmental Concerns and Uncertainty

Stakeholders highlighted the importance of ecosystem services and land-use conflicts in relation to mining, in particular with reference to Sámi reindeer herding and nature-based tourism. EIAs are usually in place, but the effectiveness and degree of influence of EIAs varies in different countries and is generally not straightforward, since decisions are weighed in the context of other considerations. There is also concern over the increased risks of environmental disasters and the effects of permanent or temporary closures of mines.

51. Directive 2012/33/EU of 21 November 2012 amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels.

52. International Convention for the Prevention of Pollution from Ships and 1978 Protocol (MARPOL 73/78), 1340 UNTS 184, 12 ILM 1319 (1973).

53. Nordström, K. (May 2013). Sulfur directive impact on terminals in Baltic sea region, Some current reflections, presentation, *http://www.centrumbalticum.org/.* Accessed 5 March 2014; European Commission, *http://ec.europa.eu/environment/air/transport/ships.htm*. Accessed 5 March 2014

54. See examples in Annex 2.

55. Horizon 2020, Work programme 2014-2015. 12. Climate action, environment, resource efficiency and raw materials. European Commission Decision C (2013) 8631 of 10 December 2013

56. European Commission - MEMO/12/428 13/06/2012 Greenland's raw materials potential and the EU's strategic needs. *http://europa.eu/rapid/press-release_MEMO-12-428_en.htm*. Accessed 4 March 2014

57. The European Commission has commissioned a study on the significance of the mineral potential of Greenland for the EU economy and possible ideas for projects and co-operation.

7.8.3 Local Communities and Socioeconomic Impacts

At the local level, there is often uncertainty and concern about the socioeconomic effects of new mine developments, in particular in relation to effects on the workforce and composition of the population. Social issues are usually considered as a part of an environmental assessment procedure (or a separate, albeit connected process, as in Greenland) or within the process leading to benefit agreements. Multinational companies are expected to adhere to the principles of Corporate Social Responsibility and to acquire an informal social licence to operate. Nevertheless, there are many unresolved issues, for instance in relation to land ownership and use.

7.8.4 Indigenous Peoples' Rights and Livelihoods

Mining activities and their impacts on traditional livelihoods (especially reindeer herding) are of major concern for Arctic indigenous peoples. Reindeer herding requires vast areas for winter and summer pastures. Mining may lead to the reduction of reindeer grazing areas, resulting in land-use conflicts. There are various resource governance systems and arrangements connected with the distribution of benefits in the Arctic, and there are also a variety of co-management regimes. Issues of control over resources and property rights will evolve in the near future, partly due to international recognition and increasing awareness of the rights of indigenous peoples, manifested by the 2007 United Nations Declaration of Rights of Indigenous Peoples, which includes the concept of Free, Prior and Informed Consent (FPIC).[58]

7.8.5 Existing Decision-Making Structures and Policy

This principle of using Free, Prior and Informed Consent for mining projects is related to the more general notion that there is a need for better and more inclusive decision-making structures and policies, where people are not only heard, but can also clearly influence decisions. On the one hand, many communities and stakeholders feel that the processes leading to decisions and the decision-making processes and structures themselves are inadequate for responding to challenges arising from mining projects. On the other hand, the industry finds itself faced with long permitting processes, administrative uncertainty and complex bureaucracy. Better and more inclusive processes are called for, including improved dialogue, communication and consultation throughout the entire project life-cycle. The existing decision-making structures need to be taken into account when policies are made at the EU level.

58. Hanna, F. & Vanclay, F. (2013), "Human Rights, Indigenous peoples and the concept of Free, Prior and Informed Consent", Impact Assessment and Project Appraisal, 31:2, 146-157.

7.9 Recommendations

So far the EU's role and interest in the European Arctic as a resource region has been limited. The EU does not have direct authority regarding some of the main critical issues (e.g. land use), but there are a number of key policy areas in which the EU plays a relevant role. The following recommendations, which the report authors developed by taking ideas from stakeholders as a starting point, should be considered.

7.9.1 Facilitate the Collection and Sharing of Data, Knowledge and Information

In order to ensure integrated assessments, monitoring and informed decisions, reliable and comparable data and information on mining activity in the European Arctic should be collected and updated frequently. Acquiring and sharing accurate information and best practices will benefit governments, businesses and communities. The EU also has a role to play in stimulating high standard research, education and capacity building. The possible tools include communication and data platforms or research projects built on the needs of industry, national permitting authorities and communities. Information platforms may be based on INSPIRE infrastructure and the outcome of projects like Promine (which maps European mineral resources).[59] This process has already started within the European Innovation Partnership (EIP) on Raw Materials, which aims to identify research needs and potentials. However, the present initiative lacks significant input from those both positively and negatively affected by mining activities, such as local communities or other land users.

7.9.2 Develop an Integrated View on the Mining Sector and Transparent Policies

Although there are many EU policies and regulations that have a connection with mining, there is no integrated comprehensive policy overview for the mining sector in the European Arctic. This policy should be robust and flexible as stakeholders emphasise that current EU directives are detailed and prescriptive, whereas local conditions in the Arctic vary substantially. Therefore, more flexibility and local-level variation are required. At the same time, businesses need more transparency in regulations and policies to enhance the competiveness of the sector. The 2008 Raw Materials Initiative and the process that followed comprise an appropriate initial framework, as it integrates production, import and

59. Promine project, *http://promine.gtk.fi/*. Accessed 18 February 2014.

recycling. However, there is a need for greater focus on mining within the EU and the Arctic as an area with major potential, attention to social impacts, as well as more comprehensive and structured exchange of best practices between member states.[60] Refinement of minerals within the Arctic regions could be supported, so that the regional economy gains greater benefits from the minerals extracted in the North.

7.9.3 Harmonise Environmental, Economic and Social Assessments

EU policy should be directed towards ensuring that the current level of good practice in EIAs is maintained and improved where necessary. Improvements include addressing issues related to mine closure and safety, emergencies and hazards. Social and economic issues should be effectively addressed in assessment processes. For that, the EU needs a clear vision and policy to address the social and economic impacts in all phases of the lifecycle of mining. In this respect, EU policy should be in line with international human rights developments (e.g. the principle of Free Prior and Informed Consent), and the current practice of the social responsibility of businesses (CSR). There is a need for the inclusion of the general principles connected with social licence to operate into the EU regulatory framework covering mining activities, including EIAs. Harmonisation, basic standards (including the assessment of social impacts) and procedures may enable companies operating across national boundaries to perform more effectively.

7.9.4 Improving Dialogue and Meaningful Consultation, in Particular with Indigenous and Local People

For the EU in general, more efforts should be made to involve communities and indigenous populations in remote regions in relevant EU policies and directives. Particularly for mining activities, these efforts should be directed towards improving dialogue with and between stakeholders in order to allow meaningful consultation. Many stakeholders feel that the awareness among EU decision-makers of northern livelihoods, in particular traditional livelihoods and cultural identity of indigenous peoples, should be improved. Overall consultation procedures conducted by the European Commission may prove insufficient for stakeholders in remote regions such as Lapland and those who experience specific challenges (such as indigenous communities). Constraints include: understanding of the influence of EU policies, capacity to participate in a meaningful way and human resources.

7.9.5 Support International Governance and Cooperation Enhancing Responsible Mining

Various international environmental instruments may be relevant to mining operations, for example the Ramsar Convention on Wetlands. However, international regulation and guidelines specific to Arctic mining can be considered to be fairly weak. For example, the Arctic EIA Guidelines adopted in 1997 under the Arctic Environmental Protection Strategy remain largely unknown to both regulators and companies.[61] The Commission, in the development of its Arctic policy and its activities within the Arctic Council as an observer in principle, should focus attention on promoting and facilitating past and future Arctic Council work on environmental and social impact assessments. The Commission should strengthen its activities regarding various international developments such as international transport, International Maritime Organization negotiations on environmental performance of Arctic shipping in the Polar Code and sulphur regulation as well as international EIA standards. Co-operation within and across the mining industry may also influence mine operation norms and corporate standard setting. This can be done, for example, via the European Innovation Partnership or co-operation with the European Association for mining industries, metal ores and industrial minerals (euromine). Also, EU dialogues on minerals with Arctic partners and suppliers of the EU market such as the United States, Russia, Canada, Norway and Greenland, may in the long term be used as a tool for promoting high standards in responsible mining. However, it is important to engage a broad spectrum of stakeholders, going beyond the sole involvement of industry.

60. European Commission Report on the implementation of the Raw Materials Initiative, COM(2013)442 final, *http://register.consilium.europa.eu/doc/srv?l=EN&t=PDF&gc=true&sc=false&f=ST%2011876%202013%20INIT*. Accessed 16 February 2014.

61. Koivurova, T. (2007). Implementing Guidelines for Environmental Impact Assessment in the Arctic. In Theory and Practise of Transboundary Environmental Impact Assessment (eds. Bastmeijer and Koivurova), Martinus Nijhoff, pp. 151-173.

Chapter 8

ACTIVITIES AFFECTING LAND USE IN THE EUROPEAN ARCTIC

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Key Messages:

- Globalisation, demand for resources and the indirect effects of climate change trigger a multiplicity of developments in the European Arctic.
- Conflicts with activities requiring vast areas and pristine nature, such as reindeer herding, tourism or nature conservation, are possible.
- Impact assessments, participation and dialogue are key to avoiding conflicts.
- EU regulations affect all land use activities as well as contribute to frameworks governing interactions between these activities.
- Critical factors for EU decision-making are human well-being and social sustainability, public participation and indigenous rights.

Recommendations to the EU:

- Increase knowledge generation and sharing
- Include social impact assessment more effectively in the environmental impact assessment process.

"Human rights and indigenous peoples' rights to both land and culture must come first. Having these core issues respected will without doubt be the best way to avoid and resolve conflicts..."

Local Government, Norway

"Environmental factors must define limits to natural resource use. To stay within ecologically defined frames is an imperative for future sustainability. Social and cultural values must define societies' development, and the economy must be developed and managed in order to achieve social objectives..."

Environmental NGO, Sweden

"Respect for the existing international legal regime, as well as the establishment of mechanisms that enhance the full and effective participation of indigenous peoples in decision making. Resource mechanisms should be available in cases of rights violations due to land use conflicts..."

NGO, Denmark

The quotes come from respondents to the online questionnaire – an element of the consultation process within the 'Strategic Assessment of Development of the Arctic'

Chapter cover image: Hiker passing by Suorva Dam close to the Sarek National Park in Swedish Lapland.

Photo: Adam Stępień, Arctic Centre, University of Lapland.

Picture 8.1: *Arctic Landscape – "Empty" at first sight, but full of human activities.*
Photo: Paula Kankaanpää, Arctic Centre, University of Lapland.

8.1 Introduction

This chapter focuses on various activities affecting land use in the European Arctic and especially in Fennoscandia, where European Union (EU) policies have the greatest influence. The European Arctic is a resource-rich region with minerals, forests and hydrocarbons that attract domestic and international interest and investment. Northern communities often view large-scale activities as a basis for economic sustainability.[1] Yet they may also have consequences such as losses of biodiversity, ecotourism and reindeer pastures. The culture and livelihoods of Arctic peoples – such as the Sámi – are tightly connected to the land they have occupied and used for centuries.

Based on the case of Finnish Lapland, Suopajärvi defines three distinct perspectives on the relationship between humans and nature: 1) traditional livelihoods such as reindeer husbandry and agriculture define nature as lived space; 2) industries such as mining, large-scale forestry and hydroelectric power generation see nature as a resource; and 3) tourism in the postmodern society sees nature as a place of experience.[2] The interactions among these three perspectives provide the key elements to understanding land-use conflicts in the European Arctic.

8.2 Key Drivers of Land-use Pressures

8.2.1 Globalisation

The most important factor putting significant pressure on Arctic land use is economic globalisation. Global demand for resources is increasing the presence of multinational companies, bringing with it investment, trade and technological innovation. For example, new Arctic mining developments and the reopening of old mines have been stimulated primarily by global demand and attractive prices for minerals and metals (see Chapter 7).

8.2.2 Climate Change

Climate change is a critical driver of overall change in Arctic biodiversity (see Chapter 3), but it also has indirect effects on land-use activities. Climate change is also a political driver as international climate agreements and climate policies aimed at reducing carbon dioxide emissions potentially increase the demand for renewable energy production.[3]

An example of an indirect effect is the opening of the Northern Sea Route through which cargo would be transported to world markets. This would require new transportation infrastructure, such as roads, putting pressure on land previously used for tourism, reindeer herding, agriculture and other forms of livelihood, as well as for nature conservation. New roads and railways also provide new pathways for invasive species, which can affect species diversity and distribution. These additional impacts are often felt cumulatively, including other effects of climate change.

1. Economic sustainability is the term used to identify various strategies that make it possible to use available resources to their best advantage. The idea is to promote the use of those resources in a way that is both efficient and responsible, and likely to provide long-term benefits. In the case of a business operation, it calls for using resources so that the business continues to function over a number of years, while consistently returning a profit.

2. Suopajärvi, L. (2003). Competing industries and contested nature in Finnish Lapland after World War II, in S. Moller, and S. Phonon (eds.), Encountering the North. Cultural Geography, International Relations and Northern Landscapes. (pp. 203-220). Ashgate, Aldershot.

3. United Nations Framework Convention on Climate Change, UNFCCC, Kyoto Protocol.

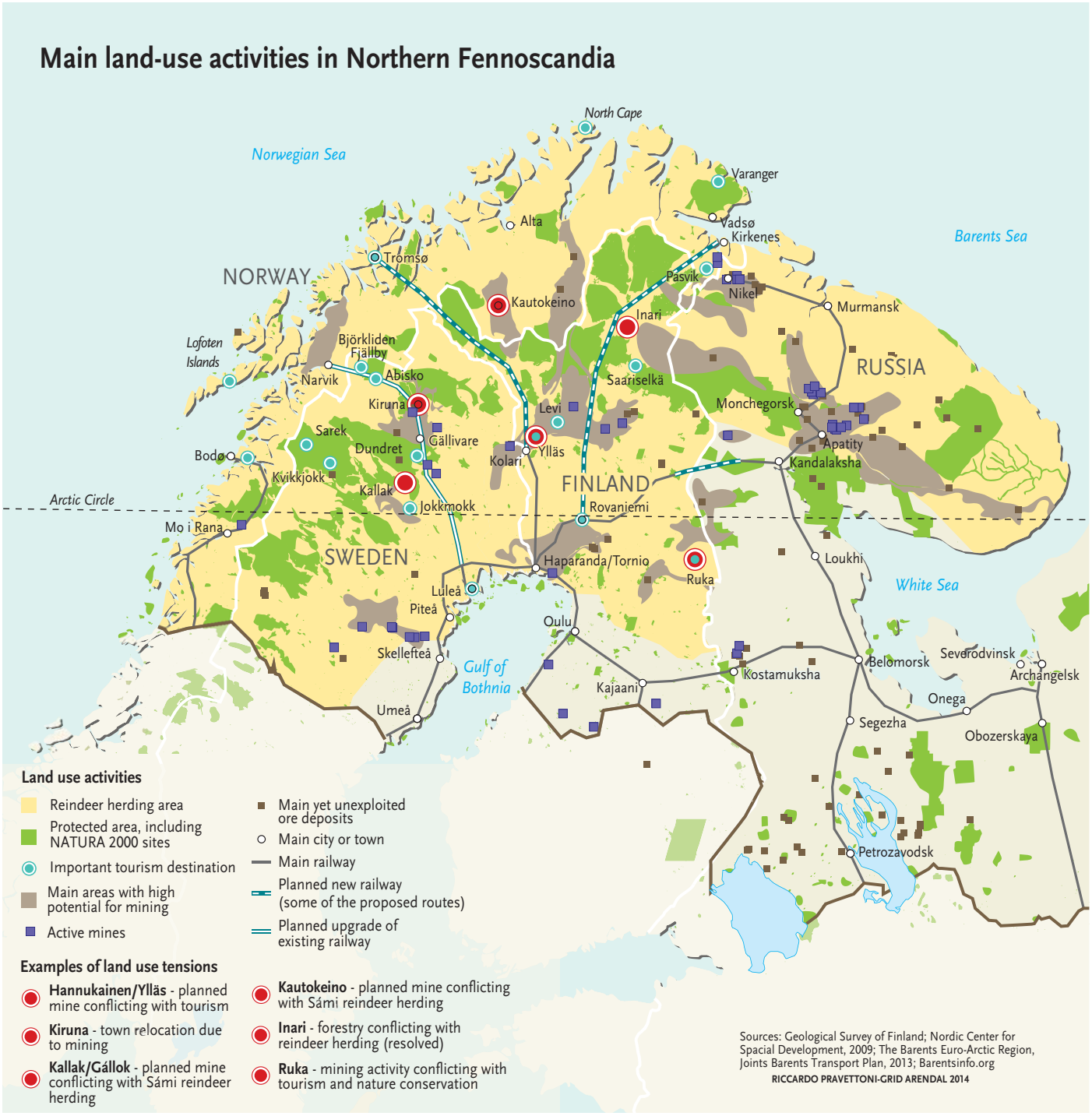

Figure 8.1: *Main Land-Use Activities Causing Pressures in Northern Fennoscandia (southern boundary – Barents region).*
Source: R. Pravettoni, GRID-Arendal.

8.2.3 Increasing Role of Environmental Values

Preservation of the natural environment in order to protect biodiversity and avoid habitat fragmentation is an important driver affecting land use in the Arctic. The environment has an intrinsic value and is important for human well-being. A term often used in this context is "environmental / ecosystem services", which can be understood as benefits that the natural environment provides expressed in economic terms.

8.3 Main Land-use Activities and their Interconnections

The land-use activities discussed here include mining, tourism, forestry, reindeer husbandry, renewable energy, transport, nature conservation and subsistence use of forests. Mining has a variety of impacts and interrelations with other human activities and is presented in Chapter 7. Therefore, it is only discussed here from the perspective of its relationship (e.g. conflicts and synergies) with other land-use activities (Figure 8.1).

Can Mining Co-exist with Tourism? – Case of Hannukainen

Studies are underway for the proposed Hannukainen project in northern Finland to exploit iron ore deposits with re-opening of an open pit mine (Picture 8.2.). The area has developed infrastructure with paved roads, rail and high voltage power lines. The mining site is located 10 kilometres from the Ylläs ski resort and the Pallas-Ylläs National Park, Finland's most popular park.

The main concern arising from the Hannukainen mine development is that it may impair the image of the area as attractive for nature-based recreation. One problem is the plan to pipe treated process water from the mine to the Muonio River, one of the last major free salmon rivers in Finland and an EU Natura 2000 protected area. Secondly the municipality of Kolari relies on tourism for 50% of its revenue and thirdly, reindeer herders are concerned about disruption from mining noise and activities, and the loss or fragmentation of grazing areas.

Picture 8.2: *Hannukainen Mine Site and Near-by Ylläs Ski Resort.*
Photo: Northland Mine Ltd.

8.3.1 Tourism

Tourism is one of the largest sources of income in many northern areas; for example, in Finland some municipalities receive almost half of their revenue from tourism.[4] Tourism areas (e.g. ski resorts) are often connected to nature conservation areas. Nature conversation areas are also attractive for ecotourism. In some cases, parks have obtained sustainable tourism certifications, e.g. PAN Parks Certification.[5]

Mining development and operations are among the greatest threats to eco-tourism and have considerable impacts on the landscape. Open-pit mines adjacent to recreational areas such as national parks and ski resorts may decrease the number of visitors. A survey conducted in Finnish Lapland at the Ylläs ski resort next to the Hannukainen mining project (see textbox) and at the Levi ski resort next to Kittilä mine indicated that visitors come to Lapland for the pristine natural landscape and silence. Tourists envisioned that mining would have more negative impacts on tourism than local people did.[6]

8.3.2 Forestry

Forestry has traditionally been a large employer in Nordic countries, especially in Sweden and Finland (14% of EU/European Economic Area's [EEA] total forest area is located in northern Sweden, Norway and Finland). More recently the number of jobs has decreased due to heavy mechanisation and globalisation, for example as companies relocate pulp mills.[7,8] Forestry is still one of the key land-use forms in the Arctic, but the benefits from forestry are no longer distributed to local and regional actors as widely as before, and hence the position of

4. Satokangas, P. (2013). Matkailulla maakunta menestyy - Matkailun tulo- ja työllisyysvaikutukset 12 lappilaisessa kunnassa vuonna 2011. Lapin korkeakoulukonserni. Rovaniemi, p. 44. [County's profits come from tourism – the impacts of tourism on income and employment in 12 municipalities in Lapland in 2011].

5. The PAN Parks certificate is awarded to extensive wilderness-like protected areas that successfully combine nature conservation and sustainable nature tourism. *www.panparks.org*

6. Jokinen, M. & Tyrväinen, L. (2013). Can We Predict with Tourist Opinions? *http://www.metla.fi/hanke/7451/pdf/13052013-jokin en-ja-tyrvainen.pdf*. Accessed 20 February 2014.

7. For example in Finland, this has led to the closing of the Kemijärvi pulp mill - a very important employer in the local area

8. Sarkki, S. & Rönkä, A. R. (2012). Neoliberalisations in Finnish Forestry. Forest Policy and Economics 15, 152–159

forestry as self-evidently the most profitable form of land use is changing. Over the past two decades, both the number of tourists and the economic benefits of tourism have risen, while at the same time reindeer herding and nature conservation have gained more attention from policy-makers and the public. Sometimes this leads to conflicts between forestry and other activities, with forestry losing its earlier dominant position (e.g. the case of Inari, Figure 8.1.). In Finland many forest disputes in the period 2000-2010 were resolved in favour of nature conservationists, reindeer herders and tourism entrepreneurs, resulting in a decline in the area of forest that can be used for industrialised forestry.[9,10]

8.3.3 Renewable Energy

Demand for wind power is anticipated to rise in the European Arctic due to the EU targets for renewable energy.[11] Wind power development plans often encounter resistance among local people due to the resulting changes in the landscape and possible effects on eco-tourism. Wind power installations also disturb reindeer herding. The construction of hydroelectric power plants has changed the landscape and affected land use in the European Arctic. However, environmental policies (including Natura 2000) and a shift in public attitudes concerning hydropower (due to better understanding of the impacts in the 1970s and 1980s) have prevented construction of new hydropower plants and may even lead to a reduction in the current hydropower capacity.[12] The situation is different in Greenland where hydropower investments are key development priorities: as a way to provide power for isolated Greenlandic communities and reduce carbon dioxide emissions from diesel-fired power stations, but possibly also to encourage development of energy-intensive industries (as is for example the case with existing or planned aluminium smelters in Iceland and Greenland).

8.3.4 Reindeer Husbandry

Reindeer herding is believed to be a flexible activity that can co-exist with other land-use activities. In practice, however, this has usually meant that reindeer herders have had to move to other grazing sites. The landscape of northern Fennoscandia might appear to be empty at first glance, but in fact the land is divided between reindeer herding districts where the animals graze and migrate between winter and summer pastures. Mining, oil and gas extraction and large-scale forestry have reduced the size of available pasturelands for reindeer husbandry. In Sweden and Norway reindeer herding is strongly connected to Sámi culture and practiced exclusively by the Sámi (in Finland it is practised by both Finns and the Sámi). Reindeer herders use traditional summer and (critically important) winter pastures that the family/village have used for generations (Picture 8.3.). Land-use changes can result in the fragmentation of pastures or disturbance to calving and culling areas and reindeer migration corridors.

Picture 8.3: *Traditional Sámi Reindeer Herder Summer Camp, Skuolla, Sweden*

Photo: Carl-Johan Utsi.

One commonly debated issue in all Nordic countries is predator management, regulatory protection and reindeer killed by wolves, wolverines, lynxes, golden eagles and brown bears. Reindeer herders have adapted to climate change and EU policies (e.g. regulations on reindeer meat production and slaughtering), but they cannot adapt to the increasing numbers of reindeer killed by predators (in Finland, the number grew 2.5-fold between 1995 and 2007, with some cooperatives losing 60-70% of calves).[13] The government pays compensation for the killed reindeer, but that does not cover benefits for clothing and handicrafts and the additional time and costs incurred by herders when searching for reindeer carcasses. Overall, the reduced freedom of action resulting from loss of habitat, predation and legal constraints is having a more negative impact on reindeer herding than climate change.[14]

9. Sarkki, S. & Heikkinen, H. (2010). Social Movements' Pressure Strategies during Forest Disputes in Finland. Journal of Natural Resources Policy Research 2(3), 281–296.

10. Sarkki, S. & Karjalainen, T.P. (2012). Science and Issue Advocacy in a Forest Debate in Finland. The Polar Journal 2(1), 125 – 138

11. In the European Arctic, especially in Finland and Norway, the amount of wind power produced annually is very low (Finland: 447 megawatts (MW) in 2013, Norway: 703 MW in 2012) compared to Sweden and Denmark (over 4 000 MW in 2013).

12. Energiateollisuus, *http://energia.fi/energia-ja-ymparisto/energiala hteet/vesivoima*, Accessed 12 March 2014.

13. Vuojala-Magga, T. (2012). Adaptation of Sàmi Reindeer Herding: EU Regulation and Climate Change. In Tennberg, M. (Ed.), Governing the Uncertain: Adaptation and Climate in Russia and Finland (101-122), Springer Science+Business Media B.V.2012.

14. Tyler, N. J. C., Turi, J. M., Sundset, M. A., Strom Bull, K., Sara, M. N., Reinert, E., Oskal, N., Nellemann, C., McCarthy, J. J., Mathiesen, S. D., Martello, M. L., Magga, O. H., Hovelsrud, G. K., Hanssen-Bauer, I., Eira, N. I., Eira, I. M. G. & Corell, R. W. (2007). Sámi reindeer pastoralism under climate change: Applying a generalized framework for vulnerability studies to a

Sámi Perspective on Mining – Case of Gállok

A key political issue regarding the interaction between mining and land use in the Nordic countries concerns the rights of the Sámi. Gállok (Kallak), an area in Jokkmok municipality in northern Sweden, became globally known in 2013 when Sámi and environmental activists demonstrated against iron ore mining (Picture 8.4.).

The case of Gállok demonstrates the challenges of balancing mining, nature-based livelihoods and the rights of indigenous peoples. In Gállok, the environmental concerns include pollution caused by mining to ground and fresh water. The main issue, however, is Sámi reindeer herding. The mining site is not vast, but combined with the infrastructure, transport vehicles, dust and noise it could have serious negative impacts on reindeer herding and Sámi culture. If the mine is opened, the migration route and utilisation of winter pastures will be endangered for three Sámi reindeer co-operatives (Sameby) and hundreds of families and households.

Even when consultation among the local people and Sámi has been conducted, there have been differences in opinion on how open the dialogue has been and whether Sami and their culture and livelihood have been taken into account by the municipality and other stakeholders in question. Open dialogue, collaborative learning and transparent governance are cornerstones of environmental conflict management and the reconciliation of mining and other land uses. Sometimes these procedures do not work and there is no true sustainable way to integrate different interests and land-use activities. Ore deposits and winter pastures are not transferable. In the case of Gállok, the socially and culturally sustainable co-existence of mining and reindeer herding might not be possible.

Picture 8.4: *Local People and Sámi Demonstrating against the Planned Mining Activities at Gállok in Summer 2013. Photo: Carl-Johan Utsi.*

8.3.5 Nature Conservation

Nature conservation does not as such put pressure on land use, but it significantly affects land use and all the activities discussed above. Arctic biodiversity is an irreplaceable cultural, scientific, ecological, economic and spiritual asset. However, climate change, industrial development, pollution, local disturbances and invasive species already affect the Arctic, and it is anticipated that the impacts from these stressors will be even greater in the future.[15]

The challenges for biodiversity are substantial, including habitat fragmentation and degradation. Construction of roads, railroads, pipelines, drilling and mine sites, and dams cause fragmentation of the landscapes and habitat losses, with major effects on biodiversity and hydrology. Habitat fragmentation can adversely affect species distribution and abundance, as well as nature-based livelihoods.

The expansion of industrial activity in the Arctic may also increase the local sources of pollution, waste, sewage and black carbon.[16] These risks to the environment affect human health as well as food and water security.[17] People (both indigenous and non-indigenous) in the Arctic have a unique relationship with nature, including the subsistence use of forests (e.g. berry and mushroom picking) and terrestrial and fresh water resources (e.g. hunting and fishing). A significant proportion of the local diet is derived from these traditional sources; thus, if land and water were to be contaminated, food safety would be at risk.

sub-arctic socio-ecological system. Global Environmental Change 17, 191-206

15. Conservation of Arctic Flora and Fauna (CAFF). 2013. Arctic Biodiversity Assessment: Report for Policy Makers. CAFF, Akureyri, Iceland.

16. Conservation of Arctic Flora and Fauna (CAFF). 2013.

17. Nilsson, L. M., Berner, J., Dudarev, A. A., Mulvad, G., Odland, J. O., Parkinson, A., Rautio, A., Tikhonov, C. & Evengård, B. (2013). Indicators of food and water security in an Arctic Health context – results from an international workshop discussion. Int. J Circumpolar Health 72: 21530 – *http://dx.doi.org/10.3402/ijch.v72i0.21530.*

Table 8.1. Land-Use Pressures, Drivers and Impacts in the European Arctic

Land-Use Pressure	Main Drivers	Environmental Impacts	Social Impacts	Economic Impacts
Forestry and wood-based small and medium-sized industries A major land-use activity in the north.	Demand for timber, which is expected to increase in step with the demand for green energy. Northern regions of Finland, Sweden and Norway have 20 million hectares of forest.	Changes in landscape, decreased biodiversity, habitat destruction and fragmentation. Reduced nature values and impacts on water quality. Increased monocultures.	Importance for local livelihoods and multi-use of wood. Decrease in reindeer pasture areas and potential effects on reindeer husbandry culture. Decrease in ecotourism areas and subsistence use of forests. Negative impacts from clear-cutting on the mental well-being of local inhabitants.	More employment opportunities (including renewable wood-based products and handicrafts). increased spending. Increased tax revenues. Increased infrastructure (e.g. roads). This also has negative impacts, as a decrease in reindeer grazing lands leads to lower production in reindeer herding. Also has negative impacts on ecotourism.
Nature Conservation Expansion of protected areas. Species protection.	Increased environmental awareness and NGO actions. Local, national and international policies and agreements.	Sustain biodiversity and habitats. Increase populations of big predators.	Increased human well-being of local people (cultural significance of land, subsistence use of forests such as berry and mushroom picking, which are “everyman’s rights” in Finland and can be performed in protected areas as well). Increased nature-based tourism and recreational use of lands. Also has negative impacts, e.g. in Finland where the number of predators has increased so much that wolves and bears come to settlements and people are afraid to go outside of their homes. (The problem is not so great in other European Arctic countries.)	Loss of reindeer to predators, leading to lower economic growth. Decrease in areas used for forestry and wood-based industry. Increase in cultural ecosystem services (e.g. tourism) and economic ecosystem services.[18]
Renewable Energy Development of wind and hydropower plants.	Environmental regulations. Local, national and international policies. Demand for sustainable energy.	Decreased biodiversity, habitat destruction and fragmentation. Disruption of migration paths.	Negative effects on reindeer husbandry and nature-based tourism.	Public costs of infrastructure. More employment opportunities. Increased tax revenues.
Tourism Expansion of tourism: more people, more places, more infrastructure.	Demand for winter and ecotourism in particular. Local economies are dependent on tourism (in some regions in Finland almost 50% of local income comes from tourism).	Increased air and land traffic and tracks (e.g. snowmobiles, mountain bikes), noise, land erosion, wastes, pollution. Disturbance to reindeer and wildlife.	Demographic change: seasonal workers; shifts in social structure in rural communities, potentially leading to social problems. Job opportunities, increased services. Decelerated migration of local people.	Increase in local employment and economy. Increased use of public services (e.g. health care, airports). Investments by the government and private sector. Increased tax revenues. Increase in demand for local food products and wellness products.

18. Definition of ecosystem services by the United Nations 2005 Millennium Ecosystem Assessment (MA): ecosystem services are grouped into four broad categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits.

Land-Use Pressure	Main Drivers	Environmental Impacts	Social Impacts	Economic Impacts
Mining: Expansion of mining activities.	Global market demand for minerals. Economic development policies.	Changes in the landscape, water and ecosystem. Potential pollution. Biodiversity, habitat, migratory route changes. Reduced nature values and possible biodiversity losses.	Severe negative effects on reindeer herding and Sámi culture with loss of employment opportunities, especially in Sweden and Norway. Potential negative effects on tourism. Demographic change: influx of foreign workers; shifts in social structure in rural communities. Job opportunities, skills transfer, increased services. Big differences between the regions.	Local employment and increased spending. Investments by the government and private sector. Increased tax revenues (note: this varies considerably among areas and mines). Boom and bust cycles. Decreased tourism and reindeer husbandry and other traditional livelihoods, leading to economic losses.
Reindeer Husbandry: In Sámi regions in Sweden and Norway, only Sámi people can practice reindeer herding. In Finland, Finnish people can also practice reindeer herding.	Sustaining culture and traditional livelihoods in herding in Sámi areas as well in other areas where reindeer husbandry is practiced.	Changes in grazing areas, habitat losses and fragmentation. Increased land erosion via overgrazing and damage to land from all-terrain vehicles. Loss of biodiversity.	Traditional livelihoods support local, cultural and ethnic identity and keep remote communities alive. Threat of loss of traditional lifestyles affects cultural identity and peoples' well-being, especially in Sámi areas.	Household dependence on traditional livelihoods. Supports tourism. Subsistence costs of predator losses.
Transport: Development of new infrastructures and transport routes, railways (e.g. growth in land-based transportation due to increased cargo shipping on the Northern sea route).	Demand for new transport infrastructure for mining, tourism and other activities.	Biodiversity losses and habitat fragmentation. Increased noise. Increased accessibility to remote places. Reduced nature values. Search and rescue and disaster prevention in coastal and harbour areas.	Supports new settlements and migration, which affects needs for schools, housing, jobs, social life and well-being.	Economic stimulation. Public costs of infrastructure. More employment opportunities. Increased tax revenues.
Agriculture (excluding reindeer husbandry), sheep husbandry (especially in Iceland)	Maintaining the national heritage of sheep farming in Iceland.	Land and water pollution due to use of fertilisers, herbicides and pesticides. Land erosion and loss of biodiversity and habitat fragmentation caused by overgrazing by sheep.		Income from exporting lamb meat and other agricultural products.
Freshwater fishing and fish farming (in lakes in Finland and fjords in Norway)	Demand for fish due to overfishing of wild fisheries.	Nutrient pollution increased by fish farms, decreases in wild fish stocks (for example, salmon in Norway).	Mental well-being (recreational fishing and livelihood).	Increased economy and employment, but can also have the opposite effect, as fish farming can cause losses of wild fish stocks.
Subsistence use of forests (e.g. berry and mushroom picking)	Tradition.	Hunting and fishing may disturb population dynamics.	Increased health and well-being, both mental health and healthy food consumption.	Increased income for local people and foreign workers (companies import workforce from countries with "cheap labour") and local companies producing berry products and exporting mushrooms (For instance, Boletus edulis mushrooms are exported from Finland to Italy).

8.4 Governance of Land Use in the European Arctic

Governance affecting land-use activities and their interactions is very broad, and only the most important aspects in relation to conflicts and cumulative impacts are discussed here.

Environmental impact assessments (EIAs) are one of the key tools for understanding and communicating the implications of new developments, and may create a basis for dialogue between various land users. They include formal procedures for examining the impacts of a project as well as identifying alternatives and mitigation measures. However, the effectiveness of EIAs varies in different countries. Ideally, an EIA should examine social aspects (as in Finland) or be accompanied by a separate social impact assessment (as in Greenland).

While various activities may be manageable individually, considered together they may result in substantial environmental, social and economic changes or disruption, especially in the fragile and slowly recovering Arctic environment. It is important to take into account the cumulative impacts from historical, ongoing and planned activities, as well as global factors such as climate change.

Social impacts are also cumulative and should be assessed for each new project, both within EIAs and in spatial and land-use planning. Strategic environmental or integrated (including social and economic aspects) assessments serve this purpose. Broader frameworks for impact assessments include instruments such as the Espoo Convention[19] (for transboundary impact assessment) or the much less known Arctic Environmental Protection Strategy's (AEPS) Arctic EIA Guidelines.[20]

Recently, voluntary governance mechanisms exceeding legal requirements have emerged. In the mining industry, much attention has been given to the notion of a "social licence", which is often acquired by companies exceeding the legal requirements regarding matters such as stakeholder participation. Tourism and forestry companies develop industry standards or eco-labels.

Governance tools for interaction between the various land-use forms include local land-use planning, participatory resource planning and compensation schemes. International mechanisms for protection of Arctic biodiversity include the Barents Protected Areas Network (BPAN) project[21], an ongoing process under the Convention on Biological Diversity to facilitate the description of ecologically and biologically significant areas in the Arctic.

8.5 Outlook to 2030

Given that mining activities are expected to increase in the Arctic region (see Chapter 7), it is anticipated that new conflicts will emerge and eventually policymakers will be forced to comprehensively address these challenges. Incidents like the Gállok mine conflict (see textbox) have highlighted the issue of Sámi land rights and indigenous rights. This may lead to a decrease in mining activities in Sámi areas in the future. If not, the future of Sámi reindeer herding is uncertain, especially in Sweden. In the light of the multiplicity of pressures from other activities and policies, reindeer pastures, the subsistence use of forests and water supplies, as well as associated aspects of local culture could be degraded or lost. Another key uncertainty for reindeer husbandry is the impact of future policies regarding predators.

Tourism is expected to either stay stable or increase due to globalisation. However, there might even be adverse effects due to economic recession and climate change. The types of tourism activities are difficult to predict, whether they will be mass tourism, e.g. in ski resorts, or more expensive and specifically tailored nature-based tourism, or both. As Arctic tourism is heavily dependent on snow and ice conditions, the unpredictable conditions caused by climate change may adversely affect the industry's growth potential. On the other hand, however, climate change impacts on competitive locations in Europe may be higher than in the North.

The forestry sector will face uncertainties in the future. These are related to increasing pressures to protect nature, an increased demand for renewable energy and biofuels, the relocation of pulp production, the development of certification systems for forestry, and the views of local and regional actors concerning the benefits gained from the sector.

Conflicts due to numerous land-use pressures are expected to continue and may become increasingly difficult to resolve if indigenous rights are not acknowledged and participatory processes are not implemented.

19. Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991) – the "Espoo Convention".

20. Arctic Environmental Protection Strategy (AEPS, predecessor of Arctic Council), Guidelines for Environmental Impact Assessment in the Arctic. Finnish Ministry of Environment, 1997.

21. Barents Protected Areas Network project, *http://www.bpan.fi/*. Accessed 23 February 2014.

8.6 EU Policies Relevant to Arctic Land Use

The EU has no direct authority regarding land-use planning in the Arctic. However, EU policies and regulations have influence on the discussed activities relevant for Arctic land use.

8.6.1 Tourism

A variety of EU measures to facilitate transport connections and mobility, particularly for air transport (e.g., low-cost airlines benefit from the liberalisation of EU air space and common EU rules for air passenger rights), have had a positive impact on the expansion of tourism in remote European Arctic locations.[22] As the current rapid growth of the tourism industry is to a great extent due to Russian travellers,[23] the increasingly remote possibility of a visa-free regime between the EU/Schengen countries and Russia could lead to a significant growth in the number of Russian tourists in Fennoscandia and the development of the tourism infrastructure.

8.6.2 Forestry

Despite the absence of a common forest policy, the EU has attempted to facilitate sustainable forest management through policies or funding mechanisms focused on rural development, employment, climate change, energy, water and biodiversity.[24] In the latest EU Forest Strategy released in 2013,[25] the European Commission underlines the need for securing wood supplies, managing forests in a sustainable way and ensuring that forest-based ecosystem services are not adversely affected by climate change impacts. If implemented, this approach may be of importance for livelihoods dependent on forests, in particular, reindeer herding.[26] The European Commission has made efforts to advance negotiations on legally binding agreements on the management of forests in Europe, including on issues such as ecosystem services provided by forests, illegal logging, monitoring and reporting.[27] This agreement, especially if adopted by Russia, would be of major relevance to the forestry industry in the European Arctic.

8.6.3 Renewable Energy

The EU has set the target of obtaining 20% of its energy from renewable sources by 2020 (Directive 2009/28/EC, which has EEA relevance) and 27% by 2030.[28] This goal facilitates renewable energy development as well as research. Given that Nordic states are close to reaching their national goals[29] and the 2030 EU target may not be translated into binding national targets,[30] the development of renewables could be facilitated by a variety of existing measures, established or encouraged by EU legislation,[31] rather than the EU targets as such.[32] Due to the importance of forestry in Fennoscandia, regulations related to biomass energy are relevant for the European Arctic. Here, EU policies encourage the development of biofuels and biomass for primary energy consumption, heating and transport.[33]

8.6.4 Transport

EU transport policy promotes inter-modality and accessibility. By supporting the interconnectedness of remote regions with economic centres, the EU may influence infrastructure developments resulting in direct impacts of supported projects as well as long-term trends in changes in land use driven by improved accessibility.

22. The number of European tourists has been rising since the 1990s with tourists primarily from Germany, France, the United Kingdom, Spain and the Netherlands. (Figures for Finnish Lapland).

23. See: e.g. the Tourism Strategy of Lapland, Regional Council of Lapland website *http://www.lappi.fi/lapinliitto/c/document_library/get_file?folderId=349619&name=DLFE-9598.pdf*. Accessed 15 January 2014. Statistics of tourism in Finnish Lapland available at *http://www.lappi.fi/lapinliitto/julkaisut_ja_tilastot/matkailu*. Accessed 5 February 2014.

24. European Commission (2013). Staff Working Document, SWD (2013) 342 final (for the document COM(2013) 659 final: A new EU Forest Strategy), Brussels, 20.9.2013. *http://ec.europa.eu/agriculture/forest/strategy/staff-working-doc_en.pdf*. Accessed 7 February 2014.

25. European Commission (2013). A new EU Forest Strategy: for forests and the forest-based sector. Commission Communication. COM(2013) 659 final. *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0659:FIN:en:PDF*. Accessed 7 February 2014.

26. This is the primary example, including the conflict over logging in Inari before 2010/2011. See the Sami Council's position on the issue at: *http://www.saamicouncil.net/files/20051116181056.pdf*. Accessed 7 February 2014.

27. Ministerial Conference on the Protection of Forests in Europe, *http://www.foresteurope.org/en/LBA*. Accessed 7 February 2014.

28. European Commission, *http://ec.europa.eu/clima/policies/2030/index_en.htm*. Accessed 29 January 2014.

29. Renewable energy in 2011 accounted for 31.8% of energy produced in Finland (90% of energy produced regionally in Lapland), Finland's 2020 national target is 38%; 46.8% in Sweden (2020 target - 49%); 65% in Norway (2020 target - 67.5%). See: Eurostat data on the share of energy from renewable resources, *http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/data/database*; International Energy Agency (2013), Key World Energy Statistics 2012, *http://www.iea.org/publications/freepublications/publication/kwes.pdf*

30. A final decision had not been taken as of time of publication of this report. European Commission, *http://ec.europa.eu/clima/policies/2030/index_en.htm*. Accessed 29 January 2014.

31. Such measures include: EU funding for research and development of renewable energy technologies and energy transport, investment in trans-European energy networks, energy market integration, instruments such as targeted private equity funds supported by the European Investment Bank, as well as projects (within cohesion policies) on renewable energy generation in remote communities or sharing experiences in wind power development with Russia. Northern Periphery Programme, *http://www.northernperiphery.eu/en/projects/show/&tid=71*. Accessed 27 January 2014. The project involves partners from Finland, Sweden, Iceland and the Faroe Islands. Projects Polar Wind and Polaris. Partnership Northwest Service Centre, *http://www.fsc.net.ru/content4*. Accessed 2 February 2014.

32. European Commission, Renewable Energy Progress Report, COM(2013) 175 final, *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0175:FIN:EN:PDF*. Accessed 30 January 2014.

33. Directive 2003/30/EC of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport, including progress reporting. See also European Commission, The Renewable Energy Progress Report, Communication, COM(2009) 192 final, Brussels, 24.4.2009; European Commission, Biomass Action Plan, Communication, COM(2005)628.

Environmental regulations relevant to transport are expected to influence modes and patterns of transport in the north.[34] One example is the planned railway connecting Finnish Lapland with the Norwegian coast (Figure 8.1.), which would be used as the main bulk cargo transport route, replacing the marine route from the Baltic Sea (which is an Emission Control Area for sulphur under MARPOL[35]). According to the industry, due to the lower limit for sulphur content in marine fuels (after 2015, 0.1% compared to 1% currently and 0.5% after 2015 outside of emission control areas, e.g. in the Barents Sea), transport will become too costly. The EU Directive 2012/33/EU[36] implements MARPOL limits within the EU (Finland has declined to accept the MARPOL amendment but is bound by EU legislation).

8.6.5 Reindeer Husbandry

The concerns of the Sámi and reindeer herders highlight the need for the EU biodiversity and conservation framework to better take into account reindeer herding. Predators (protected within biodiversity frameworks) are perceived as one of the main threats to the sustainability of reindeer herding.

In the timeframe since Finland became a member of the EU, the number of large predators has increased.[37] However, the outcomes depend largely on national legislation, as the management and policy regarding big predators is different in Sweden. Noticeably, some stakeholders (e.g. environmental non-governmental organisations driven by general environmental principles) are supportive of the EU biodiversity framework, including the protection of predators.

Stakeholders representing reindeer herding or small fisheries emphasise that their livelihoods should be supported also within the EU framework (including indigenous rights). Several EU territorial co-operation projects already respond to this need. However, traditional livelihoods are not taken up strongly in environmental policies, transport frameworks or strategies referring to mining or forestry.

8.6.6 Nature Conservation and Biodiversity

Changing land use and the cumulative impacts of various activities are among the main threats to biodiversity.[38]

The European Commission has adopted the EU Biodiversity Strategy to 2020, aimed at halting the loss of biodiversity and improving the state of Europe's species, habitats, ecosystems and the services they provide. A biodiversity strategy is being integrated into major EU policy frameworks.[39]

So far the European Commission has had a limited presence in the Arctic Council's biodiversity work (e.g. Arctic Biodiversity Assessment). Although the Commission is a full member of the Barents Euro-Arctic Council, its representatives have not participated, for example, in the meetings of the Working Group on the Environment, which is in charge of the Barents Euro-Arctic Council's projects related to biodiversity, such as the Barents Protected Areas Network (BPAN) and the Green Belt of Fennoscandia.[40] However, both projects have been on the agenda of recent EU-Russia environmental dialogue meetings, which could lead to concrete outcomes if continued in the future.[41,42]

The most important EU environmental regulations affecting Arctic land use are the Natura 2000 network of protected sites and associated Habitats and Birds Directives (Council Directive 92/43/EEC and Directive 2009/147/EC).[43] This framework is also relevant for the indigenous rights of the Sámi in the north of Sweden and Finland, as it provides additional protection for many habitats that are also used for traditionally practiced nature-based livelihoods, such as reindeer herding or fishing. As these areas are considered to be of importance for the whole EU, possible and actual significant damages to designated sites can be addressed by the European Commission and EU courts. Consequently, major industrial developments may be limited in these areas. On the other hand, the same legislative framework protects predators, the numbers of which have grown significantly in the past few decades, resulting in increased loss of reindeer. However, national regulations in Finland and Sweden are critical for these two dimensions of Sámi rights, as well as for other inhabitants practicing nature-based livelihoods.

Regulations such as the Waste Framework Directive

34. See: Joint Barents Transport Plan 2013 (September 2013). http://*www.barentsinfo.fi/beac/docs/Joint_Barents_Transport_Plan_2013.pdf.* Accessed 4 February 2014.

35. International Convention for the Prevention of Pollution from Ships and 1978 Protocol (MARPOL 73/78), 1340 UNTS 184, 12 ILM 1319 (1973). Entry into force: 1982 (Annexes 1 and 2).

36. Directive 2012/33/EU of 21 November 2012 amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels.

37. For example, a recent inventory of lynxes counted over 2500 individuals whereas in 1978 the number was about 100. RKTL. Finnish Game and Fisheries Institute. *http://www.rktl.fi/*. Accessed 18 November 2013.

38. European Commission, *http://ec.europa.eu/environment/interna tional_issues/relations_russia_en.htm*. Accessed 7 February 2014.

39. EU Biodiversity Strategy to 2020, European Commission, *http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm*. Accessed 29 January 2014.

40. Other relevant BEAC projects include: ecotourism and protected areas; conservation of the last pristine forests in the Barents Region; effects of climate change on biodiversity and ecosystem services in the Barents Region; and wetlands – conservation and ecosystem services, *www.syke.fi.*

41. European Commission, *http://ec.europa.eu/environment/international_issues/relations_russia_en.htm*. Accessed 7 February 2014.

42. See: Annual Report of the Working Group on Environment (Barents Euro-Arctic Council) (January 2014), *http://www.barentsinfo.fi/beac/docs/WGE_Annual_Report_2012_2013.pdf*. Accessed 6 February 2014.

43. Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora; Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the codified version of Directive 79/409/EEC as amended).

(Directive 2008/98/EC) and the Water Framework Directive (Directive 2000/60/EC, WFD), which aim to improve the status of European water bodies by 2015, have direct implications for land use.[44] In the course of implementing the WFD, EU/EEA member states have adopted river basin management plans. The adopted basin-based approach may contribute to good governance of activities within river basins also in the European Arctic.[45]

8.6.7 EU Frameworks Relevant for Managing Conflicting Activities

The EU framework for environmental and strategic impact assessment (Directive 85/337/EEC [2011/92/EU] and Directive 2001/42/EC) creates an important framework for common standards, applicable throughout Fennoscandia, such as by ensuring that certain projects are obliged to undergo an environmental impact assessment (EIA). The EIA framework is currently being amended. Some stakeholders have expressed concerns that the scope of its applicability might be too broad and it would place a bureaucratic burden on private actors. At this stage, it is unclear if and how an amendment would contribute to addressing specific Arctic challenges and improving the assessment of cumulative impacts. The EU's dialogue with Russia regarding Russian ratification of the Espoo Convention[46] (and its Kiev SEA Protocol) is of significance for the Barents region, as it would create a common binding framework for trans-boundary impact assessments.

The EU does not have competence regarding spatial planning, but some initiatives exist, like the European Spatial Development Perspective (1999) promoting exchange of regional experiences. More practically, the INSPIRE Directive establishes an infrastructure for spatial information in Europe to support environmental policies and policies/activities having environmental impacts.[47]

Although the European Union supports indigenous (and in particular Sámi) rights on a declaratory level, there are virtually no Arctic-relevant provisions addressing the issue of land rights in the above-listed EU policies affecting land use. For example, land-use rights within the framework for renewable energy and indigenous rights violations in forestry management are primarily applicable to biofuels and timber imported from developing states.[48]

8.7 Critical Factors for EU Decision-making

The critical factors identified by stakeholders and developed by the report authors highlight the importance of taking into account the opinions of the local people and the socioeconomic impacts of various existing and planned activities.

8.7.1 Human Well-being and Social Sustainability

The concept of human health and well-being is a combination of physical and mental health, in which efforts to sustain the culture, language and traditional way of life are indispensable elements. Therefore, any action that disrupts normal daily life can have effects on health and well-being. Food and water supplies are fundamental to life and can be altered by climate change or human activities (e.g. pollution, contaminants and access to food supplies).[49] Land-use activities should not risk human health and well-being and therefore social sustainability should be taken into account in policy-making.

8.7.2 Public Participation

The role of stakeholders in the environmental planning process as well as their opportunities to influence decisions relevant to land use has expanded in recent years. Participatory management planning for national parks is a good example, with a greater role being played by local tourist enterprises and reindeer herders. Yet, critics question whether the existing participatory processes provide genuine possibilities for influencing decision-making. Various stakeholders emphasise different values: while non-governmental organisations (NGOs) advocate for environmental values, locals underline the community's economic development.[50]

Addressing cumulative impacts and the possibility of social conflicts requires open, inclusive and democratic conflict- and problem-solving mechanisms and partnerships. Social and environmental assessments alone are not sufficient. Participation from the public, private and voluntary sectors based on mutual respect is necessary if ecologically balanced and economically and socially sustainable developments are to be achieved.

Challenges include: power relations between various

44. European Commission, *http://ec.europa.eu/environment/international_issues/relations_russia_en.htm*. Accessed 7 February 2014.

45. See European Commission Report at *http://ec.europa.eu/environment/water/water-framework/pdf/COM-2012-670_EN.pdf*. Accessed 6 February 2014.

46. Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991) - the Espoo Convention.

47. More at *http://inspire.ec.europa.eu/*. Accessed 17 February 2014.

48. European Commission. Staff Working Document for Renewable Energy Progress Report. SWD(2013) 102 final, *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0175:FIN:EN:PDF*. Accessed 3 February 2014; European Commission, Staff Working Document SWD (2013) 342 final.

49. Nilsson, L. M. & Evengård, B. (2013). Food and water security indicators in an Arctic health context. A report by the AHHEG/SDWG, and the AMAP/HHAG during the Swedish chairmanship of the Arctic Council 2011-2013. Publications from Arctic Research Centre no. 1. Umeå University.

50. Sarkki, S. (2011). The Site Strikes Back: Multi-level forest governance and participation in northern Finland. PhD thesis. Thule Institute & Discipline of Anthropology, University of Oulu, Finland. Acta Universitatis Ouluensis B 102.

stakeholders; the human and resource capacity of social actors to take part in the consultation process; the clarity of interconnection between consultation/participation and decision-making and the possible participation overload, as is sometimes the case with the Sámi parliaments in Fennoscandia).[51]

8.7.3 Indigenous Peoples' Rights

Decision-makers need to acknowledge the indigenous people's connection to traditional lands as activities affecting land use can have adverse effects on the culture and identity of indigenous people. Cultural pressures can bring about negative social impacts, such as rising rates of school drop-outs, substance abuse and suicide, all of which are major challenges among indigenous youth.[52]

Finland and Sweden have not ratified the 1989 ILO Convention No. 169[53] yet, as in both countries there is an ongoing discussion about Sámi rights to land. The issue of access to land and waters and land ownership is important for all traditional livelihoods, but it is perhaps most clearly evident in the case of reindeer herding. International indigenous legal instruments may be helpful in decisions on land rights and in setting up participatory processes.[54] For example, the provisions of the ILO 169 put obligations on states in this regard.

8.8 Recommendations

The recommendations have been developed by the report authors, taking the ideas proposed by stakeholders during the assessment process as a starting point.

8.8.1 Increase Knowledge Generation and Sharing

The EU plays a major policy role in the European Arctic with its degree of influence depending on the particular locality and issue. Therefore, both in general and in the context of EU policy-making, there is a need for more knowledge on local issues, culture and livelihoods. Facilitating knowledge exchange between regions, providing tools for collaborative research and developing formal and stakeholder engagement tools would increase knowledge sharing and the quality of decision-making, including cohesion between policies at different levels of governance. Without knowledge on how people use the land, including reindeer herding, subsistence use of forests, hunting and all aspects of daily life, it is impossible to assess the impacts of new initiatives. Thus, new governance structures should be developed and implemented for connecting stakeholders, European and national policy-makers, thereby allowing Arctic stakeholders to participate more effectively in the decision-making (and consultation) processes. The EU European Arctic Information Centre (EUAIC) is one option to facilitate such better participation.

8.8.2 Include Social Impact Assessment More Effectively in the Environmental Impact Assessment Process

In northern Finland a recent survey showed that local tourism entrepreneurs had little trust in the EIA conducted for planned mining activities in the region. The main reason for this mistrust is that the EIA is carried out by companies or by consultants hired by companies themselves.[55] Social impact assessments are often not conducted or their role in the EIA process and reports is minor.[56] Therefore, in order to carry out a reliable social impact assessment, international principles and guidelines should be followed in EIA processes throughout Europe. Here, the EU could take leadership, or, to a limited extent, a regulatory role. Internationally, the European Commission should continue to encourage Russian authorities to ratify the Espoo Convention.

Strategic environmental or integrated (including social and economic aspects) assessments are crucial governance tools. The EU is currently working on amending its EIA directive with the possibility of raising the importance of social impacts. This is important, especially for sparsely populated areas and to address the cumulative impacts of activities that require large land areas.

51. Stepien, A., Koivurova, T., Gremsperger A. & Niemi, H. (2014). Arctic Indigenous Peoples and the Challenge of Climate Change, in E. Tedsen, S. Cavalieri & R. Kraemer, Arctic Marine Governance: Opportunities for Transatlantic Cooperation. Dordrecht: Springer.

52. Arctic Council, SDWG Highlights Open Discussion Session in Gällivare, Sweden, 2012.

53. International Labour Organization (ILO) Convention no 169 concerning Indigenous and Tribal Peoples in Independent Countries (Geneva, 76th ILC session (27 Jun 1989); Entry into force: 5 Sep 1991).

54. Raitio, K. (2008). "You Can't Please Everyone" - Conflict Management Practices, Frames and Institutions in Finnish State Forests. PhD thesis. University of Joensuu.

55. Jokinen, M. (2014), Hannukaisen kaivos ja matkailu (Hannukainen mine and tourism). *http://www.metla.fi/hanke/7451/pdf/Matkai lun%20kehitysnaky-mat_seminaari_17.2.2014.pdf.* Accessed 26 February 2014.

56. Suopajärvi. L. (2013). Social impact assessment in mining projects in Northern Finland: Comparing practice to theory, Environmental Impact Assessment Review, 42, 25-30.



Chapter 9

SOCIAL AND CULTURAL CHANGES IN THE EUROPEAN ARCTIC

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Key Messages:

- Social development in the region is characterised by generally growing, often highly innovative Arctic cities and thinning-out rural areas that face demographic and resource challenges.
- Dependence on extractive/primary industries and support from national budgets to a great extent shapes socioeconomic development.
- Accessibility and connectivity, especially intra-regional and cross-border, are among the key concerns.
- Indigenous peoples experience the challenges faced by all Arctic inhabitants in a distinct manner. These challenges need to be addressed in the light of indigenous peoples' rights.
- Various EU programmes in the North are well-aligned with the needs identified by regional actors, primarily because decision-making takes place at the local/regional level.

Recommendations to the EU:

- Give a voice to Arctic communities in policy developments that may affect them.
- Support entrepreneurship and innovation with sensitivity to indigenous youth and gender issues.
- Invest in intra-regional accessibility and connectivity.
- Consider the special needs of Arctic cities in relevant EU policies and programmes.

"In the Arctic and Northern regions people possess particular knowledge of the reciprocal relationship between humans and nature. The knowledge [regarding this relationship] could be one of the aspects to be protected and supported."

Researcher, Finland

"Contemporary art and education [should be supported], not so much heritage and traditional forms of culture. I don't want the north to be a museum."

Culture entrepreneur, Sweden

"The EU could support cultures and societies in the Arctic by informing and enlightening European citizens about the cultural differences and way of living in the Arctic compared to other European cultures."

Environmental NGO, Denmark

"As long as it is as expensive to set up a business in Jokkmokk as in Malmö, there will always be less reason to carry the extra costs of being in a remote area."

Tourism researcher, Finland

The quotes come from respondents to the online questionnaire – an element of the consultation process within the 'Strategic Assessment of Development of the Arctic'

Chapter cover image: Tromsø, Norway in winter.
Photo: GettyImages

9.1 Introduction

This chapter discusses selected social and cultural trends in the European Arctic. Arctic cultures are characterised by high resilience and adaptive capacity, but aspects of social change have been challenging.[1] Peripherality is an important feature of the region. The presence of indigenous peoples distinguishes the North from the rest of Europe.

9.2 Key Sociocultural Trends in the European Arctic

9.2.1 Complex Demographic Trends and Urbanisation

Demographic trends in the European Arctic are significantly influenced by migration – north-to-south and rural-to-urban – and the influx of people seeking work in the resource extraction and services sectors. The patterns differ across the region – for instance, the population is growing in northern Norway and Iceland, and declining in Finnish Lapland and northwest Russia (Figure 9.2.).[2] In most regions net out-migration from rural areas has been coupled with the growth of Arctic urban centres (Figure 9.3.).

Urbanisation is a global trend connected with modernisation. Urban areas offer economic opportunities, education, culture and social networks. In the Arctic, urbanisation has been driven by an increase in regional trade and administration centres, industrialisation, the expansion of the welfare state, resource extraction and military facilities.[3] The emergence of knowledge-based economy may lead to further urbanisation. At the same time, conditions for viable economic and social activities are becoming limited in thinning-out rural areas.[4]

Urbanisation in the Arctic, understood as the changes in lifestyle, occurs in areas previously not considered "urban".[5] Indigenous people living in cities face particular challenges, as their connection to traditional livelihoods and access to language education may be limited.[6]

Young people, especially women, are increasingly moving to Arctic urban centres and cities in the south, attracted by economic and educational opportunities. This has raised the share of the elderly population in some areas, resulting in gender and age imbalances, and threatening the fabric of social services (e.g. workforce shortages in the health and elderly care sectors).[7]

1. Arctic Human Development Report (AHDR) 2004. Arctic Stefansson Institute, Akureyri, Iceland; ArcticStat, 2010 Census for Russian Federation, at *http://www.arcticstat.org*. Accessed 10 January 2014.

2. Rasmussen, R. et al. (2011). Megatrends. Nordic Council of Ministers; AHDR (2004).

3. Rasmussen et al. (2012); AHDR (2004); Berman, M. & How, L. (2013). Remoteness, Transportation Infrastructure, and Urban-Rural Population Movements in the Arctic, in Hansen, K.G. et al. (eds.), Proceedings from the first international conference on urbanisation of the Arctic (pp. 109-121), Nordregio, Stockholm; Dubois, A. & Roto, J. (2012). Making the best of Europe's Sparsely Populated Areas. On making geographic specificity a driver for territorial development in Europe. Nordregio Working Paper 2012:15, pp. 18-19.

4. Northern Periphery Programme (NPP) (2013). Programme Area Analysis (for consultation on the Northern Periphery and Arctic Programme 2014-2020), *www.northernperiphery.eu*. Accessed 10 February 2014. See: e.g. Staalesen, A. (15 January 2014), Hi-Tech regions are Arctic population winners. BarentsObserver, *http://barentsobserver.com/en/society/2014/01/hi-tech-regions-are-arctic-population-winners-15-01*. Accessed 15 February 2014.

5. Dybbroe, S., Dahl, J. & Müller-Wille, L. (eds.). (2010). Acta Borealia 27(2), Special Issue: History Matter: Dynamics of Arctic Urbanization.

6. In Finland, over 70% of Sámi children live outside of the Sámi Homeland Area in the north of Lapland, where the Sámi enjoy access to Sámi-language schooling.

7. Rasmussen et al. (2011); AHDR (2004); NPP (2013); Janson, M. (2012). Northern Sparsely Populated Areas. Working Uniquely Together. Presentation at the Committee of Regions, 19 January 2012.

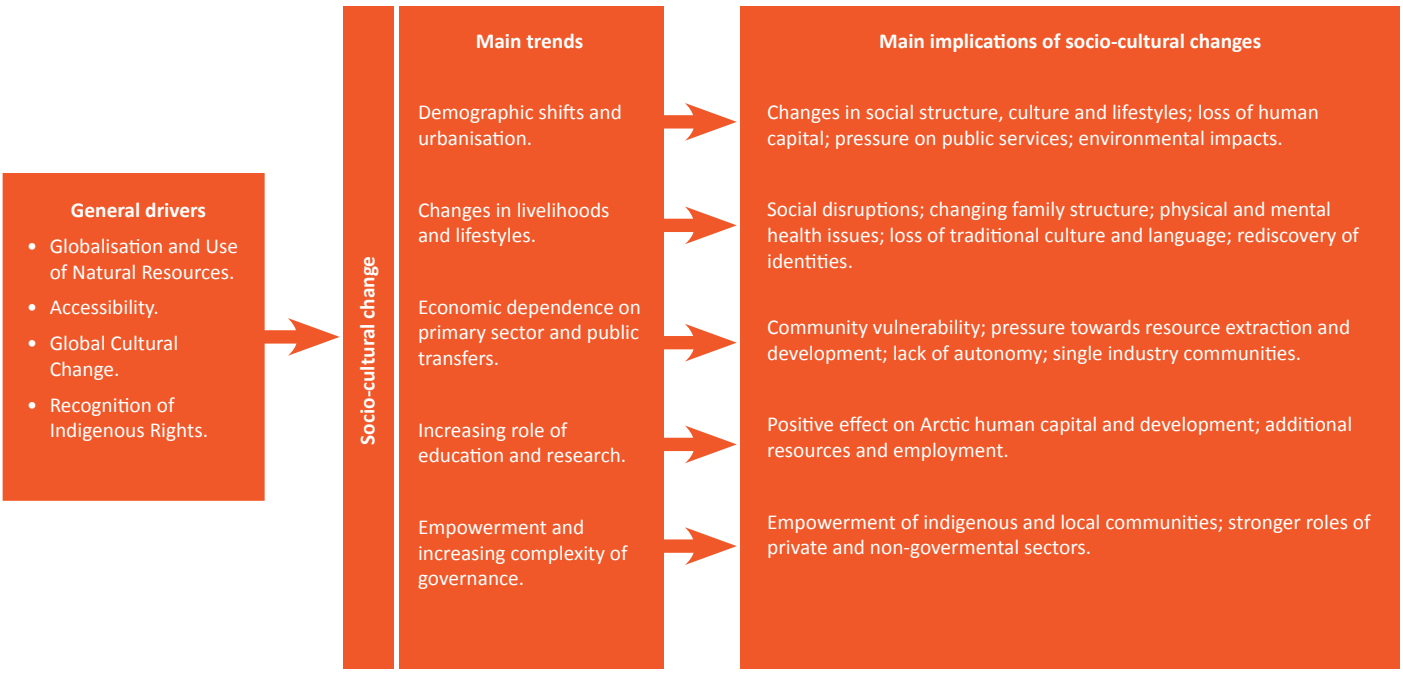

Figure 9.1: *Main Socio-cultural Drivers and Trends and Their Implications for the European Arctic*

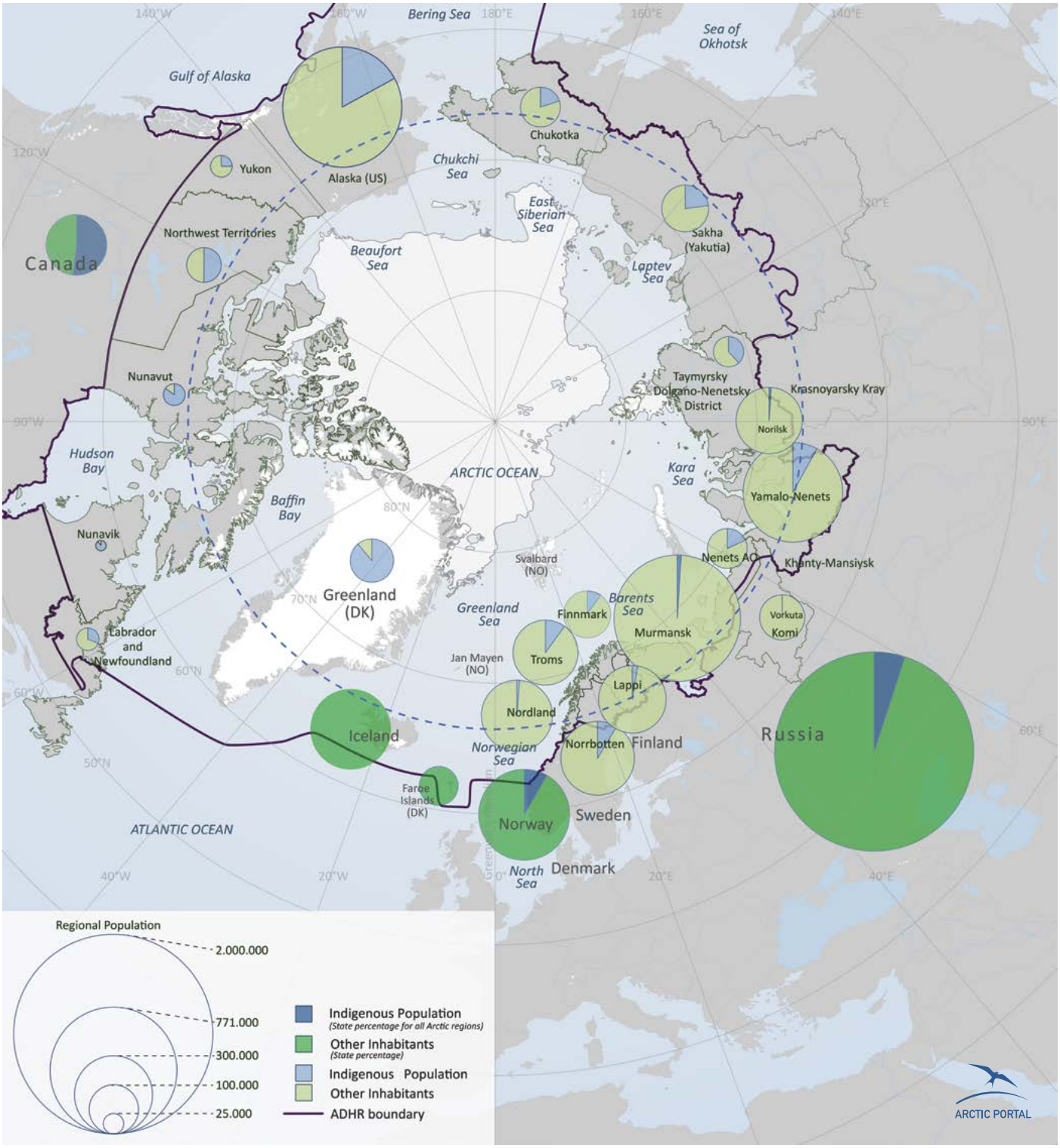

Figure 9.2: *Arctic Population: Indigenous and Non-Indigenous.*

Note: The Arctic Human Development Report (AHDR) (2004) estimated that there are four million people living in the Arctic, of whom 10% are indigenous, e.g. Inuit, Sámi and Nenets. 1.3 million people live in the Arctic regions of the Nordic countries (including Greenland. According to the AHDR boundary: the three northernmost counties of Norway, Norrbotten county in Sweden, Lappi (Lapland) in Finland, whole territory of Iceland, the Faroe Islands and Greenland). The Barents region (which extends south of the AHDR boundary) has a population of six million. Arctic areas in Russia, according to AHDR (2004) include: the Murmansk Oblast, the Nenets, Yamalo-Nenets, Taimyr, and Chukotka autonomus okrugs, Vorkuta City in the Komi Republic, Norilsk and Igarka in Krasnoyarsky Kray, and those parts of the Sakha Republic whose boundaries lie closest to the Arctic Circle.

Source: Arctic Portal and Arctic Centre, 2014, based on data from: Statistics Sweden 2011, Tilastokeskus 2013, Statistics Norway 2013 and Sami Statistics 2014 (Statistics Norway), Statistics Iceland 2012, Faroe Statistics 2013, Statistics Greenland 2013 (for Greenland indigenous number refers to persons born in Greenland), Barents Euro-Arctic Council, US Census 2010, (Russian) Federal State Statistics Service 2013-2014, Census (Russian Federation) 2010, Statistics Canada 2006-2011, US Census Bureau 2010, Statistics Alaska 2012, Arctic Centre, University of Lapland estimates (data based on estimates with discrepancies between available sources). Numbers for Sakha Republic (municipalities on or above the Arctic Circle) based on estimates only. All numbers, although based on statistics, are illustrative, estimate and approximate, often due to difficulty of specifying exact number of indigenous peoples living in the particular region.

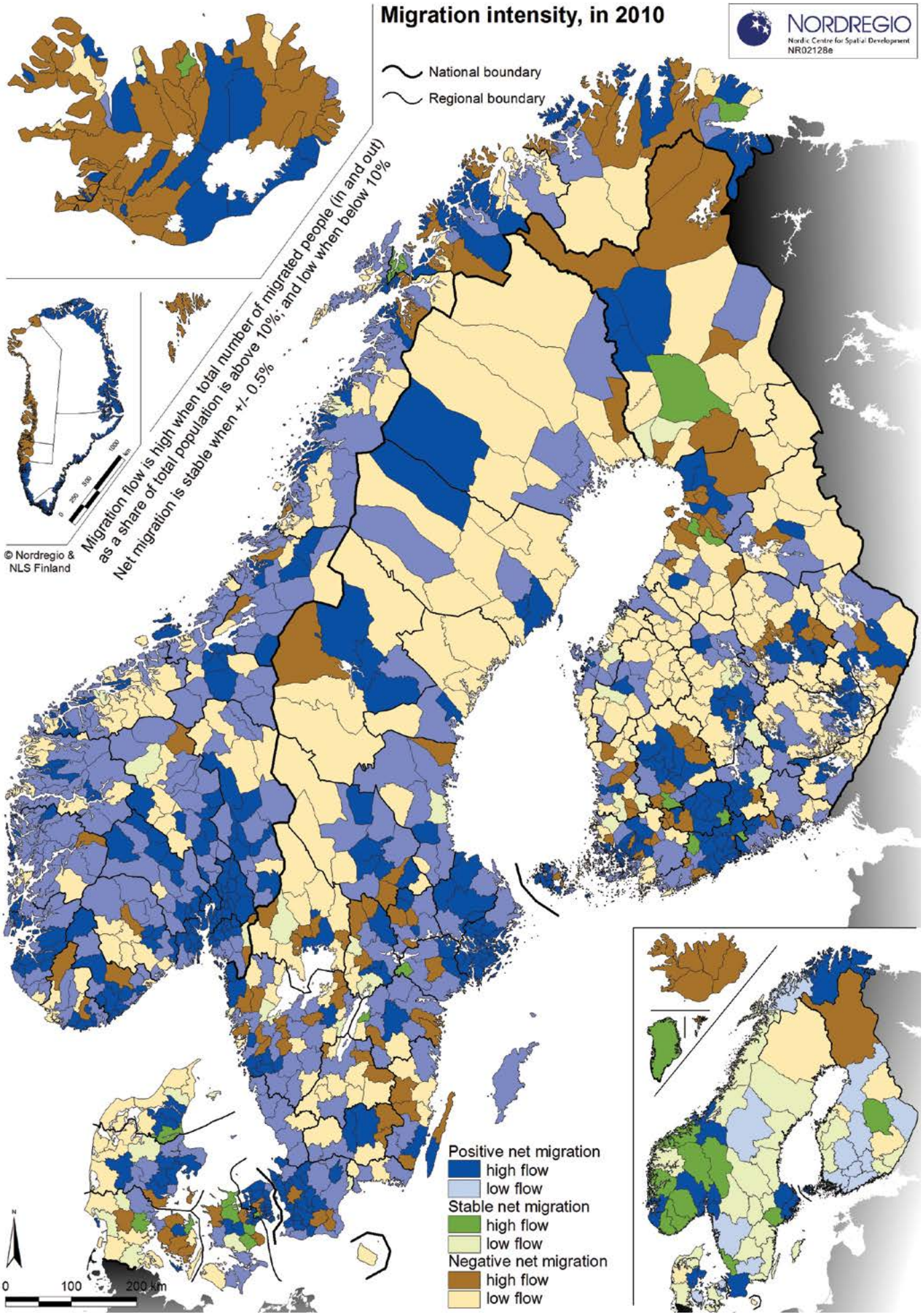

Figure 9.3: *Migration Intensity in the Nordic Region, 2010*
Source: Johanna Roto, Nordregio, 2011.

Historically, in-migration has significantly influenced the Arctic social landscape. People migrating to northern regions are often attracted by employment opportunities in extractive industries or the quality of life connected to landscape/nature values. Currently, the migration from new EU member states and countries such as Thailand is increasing.[8]

Arctic gender issues have recently received more attention.[9] Challenges include male-dominated rural areas and low female participation in traditional and resource-based industries. However, women have a comparatively strong position in Northern governance structures.[10] There is a lack of gender-disaggregated data specific to the Arctic regions.

9.2.2 Changing Livelihoods and Lifestyles

The Arctic economy is characterised by the co-existence and interdependence of a formal and informal economy.[11] The major components of the formal "cash" economy include tourism, fisheries, large-scale mineral and energy development, forestry and reindeer husbandry. The informal economy consists of small-scale subsistence use of forests (e.g. berry and mushroom picking), hunting, reindeer herding, fishing and trapping, and is also important for cultural practices and identities. In the European Arctic the relative role of traditional activities as a source of livelihood has been declining over the last century.

Changes in lifestyle bring about a cultural transformation, including alterations in family structure, values and cultural forms of expression. These can lead to positive developments, e.g. the increasing role of women in society, and negative ones, e.g. barriers to inter-generational knowledge transmission or loss of indigenous languages.[12]

Lifestyle changes, combined with climate change, have had an impact on human health and well-being (although Fennoscandia has been less affected than other Arctic localities). Due to changes in climate, flora and fauna, humans in the North could be exposed to new micro-organisms, causing vector-borne infections. Contaminants such as pollen, persistent organic pollutants or mercury are also a threat to health. Dietary changes have increased obesity rates, Type 2 diabetes and cardiovascular diseases.[13] Many Arctic communities are also afflicted with domestic violence, substance abuse and high suicide rates.

9.2.3 Ongoing Dependence on the Primary Sector and Public Transfers[14]

Substantial hydrocarbon and mineral resource developments in the Arctic region are important contributors to national economies, especially in Russia and Fennoscandia. In addition, fisheries and forestry remain vital industries. Primary industries and resource extraction strongly link Arctic regions to the global economy and provide resources for social development, but they also expose the regions to market and price fluctuations.[15] Single-industry communities are particularly vulnerable to boom-and-bust cycles. Primary industries tend to often create islands of economic activity, rather than serving as engines of development for entire regions.

The public sector and transfers include government employment, welfare payments, pensions, as well as development policies and infrastructure maintenance. The public sector is responsible for 20 to 50% of economic activity in most Arctic regions, and dominates the expanding service sector (e.g. education, health care and administration). The share of public sector employment in the European Arctic (30-55%) is higher than the average for developed states (5-28%) (Figure 9.4).

As regional authorities in the European Arctic attempt to reduce dependence on government transfers, there is greater interest in developing natural resources. Simultaneously, governments are increasing support for activities that offer alternatives to resource-based economies, such as tourism, creative industries, research and innovation or aquaculture.

9.2.4 Rising Role of Education and Research

The education level in the European Arctic is generally high (it is comparatively lower in Greenland) and lays a solid foundation for enhancing Arctic human capital and empowering Arctic communities. On the other hand, centralised educational systems have often had adverse implications for indigenous cultures. Education and research also create jobs and bring resources into communities. International co-operation constitutes

8. Rasmussen et al. (2011).

9. For example, the Arctic Council is currently implementing an action on gender equality in the region, *www.arctic-council.org*. Accessed 5 February 2014.

10. Women account for 56% of the Swedish County of Västerbotten's Council (compared to 43% in Finnmark and 35% in Finnish Lapland, with Russian regions falling significantly behind). The Sámi Parliament in Norway had 50-50 gender composition after the 2005 elections and companies such as LKAB (a state-owned company operating, inter alia, the Kiruna iron mine) highlight the position of women in traditionally male-dominated extractive industries. See: e.g. Staalesen, A. (4 February 2014) "Best on Women and Democracy", Barents Observer at *http://barentsobserver.com/en/society/2014/02/best-women-and-democracy-04-02*. Accessed 13 February 2014.

11. ACIA (2005). Arctic Climate Impact Assessment. Cambridge University Press.

12. Aesaether, N. & Baerenholdt, J.O. (Eds.). (1998). Coping strategies in the North. Local Practices in the Content of Global Restructuring. Copenhagen: Nordic Council of Ministers.

13. Parkinson, A. J., & Evengård, B. (2009). Climate change, its impact on human health in the Arctic and the public health response to threats of emerging infectious diseases. Global Health Action 2, doi: 10.3402/gha.v2i0.2075.

14. Rasmussen et al. (2011).

15. Dubois and Roto (2012); NPP (2013).

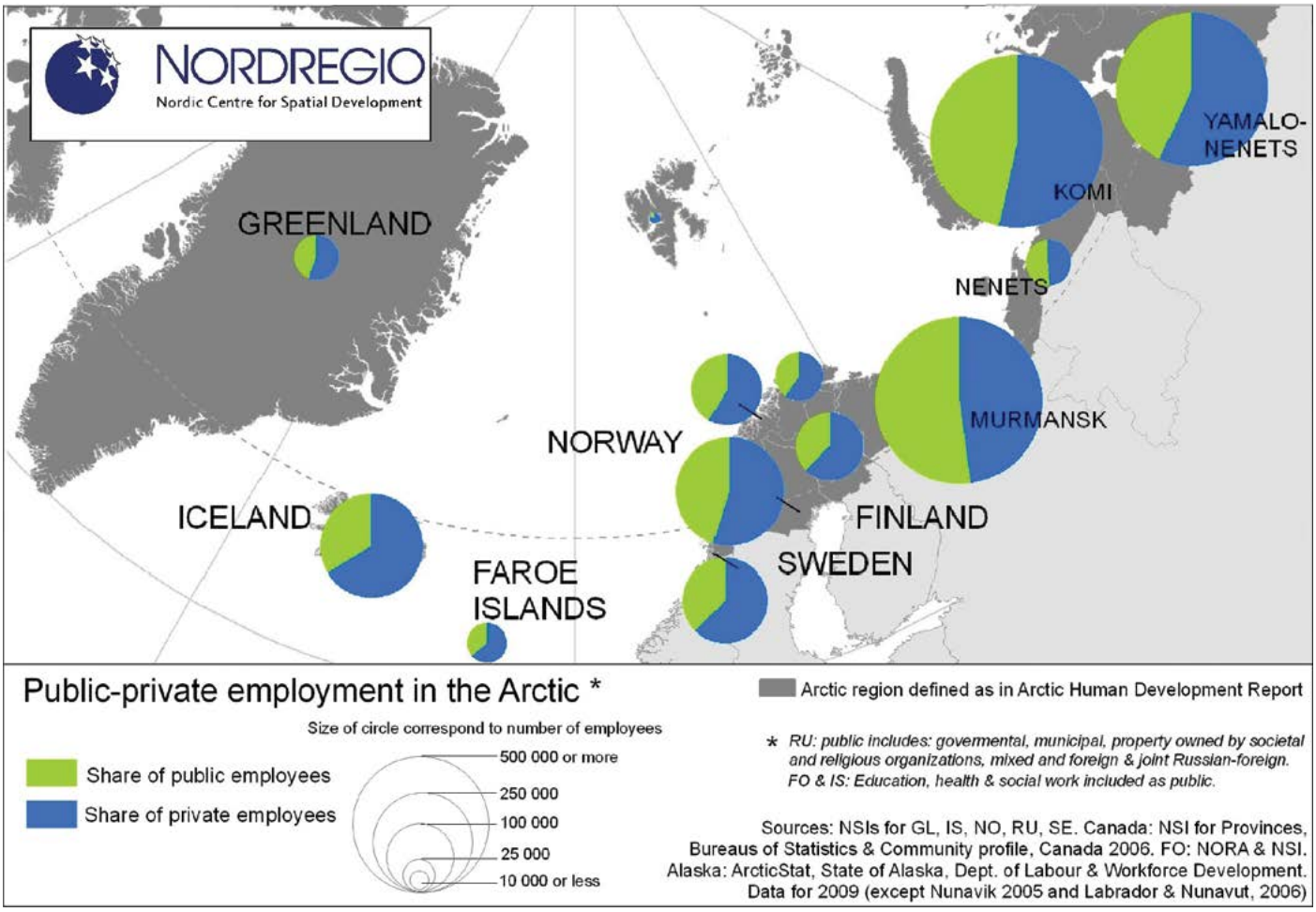

Figure 9.4: *Public and Private Employment in the Arctic, 2010*
Source: Johanna Roto, Nordregio, 2010, modified.

an important element of Arctic research, based on organisations such as the International Arctic Science Committee and the University of the Arctic.

Human capital is critical for economic and social development in the Arctic. Although human capital in the Arctic is seen as underdeveloped, this overlooks the diversity of creativity among Arctic residents, based on informal and traditional knowledge.[16] Education allows people to both benefit from and develop alternatives to primary industries. At the same time, high levels of education may stimulate greater out-migration from rural areas (especially of women).

9.2.5 Increasing Inclusiveness and Complexity of Governance

Various intergovernmental and regional forms of co-operation between Arctic nations and other stakeholders (especially indigenous organisations) have emerged over the last 20 years, such as the Arctic Council, the Barents Euro-Arctic Council and the Northern Forum.

Non-state actors have become increasingly active in advocating interests and values of various groups, including environmental organisations and industry associations. The role of indigenous peoples has changed throughout the Arctic, due to reasons such as the establishment of Sámi Parliaments in Fennoscandia and self-government in Greenland, coinciding with the evolution and adoption of international norms. In Russia, the indigenous influence on decision-making is comparatively minor. Most legal systems currently include safeguards for indigenous land rights.

9.3 What Is Driving Social and Cultural Changes in the European Arctic?

9.3.1 Globalisation and Demand for Natural Resources

Global economic shifts shape social and cultural development around the world and the Arctic is no exception, especially in light of the privatisation and commercialisation of Arctic industries.[17] Robust economic growth in emerging economies shapes

16. Rasmussen et al. (2011).

17. UN Industrial Development Organization (UNIDO) (2010). Structural Change in Global Economy: Main Features and Trends. UNIDO website at www.unido.org/. Accessed 4 July 2013; AHDR (2004).

Picture 9.1: *Inuit Villagers Gathered on Sea Ice after Successful Whale Hunting.*
Photo: Paula Kankaanpää, Arctic Centre.

demand for Arctic natural resources and influences Arctic migration, urbanisation, politics, governance and global connections. Globalisation results in competition between regions for companies, skilled workers, tourists and public investments (also within the EU context).[18] Resource exploitation and resistance to certain large-scale developments were key factors in the emergence of indigenous activism and indigenous rights.

9.3.2 Accessibility

The Nordic northern peripheries are among the least accessible regions in Europe (measured by ground accessibility). Insularity, one-directional linkages, proportionally high dependence on air and maritime transport, the dominance of north-south connections and high costs are features of all modes of Arctic transport. Initiatives to facilitate Arctic-Arctic (east-west) transport connections have so far had limited success.[19]

In remote regions, information and communication technologies (ICT) provide crucial opportunities for people and services, including education, entertainment, health, administration, as well as social and political life or identity building. While coverage and digital competence appear to be strong in the European Arctic, the costs, quality and capacity of the networks may pose significant limitations in locations such as Greenland.

For northern companies, ICT allows access to global niche markets, although this primarily promotes the greater integration of local markets.[20] Intra-regional connections are crucial, in terms of both infrastructure and spaces for co-operation, as actors functioning in the same economic, social and physical environment are better positioned to build networks necessary for the emergence of a knowledge-based economy.

Although improved transport and ICT infrastructure is hoped to encourage people to remain in rural areas, better accessibility coupled with higher levels of education often facilitates migration to urban areas.[21]

9.3.3 Global Cultural Change

Arctic social and cultural changes reflect global, particularly western, cultural trends. At a general level, these include: declining respect for authority; increasing emphasis on freedom of expression and equality of opportunities; growing social and political tolerance;

18. Dubois and Roto (2012).

19. See: e.g. NPP 2013, Programme Area Analysis; Gløersen, E., Dubois, A., Copus., A. & Schürmann, C. (2005). Northern peripheral, sparsely populated regions in the European Union. Report. Nordregio; Dubois and Roto (2012), pp. 65-66.

20. Dubois and Roto (2012), pp. 65-66.

21. Rasmussen et al. (2011).

22. See: Gløersen et al. (2005).

23. Dubois and Roto (2012); Copus, A. (2001). From core-periphery to poly-centric development: concepts of spatial and aspatial peripherality, European Planning Studies 9, 4, 539-552, p. 540

Remote and Peripheral – Northern Sparsely Populated Areas[23]

The northern peripheries of Nordic states have been recognised within the EU's cohesion policy as "regions which suffer from severe and permanent natural or demographic handicaps such as the northernmost regions with very low population density" (Treaty of the Functioning of the European Union, TFEU, Art. 174). Peripherality should be understood as a political, socioeconomic and cultural construct (e.g. meaning remote, rural, fragile or less-favoured), rather than only a demographic or geographic one. Limited access to advantages inherent to agglomerations has implications for social interactions, the availability of public services and economic activity (including the small size of the local economy, limited local demand, high transaction, transport and logistics costs, lack of specialised services, the dominance of traditional industries and dependence on extractive industries). Importantly, peripherality is dynamic, changing due to economic shifts or infrastructural investments (or degradation).[24]

emancipative orientation towards the role of women; wider political protests; and an increasing emphasis on democratic principles combined with dissatisfaction with the democratic process.[24] These trends are coupled with the spread of popular culture, information technology, virtual networks and the culture of innovation. In the increasingly globalised world, notwithstanding developments within the region, Arctic societies will undergo a transformation that mirrors global cultural developments.

9.3.4 Indigenous Activism and Recognition of Indigenous Rights

Over the last four decades, indigenous peoples have become more active in international forums, with a focus on human rights. Their key demands include self-determination, land rights, cultural development, and participation in decision-making. The International Labour Organization (ILO) Convention No. 169 concerning Indigenous and Tribal Peoples (1989),[25] the UN Declaration on the Rights of Indigenous Peoples (2007) and the establishment of the UN Permanent Forum for Indigenous Issues are the main achievements of the global movement. The influence of international indigenous law in the European Arctic varies: from major significance in Norway and Denmark/Greenland, moderate acknowledgment in Finland and Sweden (land rights issue being the most problematic) and a fairly complex situation in Russia.

9.4 Outlook to 2030

The Arctic regions will very likely remain highly dependent on resource extraction as well as public transfers from national budgets over the next twenty years. This socioeconomic dependence will continue to drive public policy and priorities as well as social attitudes. Communities and authorities will continue to attempt to attract more extractive industries and at the same time diversify local economies. The recent economic crisis (2008 onwards) has increased pressure on the public sector, and this is experienced more strongly in remote areas due to their financial and employment dependence on national budgets. Key uncertainties include volatile resource prices and the character of national regional development policies.

Economic and social life will likely increasingly concentrate in major urban centres, resulting in the increasing importance of Arctic cities.[26] Current demographic challenges may be expected to remain a problem throughout the region (including implications for governance and service delivery) with population growth in major towns and resource extraction areas and decline/thinning-out in rural areas. The continued presence of academic and research institutions in the north will contribute to economic and social diversification. Nevertheless, the development of a knowledge-based economy will be limited to the major Arctic urban centres. Indigenous rights are likely to gain increasing attention, but land rights will probably remain a challenging issue throughout Northern Fennoscandia.

24. Dalton, R. & Welzel, C. (2011). Mapping and Tracking Global Cultural Change, www.democracy.uci.edu/node/6151. Accessed 20 June 2013.

25. International Labour Organization (ILO) Convention no 169 concerning Indigenous and Tribal Peoples in Independent Countries (Geneva, 76th ILC session (27 Jun 1989); Entry into force: 5 Sep 1991).

26. Gløersen et al. (2005).

Picture 9.2: *Sámi Parliament in Norway in session. Karasjok, Norway.*
Photo: Denis Caviglia, 2013.

9.5 Assessing EU Policies: How Does the EU Influence Social and Cultural Changes in the Arctic?

The role of the European Union in shaping the direction of sociocultural changes in the region is limited, with the greatest influence in EU Arctic regions and through various cohesion and regional co-operation instruments. However, as all economic activities have a social dimension, a broad range of EU policies, e.g. environmental legislation, may contribute to changes in the sociocultural landscape. Policies designed for the development of the entire EU may not always be effective in the peripheral Arctic context.[27] In many policies, that has been acknowledged; for example, the EU/EEA State Aid Guidelines allow for additional support for regions with special characteristics. [28]

9.5.1 EU Funding for Regional Co-operation and Cohesion

The European Commission estimated that EUR 1.14 billion has been dedicated to regional development in the EU and neighbouring Arctic regions in 2007-2013.[29] A number of EU programmes cover the European Arctic: cohesion funding in North Finland and Sweden, Bothnia-Atlantica, InterregIVA/North, Kolarctic ENPI (European Neighbourhood and Partnership Instrument) and the Northern Periphery Programme (NPP) 2007-2013.

The NPP is part of a territorial co-operation objective within EU's cohesion policy. The programme aims at developing the economic, social and environmental potential of peripheral and remote communities by promoting innovation and competitiveness as well as the sustainable development of natural and community resources. Stakeholders have a generally positive view of the NPP. The programme has had a visible impact in developing innovative solutions in public service provision (including ICT and self-organisation), creative industries and aquaculture. However, the major shortcoming of the NPP is the lack of involvement of the private sector (due to state aid constraints).

27. Dubois and Roto (2012), p. 11.

28. Guidelines on national regional aid for 2007-2013. Official Journal C 54 of 4.3.2006.

29. EU (2012). Developing a European Union Policy towards the Arctic Region: progress since 2008 and next steps, JOIN (2012) 19 final.

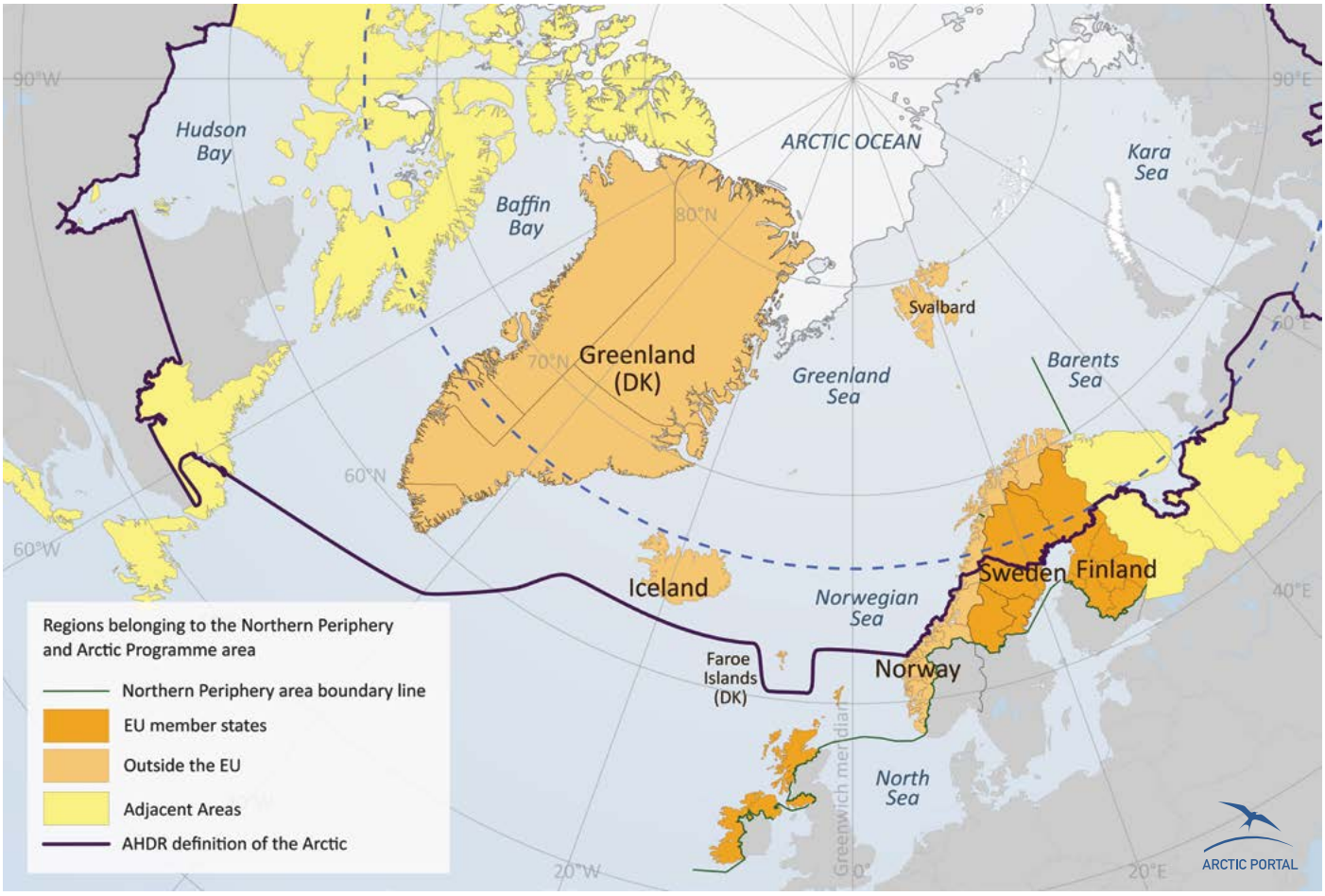

Figure 9.5: *EU Northern Periphery and Arctic Programme Area 2014-2020*
Source: Arctic Portal, based on Northern Periphery Programme and Nordregio 2013.

At the time of finalising this report, the design of programmes within the new 2014-2020 financial perspective is in the final stages, including the new Northern Periphery and Arctic Programme (NPA) (Figure 9.5). The draft of the new programme builds on key priorities of the NPP, focusing on small and medium-sized enterprises, innovation, and sustainable resource and energy developments.[30] There is concern that the new structure of cohesion funding has limited the choice of priorities within the NPA and will lead to support for fewer themes, in ways that do not always fit the specific needs in the region.

Programme objectives, owing to the strong involvement of regional actors, correspond generally to the key social and cultural challenges identified in this report. However, the NPA's role is largely limited to promoting desirable developments and enhancing co-operation between actors who can facilitate such developments, as the NPP/NPA has the smallest budget among transnational programmes (approximately EUR 100 million), although the NPA budget is likely to be 20-30% higher than for the NPP. Adding "Arctic" to the programme's name has not changed the priorities, as the main problems are seen as shared with other European peripheral regions.[31] The key challenges in the implementation of the NPA will likely include: involvement of the private sector; assessment of results based on the impact on the programme area; co-operation with Russian partners; and the limited scope of the programme in comparison to the NPP. A more substantial involvement of partners from outside of the European Arctic would have been desirable, but is limited by the EU funding schemes and lack of strong interest from other partners.

The priorities of currently negotiated cohesion programmes covering northern Sweden and Finland are also generally in line with the challenges identified in this chapter, including ICT developments in the north.[32] The notion of "smart specialisation" in the post-2013

30. Currently, four priorities have been identified: innovation to maintain and develop robust and competitive communities, promoting entrepreneurship to realise the area's competitive advantage, fostering energy-secure communities through promotion of renewable energy and energy efficiency, protecting, promoting and developing cultural and natural heritage, with a focus on transfer of knowledge and technology, sustainable use of resources and demographic development (NPA programme overview 2014).

31. Based on available draft documents. See: Northern Periphery Programme, *www.northernperiphery.eu*. Accessed 14 February 2014.

32. Sparsely populated areas receive an extra allocation within the cohesion policy. Although it has been decreased (from EUR 35 to 30 per inhabitant, constituting, for instance, 38% of cohesion funding assigned for east and north Finland, thus representing a fairly significant component of the programmes' budget), the overall funding in northern Sweden is similar to that in previous funding periods and 13% lower for east and north Finland (but only 2% lower for Lapland). Although there is currently one operational programme for mainland Finland, a separate implementation plan for east and north Finland has been drawn up (Personal communication with the Brussels offices of north Sweden and east and north Finland and with regional authorities.)

cohesion framework is generally commendable, but decision-makers must ensure that this does not mean that Arctic regions are limited to the role of a European resource base.

Overall, projects within the EU-funded programmes (see Annex 2) have promoted and encouraged the diversification of the northern economy through supporting youth entrepreneurship, creative industries and media, combining traditional livelihoods and business, including assistance for Sámi entrepreneurs, and developing tourism. Similarly, various projects address Arctic demographic challenges: promoting local development; strengthening urban and rural services; as well as promoting cultural heritage and projects dedicated to social well-being, including elderly and physically challenged people. Such projects are limited in scope and resources, but they have important inspirational leverage, e.g. by promoting the exchange of experience.

Owing to the crucial role that local and regional actors play in deciding on the priorities of the cohesion and co-operation programmes, the objectives of the EU funding schemes are in line with the key needs and they respond to the main challenges in the region. One shortcoming of the EU funding schemes is the lack of co-operation between programmes, the cohesion framework and EU policies covering sectors such as transport, agriculture or fisheries. The so-called "Bodø Process" (initiated by Norway), which brings together programmes and funding frameworks in the European Arctic (including Barents co-operation, the Nordic Council of Ministers and EU programmes), is a step in the right direction.

A major challenge connected with the programmes implemented in the region is co-operation with Russian partners. This co-operation is affected by the overall political situation as well as internal regulatory frameworks in Russia regarding, for example, the operation of non-governmental organisations. There is a concern among local stakeholders[33] that funding for programmes such as Kolarctic ENPI would be limited in the future.

9.5.2 Accessibility

The long-standing criticism that trans-European transport networks neglect the special needs of remote regions to a certain extent can be upheld for the upcoming financial perspective.[34] Until 2020, major support (80 to 85% of transport networks expenditure) will be dedicated to the core network linking key EU centres, which in Northern Fennoscandia includes only the "Bothnian corridor"

Picture 9.3: *Social Housing from the 1970s in Nuuk, Greenland. Photo: Adam Stepien, Arctic Centre.*

and the corridor to Narvik in Norway.[35] A broader "comprehensive network" is to allow all regions to access the core transport nodes. However, the social and economic development of peripheral regions depends greatly on intra-regional connectivity and the emergence of local clusters capable of generating critical mass, not only on core-periphery connections.[36] Elements of the transport network such as the Midnordic Green Transport Corridor may play a vital role here.

Various projects within EU-funded cohesion and regional co-operation programmes are directed towards developing transport connections and mitigating the adverse effects of remoteness (through concrete investments, transport subsidies for ports in the Gulf of Bothnia, feasibility studies and innovations) (see Annex 2). The impact of these projects is difficult to assess as the key challenges – deficit in east-west connections, high costs of transport and the disadvantaged position of certain localities – have remained largely unchanged over the last decade, or have even become more visible due to the thinning-out of the population in rural areas. Enhancing ICT services in remote communities, including e-medicine and e-learning, appears to have more tangible impacts.

Stakeholders from the private sector and local

33. Input from the EU office of East and North Finland. Personal communication, 24 March 2014.

34. See, e.g. Spiekermanfl, K. & Wegener, M. (1996). Trans-European networks and unequal accessibility in Europe. European Journal of Regional Development (EUREG), 35(4), 4196; Dubois and Roto (2012), p. 64.

35. Railway connections encircling the Gulf of Bothnia.

36. Dubois and Roto (2012).

administration have underlined that various EU actions directed at lowering greenhouse gas emissions and air pollution, although commendable at the European level, may have a proportionally higher impact on transport costs in the northern periphery than in the lower latitudes. One example is the directive limiting the sulphur content in marine fuels (Directive 2012/33/EU, discussed in Chapter 8),[37] as some companies are reconsidering their investment plans due to the expectations of higher transport costs.[38] Another example is the possibility of future stricter standards for heavy-duty vehicles (trucks and buses, which constitute the basis for cargo and passenger transport in remote areas), as the European Commission is currently developing a strategy to reduce carbon dioxide emissions from such vehicles.[39]

9.5.3 Research, Education and Cross-border Co-operation

EU programmes for student and teacher exchanges and professional training have become an important element of the educational framework in the region. The European Union's Seventh Framework Programme (2007-2013) funded Arctic research at about EUR 20 million a year.[40] Stakeholders clearly see Arctic research as an area where the EU's role is most visible, although they note that there is a deficit in funding for Arctic social sciences.

The EU-Greenland Agreement supports education, vocational training and the development of human resources. Progress in these areas since 2007 has been recorded.[41] As still only 11% of the population in Greenland has a university degree and many educated Greenlanders live outside of the island, primarily in Denmark, the ongoing focus on education and training, in line with the priorities of the Greenlandic government, is vital.[42] In 2007-2013, Greenland received EUR 175 million, which will rise to over EUR 217 million in 2014-2020. In addition, Greenland may participate in other programmes funded from the EU budget, including research, education or innovation (e.g. within NPP/NPA programmes) as well as receives financial contributions (around EUR 18 million for 2013-2015) within the Fisheries Partnership Agreement.

Support for international co-operation in the Arctic is one of the EU's Arctic policy objectives. EU funding for cross-border co-operation includes research platforms, co-operation between companies, non-governmental organisations (Arctic NGO Forum), joint public services and infrastructure and development of information channels.

9.5.4 Traditional Livelihoods and Indigenous Peoples

Exclusive Sámi rights to traditional livelihoods, primarily reindeer husbandry, are safeguarded in a Protocol to Finland's and Sweden's Accession Treaty (Protocol 3). Also various EU environmental regulations are of relevance for indigenous livelihoods (see Chapter 8).

EU-funded programmes acknowledge the dynamic nature of indigenous culture and many projects aim to develop creative industries and facilitate cultural co-operation, events and network-building, rather than focusing on the protection of heritage. The sub-programme InterregIVA/North/Sápmi focuses on developing Sámi languages and language resources.[43] The existence of a separate Sápmi sub-programme is seen as a positive development. Its creation allowed many Sámi actors to conduct activities vital for cultural development and contributed to strengthening Sámi cross-border co-operation. There are concerns that Sámi objectives would be lost among other programme activities after 2014, as the draft Interreg programme for 2014-2020 does not include a separate Sápmi sub-programme, even if Sámi-specific objectives are evident throughout the new programme activities, including support for culture, language, livelihood and cross-border co-operation.[44]

In a pan-Arctic context, EU policy statements support enhancing EU-indigenous dialogue in the Arctic. There are, however, problematic issues, as the Inuit in Greenland and Canada are concerned about the EU ban on placing seal products on the EU market.[45] Despite an exemption granted to indigenous peoples, the Inuit argue that, due to the collapse in the global market for seal products, the ban adversely affects their traditional practices and culture.[46] Beyond the European Arctic, commercial (or

37. Directive 2012/33/EU of 21 November 2012 amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels.

38. There are estimates that peg the decrease in sea transport at 10-21%, mirrored by an increase of 5-11% in rail transport and 5-6% in road transport. (Personal communication, Mid Sweden EU Office (Jämtland and Västernorrland counties), 10 March 2014).

39. The European Commission is currently developing a strategy to reduce CO2 emissions from such vehicles. See: "Road transport: Reducing CO2 emissions from vehicles", *http://ec.europa.eu/clima/policies/transport/vehicles/index_en.htm*. Accessed 10 January 2014.

40. European Union (2012). Developing a European Union Policy towards the Arctic Region: progress since 2008 and next steps. Joint Communication of the European Commission and the High Representative of the European Union for Foreign Affairs and Security Policy to the European Parliament and the Council. Brussels, 26.6.2012. JOIN(2012) 19 final.

41. Mid-term Review of the EU/Greenland Partnership 2007-2013 (2006/526/EC), 8 May 2012, *http://ec.europa.eu/europeaid/where/octs_and_greenland/documents/mtr_grl-eu_partnership_2007-2013_en.pdf*. Accessed 20 February 2014.

42. Particip (September 2013). Report: Study to evaluate the performance of higher education in Greenland. European Commission. *http://naalakkersuisut.gl/*. Accessed 10 February 2014.

43. InterregIVA/North, *http://www.interregnord.com/en/about-the-programme/goals-and-strategies.aspx*. Accessed 15 February 2014.

44. Draft document on Interreg IVA North 2014-2020 (in Finnish). InterregIVA/North, *http://www.interregnord.com/media/64197/program%204%200%20-%20fin.pdf*. Accessed 10 February 2014.

45. Regulation (EC) No 1007/2009 of 16 September 2009 on trade in seal products, Official Journal 31 October 2009.

46. Cambou, D. (2013). The Impact of the Ban on Seal Products on the Rights

non-indigenous) seal hunters in Canada claim that the ban has been designed with the goal of extinguishing their sealing traditions dating back hundreds of years.[47] In addition, the EU position regarding the aboriginal quota within the International Whaling Commission is of relevance to Greenlandic whaling.[48]

9.6 Critical Factors for EU Decision-making

Issues identified by stakeholders in consultations as important and uncertain are clustered into four critical factors for decision-making.

9.6.1 Intra-regional and Core-periphery Accessibility and Connectivity

Actions facilitating or jeopardising accessibility and connectivity should be carefully considered, as their consequences may be far-reaching. Physical accessibility, including transport networks and ICT-based connectivity, is of major importance in sparsely populated remote regions. Traditionally, the development of peripheries has been seen as dependent on connectivity with the main economic, social and political centres. However, intra-regional connectivity is equally important as it leads to inter-regional synergies and the critical mass needed for innovation, dynamism and competition within the global market.[49]

9.6.2 Power Structures, Social Conflicts and Cultural Diversity

Despite being sparsely populated, the European Arctic is characterised by power structures within and between communities including urban-rural interactions and relations with the national and global political and economic centres. Many important decisions are taken at the global or national level, where the peripheral regions have little influence on decisions.[50] Tensions between economic, social and environmental interests may occur, especially in light of new resource developments. The rich cultural diversity of the European Arctic regions needs to be taken into account as a part of the social landscape of the region, as an element of the power networks and as background for social conflicts. Policy-makers need to understand these power-conflict-culture frameworks when considering actions affecting the region.

9.6.3 Human-nature Interactions

Each society and its natural environment are interconnected on a number of levels. This is particularly important for northern, including indigenous, communities, whose livelihood and economy depend directly on the natural environment, as well as culture, identity and leisure-time activities. The understanding of resilience is based on analysis of social-environmental interactions. Nature or "wilderness" is more often seen as a resource by the tourist industry and is part of the image of the Arctic.

9.6.4 Innovation, Entrepreneurship and Education

The level of innovation and entrepreneurship within Northern communities as well as the level of education provide an important frame of reference for policy-making. This should be taken into account when making decisions concerning extractive industries or programmes aimed at supporting local development. Education, research, entrepreneurship and innovation are closely linked, forming a basis for a knowledge-based economy and driving bottom-up development. Arctic local knowledge and non-technological innovativeness are important elements of this framework. Although Nordic states have a high level of entrepreneurship and innovation, in peripheral, rural regions the levels are usually lower than the national average.

9.7 Recommendations

The recommendations have been developed by experts taking ideas proposed by stakeholders as a starting point.

9.7.1 Give a Voice to Arctic Communities in Policy Developments that May Affect Them

The European Arctic is a very diverse region, with each area having unique challenges. Local specifics require locally designed strategies, which the EU could then support.[51] EU policy priorities should be adjusted to changing circumstances, perceptions and social needs. That requires dialogue with Arctic stakeholders. Social issues should be taken into account in EU environmental policies, especially when the interests and values of vulnerable groups are at stake.

of Indigenous Peoples: A European Issue, Yearbook of Polar Law 5, 389–415. Hossain, K. (2012). The EU ban on the import of seal products and the WTO regulations: neglected human rights of the Arctic indigenous peoples? Polar Record, 49(2), 154-166; European Bureau for Conservation and Development (2012). The Impact of the EU Seal Ban on the Inuit Population in Greenland. Report from a seminar in the European Parliament. 7 February 2013. Brussels.

47. Sellheim, N. (2013). The Neglected Tradition? – The Genesis of the EU Seal Products Trade Ban and Commercial Sealing, Yearbook of Polar Law 5, 417–450.

48. Koivurova, T., Kokko, K., Duyck, S., Sellheim, N., & Stepien, A. (2012), The present and future competence of the European Union in the Arctic. Polar Record 48 (4), 361-371.

49. See also Dubois and Roto (2012).

50. NPP (2013), p. 5.

51. Dubois and Roto (2012).

Arctic stakeholders, especially indigenous peoples, often lack the capacity to engage in consultation processes or follow various policy or regulatory developments. The EU should be proactive in reaching out to these Arctic actors. Forums such as Arctic Dialogue (a format for, so far irregular, meetings between EU officials and Arctic indigenous organisations) or initiatives similar to this assessment are steps in the right direction. However, there is a clear need for institutional solutions supplementing existing EU structures (e.g. the Committee of Regions or consultations within impact assessments) and for incorporation of Arctic, including indigenous, actors from outside the EU. In the near future, a strong involvement of various stakeholders may be needed in regard to the EU Seal Regulation and the examination of its impacts, especially that the issue has been recently raised by the European Parliament.[52] The EU may undertake more efforts to inform the European public on the Inuit seal hunt and facilitate marketing of seal products in line with the indigenous exemption.[53]

9.7.2 Support Entrepreneurship and Innovation with Sensitivity to Indigenous Youth and Gender Issues

The EU should continue to focus on entrepreneurship and innovation (including social innovations[54]), which need to be aligned with northern values and lifestyles.[55] As external investments triggering the emergence of a knowledge-based economy are limited, long-term development can originate primarily from inside the region.[56] Areas of innovation where EU support may have comparatively greater added value include creative industries, e-services, leisure-time activities, innovations in traditional industries or cold climate technologies.

Youth (especially women) who are learning, living and working in the Arctic should be seen as the cornerstone of local entrepreneurship and innovation.[57] Moreover, programmes designed over the next 10 to 20 years could more actively engage migrants, who, if given an opportunity, may greatly contribute to regional development.

Emphasis on indigenous entrepreneurship (including social entrepreneurship) should be continued. The potential of the young indigenous generation (which is very active socially and politically) could be better addressed in the EU programmes. Separate funding lines for projects addressing indigenous-specific challenges are needed, as these may be less visible within general funding schemes.

The focus on innovations and entrepreneurship can be better incorporated in research funding, exchange programmes and regional programmes supporting educational or research institutions. The EU could also support the establishment of networks dedicated to research and innovation, which could promote co-operation between various research programmes and funding schemes (e.g. EU/EEA programmes, Barents co-operation and even taskforces in the Arctic Council).

9.7.3 Invest in Intra-regional Accessibility and Connectivity

The EU can influence accessibility and connectivity in the Arctic. There is a need for a holistic and comprehensive approach to accessibility including transport infrastructure, information flows, ease of crossing borders, and opportunities/spaces for dialogue and interaction. Many experts consider intra-regional connectivity a "sounder alternative to upgrading the transport system than direct core-periphery linkages".[58]

In terms of physical infrastructure, a comprehensive network within the trans-European transport network should not be neglected. Cross-border co-operation and venues such as Barents co-operation may provide support in the planning phase, but over the longer term, after 2020, there is a need for more targeted and substantial support for intra-regional connections.

Cross-border co-operation, especially between Nordic states and northwest Russia, is an area where the EU can play a major role. Additional projects that support economic connectivity and people-to-people connections are needed.[59]

52. European Parliament. (2014). Joint Motion for a Resolution on the EU strategy for the Arctic (2013/2595(RSP)), *http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+MOTION+P7-RC-2014-0229+0+DOC+XML+V0//EN*. Accessed 15 March 2014.

53. See also the report by the WWF, Gerde, E. (December 2013) Seals in Greenland. The important component of culture and economy. The Last Ice Area Project. WWF.

54. Social innovations are new ideas (e.g. products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. (Open Book of Social Innovation, Murray, R., Calulier-Grice, J. & Mulgan, G., March 2010). For the European Commission, "such solutions are both social in their ends and in their means. They can take the form of genuine innovations or improved solutions." (European Commission Social Innovation, http://ec.europa.eu/enterprise/policies/innovation/policy/social-innovation/index_en.htm. Accessed 10 December 2013.)

55. Focus on innovation, research and education is clearly supported for example in the Kirkenes II Declaration (Declaration on the 20th Anniversary of the Barents Euro-Arctic Cooperation, Kirkenes, Norway, 3–4 June 2013).

56. Dubois and Roto (2012), p. 50; Simmie, J. & R. Martin (2010). The economic resilience of regions: towards an evolutionary approach. Cambridge Journal of Regions, Economy and Society 3, 27-43, p. 30; Lundmark, L. (2006). Restructuring and employment change in Sparsely Populated Areas: Examples from Northern Sweden and Finland, Doctoral dissertation, Umea University, GERUM 2, p. 10.

57. Dubois and Roto (2012).

58. Dubois and Roto (2012), p. 64.

59. In fact, some stakeholders point out that such programmes are currently less visible than in the 1990s and early 2000s (see Annex 1).

9.7.4 Consider the Special Needs of Arctic Cities in Relevant EU Policies and Programmes

Arctic urban areas are small in comparison to large cities in southern latitudes but perform a variety of functions normally associated with larger centres. For Arctic cities, strategies and supportive tools that are tailor-made to their needs may be more appropriate than policies designed for urban, rural or sparsely populated areas. Arctic cities and their unique challenges should be included to a greater degree in initiatives directed at urban development.[60] An urgent issue is to support indigenous identities and cultures in urban environments.

The EU should take advantage of expertise existing in the North and facilitate production of knowledge regarding Arctic urban development. That includes the exchange of experiences, including with Greenland and Russia.[61]

60. Examples include the EU's Smart Cities and Communities Initiative, CONCERTO initiative or EIB's JESSICA Urban Development Funds. Concerto, *http://concerto.eu/*; DG-Regio, *http://ec.europa.eu/regional_policy/thefunds/instruments/jessica_en.cfm*. All accessed 18 February 2014.

61. See the Northern Sparsely Populated Areas (NSPA) network position on the European Commission's Smart Cities and Communities Initiative of the Horizon 2020 programme, *http://www.nspa-network.eu/*. Accessed 13 February 2014.




Part III CONCLUSION


ARCTIC CIRCLE

Chapter
10 GENERAL KEY MESSAGES AND SUGGESTIONS FOR EU ARCTIC POLICY

Chapter cover image: Arctic Circle as marked in Rovaniemi, Finland.
Photo: GettyImages

Based on the findings and recommendations contained in the thematic chapters as well as the overall input from stakeholder consultations, this concluding chapter identifies key general messages regarding the development of the Arctic and proposes suggestions for the ongoing process of EU Arctic policy formulation.

10.1 Development of the Arctic: Key General Messages

10.1.1 The key drivers of Arctic transformation: global economy and climate change

This assessment shows that the global economy and climate change remain key drivers of changes in the European Arctic. Neither climate change impacts nor the implications of economic developments should be analysed independently; instead, they should always be examined in the light of existing governance frameworks.

Globalisation in all its forms is the main driver of current economic trends in the European Arctic. Global prices of minerals and hydrocarbons are key determinants of extractive resource developments. Both the upsurge in Arctic mineral exploration and exploitation over the past five years, and current industry concerns regarding the profitability of many operating and planned mines reflect global markets and the outlook for demand in emerging economies (Chapter 7). Lower natural gas prices have put some investment decisions on hold (e.g. Shtokman project), while high oil prices have encouraged companies to invest in expensive exploration projects (e.g. off the coast of Greenland) (Chapter 6). As destinational shipping is expected to be the most important element of maritime transport, the transport needs of extractive industries are among the critical determinants of Arctic maritime traffic (Chapter 4). Demand for the products of fisheries and aquaculture, together with the management systems in place, significantly influence these industries and the communities that depend on them.

The influence of markets and climate change impacts is often outweighed by the role of regulatory frameworks and administrative or political decisions. This is the case with the opening of new areas for oil and gas exploration and legislation pertaining to reindeer herding or nature protection. Furthermore, local dynamics, social challenges and conflicts, environmental concerns, indigenous rights, as well as local perceptions of needs, risks and opportunities may facilitate, enhance or hinder change in particular locations.

While economic developments and climate change play a role in social transformation (the latter to a lesser extent in the European Arctic), factors such as various elements of cultural globalisation or the IT revolution have a major imprint throughout the region (Chapter 9).

10.1.2 Climate change: profound impacts on Arctic environment but limited on economic development

As the Arctic warms two to three times faster than the global average,[1] climate change presents a major challenge for the region, given the dependence of human-natural systems on the cryosphere and the fragility of Arctic ecosystems. The decrease in the sea ice extent and thickness in the Arctic Ocean as well as the melting of the Greenlandic ice sheet, thawing permafrost and coastal erosion are the clearest impacts. However, in Northern Fennoscandia, changes in snow cover or lake/river ice conditions are the most pronounced effects.

The resulting changes in Arctic biodiversity and landscape also affect human societies. Arctic communities are already affected by economic, social, cultural or political changes. Climate change is an additional pressure, testing the adaptive capacities and resilience of peoples and communities and augmenting existing uncertainties. The resilience and adaptive capacity of environmental-social systems may not be sufficient to withstand the accumulation of the multiple pressures discussed in this report.[2] Consequently, while mitigation of global change and ongoing knowledge-building are still seen as primary responses, the implementation of more concrete adaptation actions needs to be considered.

Climate change affects economic activities in the Arctic both positively and negatively. Yet, demand for Arctic resources and regulatory frameworks constitute the pivotal factors shaping the pace and direction of economic developments, both at present and by 2030. The current and future influence of different types of drivers cannot be thoroughly quantified, but the majority of the researchers and stakeholders involved in this assessment share the same general view of the limited role of climate change in socioeconomic development. This holds not only for extractive industries, but also for tourism, forestry, fisheries and even reindeer herding. Relative to other activities discussed in this report, Arctic maritime transport is likely to be the most affected by the consequences of climate change, even though a variety of constraints and uncertainties exist.

1. IPCC (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V. & Midgley, P.M. (eds.)]; CAFF. (2013): Arctic Biodiversity Report. Synthesis. Conservation of Arctic Flora and Fauna. Arctic Council; ACIA (2005). Arctic Climate Impact Assessment. Arctic Council.

2. Nilsson, A. E. (ed.), Stockholm Environment Institute and Stockholm Resilience Centre (2013). Arctic Resilience Interim Report 2013. Arctic Council. *www.arctic-council.org*. Accessed 10 January 2014.

However, in the longer-term perspective climate change is likely to become an increasingly important factor in shaping the Arctic economic and social landscape through physical and environmental changes. Moreover, the recent IPCC Fifth Assessment Report highlights the severity of likely impacts around the globe.[3] Global impacts have an indirect influence on the Arctic: via changes occurring in other regions and via the consequences of climate change mitigation policies, for example by shaping demand for Arctic resources or facilitating development of renewable energy in the region.

There is a widespread belief that climate change itself will lead to increased economic opportunities in terms of Arctic maritime transport, fisheries or resource extraction, and that these opportunities might balance out or even outweigh the negative impacts of climate change in the Arctic. This is far from certain, as while climate change already adversely impacts Arctic ecosystems and nature-based livelihoods, it has a limited role in triggering Arctic economic development, in particular in the European part of the region.

10.1.3 Moderate pace of socioeconomic developments

While signs of change, especially environmental change, are visible throughout the Arctic, the pace of socioeconomic developments is in general moderate. This is in contradiction to the dominant media coverage portraying climate change as ushering in a race among states and businesses for the region's plentiful hydrocarbon resources, minerals and navigational highways. This image of the region has been fuelled by events such as the 2007 and 2012 Arctic Ocean September sea ice minima, planting of the Russian flag at the North Pole, moderately increased number of Arctic transit voyages, and the interest of Asian states and companies. However, these dramatic narratives do not find support among expert circles or local actors.[4] In terms of international relations, the Arctic remains a zone of co-operation and no major tensions originating from within the region are expected. However, conflicts outside the Arctic may affect regional governance, even if likely to a comparatively lesser degree than other areas of international co-operation.

Economic developments and social changes will occur mostly gradually and unevenly across the Arctic. In the coming decades, there might be sectors (e.g. minerals mining, Chapter 7) that might stagnate or even bust. Therefore, it is not guaranteed that economic affluence will resolve the social challenges troubling many remote Arctic locations. The Arctic Ocean proper (compared to adjacent waters such as the Barents or Beaufort seas) is an area that receives particularly much attention from environmental NGOs, media, policy-makers and the public. However, the developments in fisheries, shipping and hydrocarbon extraction in this area are predicted to be either very limited or decades away (Chapters 4, 5 and 6).

Consequently, policies and strategies risk being misguided if they are based on such notions as "Arctic boom". This does not mean that current and expected economic and social developments do not require enhancement of policies and governance systems as well as investments in research and infrastructure. Owing to the characteristics of the Arctic environmental and social landscape, even activities that are moderate in scale may be connected with major impacts. There is a need to monitor change and adapt policies to shifting social, economic and environmental conditions. Involvement of regional actors is necessary to understand actual challenges and develop effective, tailor-made responses. Furthermore, it is always possible that unexpected political and economic events (e.g. energy or political crises) will trigger or restrict economic developments.

10.1.4 Arctic developments are closely interconnected

All changes and developments discussed in this report are interconnected, and thus often result in cumulative, often adverse, impacts, especially for Arctic biodiversity and current means of livelihood. In decision-making the interplay between various drivers, activities and their impacts should be always taken into account. No development should be analysed separately. Some issues recur across the chapters and could be taken up in greater detail in further assessment work in regard to the relationship between the EU and the Arctic, including: biodiversity, community viability, indigenous peoples' rights, participation, research, and short-lived climate forcers.

Industries may complement one another to contribute to a more diversified economic structure, but conflicts are also possible. If fisheries and hydrocarbon extraction or tourism and mining are developed in the same region, tensions or local conflicts could occur (Chapters 5, 6 and 8). The impacts are particularly pronounced when multiple activities result in cumulative impacts. Arctic maritime traffic is highly dependent on renewable and non-renewable resource extraction. Some livelihoods, like reindeer herding, are more vulnerable to pressures and there may be limits to the cumulative impacts they can withstand. In addition, Arctic hydrocarbon extraction

3. See: Intergovernmental Panel on Climate Change (IPCC) (2014). Climate Change 2014: Impacts, Adaptation and Vulnerability. Summary for Policy-makers. Fifth Assessment Report. See *http://ipcc-wg2.gov/AR5/images/uploads/IPCC_WG2AR5_SPM_Approved.pdf*. Accessed 31 March 2014.

4. Koivurova, T. (2013), The Dialectic of Understanding Progress in Arctic Governance, Michigan State International Law Review, 22, 1-21; Arbo, P., Iversen, A., Knool, M., Ringholm, T. & Sander, G. (2013). Arctic Futures. Conceptualisations and images of a changing Arctic. Polar Geography, 36(3), 163-182.

in the long term involves a dilemma: climate change that plays a role in opening the Arctic to offshore hydrocarbon extraction is partly caused by the combustion of fossil fuels, and bringing a new hydrocarbon province into production will exacerbate the effects (Chapters 3, 6).

At the same time, infrastructures created for one activity may beneficially serve other industries. The availability of viable Arctic transport may serve as an enabler of various activities (Chapters 4, 6, 7 and 8) and may in the long run serve economic development outside the Arctic as well.

10.1.5 The European Union is affected by the changes in the Arctic

The EU not only influences the Arctic via its environmental and economic footprint,[5] but is itself also affected by changes in the region. Of critical consequence for Europe are Arctic amplification effects within the changing global climate, including the rise in the sea level, and the significance of the Arctic for shaping Europe's weather patterns (Chapter 3). Gradual opening of Arctic sea routes will be important for European transport. Arctic shipping will require construction of ice-classed vessels, many of them likely to be designed and constructed in the EU (Chapter 4). Arctic fisheries are an important source of food for Europe (Chapter 5). The EU is a major importer of Arctic oil and gas (Chapter 6). Northern Fennoscandia is one of the main regions for EU domestic minerals production (Chapter 7). European tourists increasingly take advantage of the North's recreational potential and its rich biodiversity (Chapter 8). Northern cities are innovation centres of importance at the European level. Arctic cultures – including the culture of the Sámi, the EU's only recognised indigenous people – are an indispensable part of Europe's cultural diversity (Chapter 9).

10.2 Suggestions for the Further Formulation of EU Arctic Policy

Over the last decade, the European Union has made much progress in clarifying its approach to the Arctic, moving towards more nuanced and cautious approaches. The EU has been formulating its strategic approach to the Arctic region since 2008. The aim is to ensure that it is responsible, based on knowledge and engagement (as specified in the 2012 Joint Communication[6]). Future policy should also be realistic, focused on areas where the EU has the greatest influence, aligned with Arctic governance frameworks, and aimed at addressing genuine environmental, social and economic challenges faced by the region.

10.2.1 Investing in better understanding of Arctic change

Numerous uncertainties and the dynamic nature of Arctic change require an in-depth understanding of the physical, biological and social processes. The EU is an important sponsor of Arctic research, and plays a key role in the development of technologies and innovations necessary to address Arctic challenges.

The findings of EU-funded research could be better communicated to EU decision-makers, Arctic stakeholders and the EU public at large in formats adjusted to the needs and capacities of particular audiences. The role of science communication is indispensable. Moreover, other forms of knowledge need to be taken into account in decision-making.

One of the key elements of a more comprehensive understanding of Arctic change is assessment work. Assessments are particularly important as tools bridging science and policy in the Arctic context, where a number of actors external to the region are present and where some local actors lack capacities to conduct their own knowledge-building activities. Assessments bring together available knowledge and information in formats that could contribute to a common understanding among researchers, sectors of the public and policy-makers of the developments at hand. Thus, assessments enhance knowledge- and participation-based decision-making.[7] There is a particular need for integrated assessments, which should be characterised by greater attention to social and socioeconomic issues than is currently paid. Such integration should occur at all levels of assessment work: from environmental impact assessments and strategic integrated assessments to regional environmental assessments.

10.2.2 Enhanced communication and participation of Arctic actors in EU decision-making

More effective and meaningful participation of Arctic stakeholders in decision-making processes is a vital component of a response to social and environmental

5. See Ecologic Institute, Cavalieri, S. et al. (2010). EU Arctic Footprint and Policy Assessment Report, 2010. *http://arctic-footprint.eu/*. Accessed 10 January 2014.

6. European Commission (2012). Developing a European Union Policy towards the Arctic Region: progress since 2008 and next steps. Joint Communication of the European Commission and the High Representative of the European Union for Foreign Affairs and Security Policy. Brussels, 26.6.2012. JOIN(2012) 19 final.

7. See also, Kankaanpää, Paula and Malgorzata Smieszek (Eds.) (2014), Assessments in Policy Making: Case studies from the Arctic Coucnil. Preparatory Action, Strategic Environmental Impact Assessment of development of the Arctic, Arctic Centre, University of Lapland. [Report for the European Commission]. Available: *www.arcticinfo.eu*

changes and to the rising complexity of Arctic governance. Two-way communication between Arctic stakeholders and EU decision-makers and involving stakeholders in dialogue with each other are crucial. Arctic inhabitants, communities, businesses, local governments and organisations lack information on the EU's role, interests and relevant activities in the region.

Enhanced participation enables understanding of values and livelihoods that might be neglected from the perspective of densely populated European economic centres, where the human-environment relation (e.g. subsistence use of forests) may not be as vital for culture and identity as in the North (Chapters 8 and 9).

EU policies designed for a broad European constituency may also need to be assessed in the context of Arctic-specific challenges. That is because particular measures may entail outcomes in the North that diverge from those anticipated in Europe's more southern latitudes, including environmental and transport regulations (Chapters 7, 8, 9). Where relevant, the European Commission's impact assessments of proposed policies or regulations could incorporate a special focus on how such new policy or legislative proposals influence the region.[8] Due to the complexity of both Arctic realities and EU policy frameworks, identification of policies that have consequences in the Arctic constitutes a major challenge and requires stakeholder engagement. EU cohesion and co-operation programmes in the North are an example of the added value provided by stakeholder involvement. There, the key role of local actors in setting objectives has resulted in the alignment of local perceptions of needs and challenges and the goals of EU-funded programmes.

Indigenous peoples underline that they are also rights-holders. The participation of indigenous peoples (in particular the Sámi) in decision-making should be addressed in the light of evolving international indigenous rights (including land rights and the principle of free, prior and informed consent), primarily the UN Declaration of the Rights of Indigenous Peoples. Responsible decision-making with regard to EU policies that may affect Arctic indigenous communities requires their meaningful participation. The concept of establishing a more permanent presence of the Arctic indigenous peoples or the Sámi in Brussels remains relevant.[9]

10.2.3 Accounting for diversity within the Arctic

The Arctic is composed of diverse sub-regions characterised by dissimilar dynamics. Policy-making processes addressing Arctic issues or affecting Arctic regions have to take this diversity into account. Stakeholder engagement may help to understand specific local concerns. EU policy-makers and other EU stakeholders need to acknowledge Arctic diversity and act with care when discussing "the Arctic" in an abstract manner. Statements true for the European Arctic or for the EU Arctic may lead to misunderstandings when applied to other parts of the circumpolar North.

There are many commonalities between Arctic regions, including: a cold climate, vulnerability of ecosystems, sparse human population, unique landscape value, dependence on primary industries, or the presence of indigenous cultures. However, even common characteristics are manifested differently across the circumpolar North. There are numerous examples: the Barents Sea involves less or different risks connected with shipping, tourism or hydrocarbon extraction in comparison to other, heavily ice-infested Arctic waters (Chapters 4 and 6); mining in Northern Fennoscandia involves a different set of problems than in Greenland (Chapter 7); and the implementation of international indigenous rights depends greatly on the specific local context (Chapters 8 and 9).

Competences and influence of the EU regarding particular parts of the region are another element of this diversity. The EU's role differs depending on the sector and geographically: in the EU Arctic, EEA, broader European Arctic, whole circumpolar North and the Arctic Ocean proper.

10.2.4 Paying special attention to the European Arctic

The changes in the Arctic are manifested also in the EU's northernmost regions. It is important that EU policy-makers and other European actors (such as media, NGOs, national decision-makers) perceive the European Arctic's biological and cultural diversity, social and economic development and the rights of its indigenous peoples as a "European issue", just as is the case with any other EU region.

Future EU Arctic policy should accentuate the EU's role and priorities in the European Arctic (not necessarily only the EU Arctic). In this way the EU would not only focus on areas where it can make the greatest positive difference, but would also improve its image in the region and underline its status as an Arctic actor. Although the main global trends and pan-Arctic environmental priorities should not be overlooked, such a more focused approach could result in EU institutions gaining Europe-specific Arctic expertise, leading also to greater influence at the circumpolar level.

Recent EU policy documents highlight EU actions in the European North. However, challenges particular to the European Arctic – as a region distinct within the broader,

8. As was already partly suggested (regarding environmental impacts) in the Commission's 2008 Arctic Communication. See European Commission (2008). Communication COM/2008/0763 from the Commission to the European Parliament and the Council – The European Union and the Arctic Region.

9. Already suggested at the 2010 'Arctic Dialogue' meeting. See the website of the European Commission's DG Maritime Affairs and Fisheries at *https://webgate.ec.europa.eu/maritimeforum/content/1831*. Accessed 4 March 2014.

circumpolar context – as well as clear goals and priorities specific for that region are not elaborated. The policy documents should state very clearly which aims and actions refer to the circumpolar Arctic, and which to its European and EU part.

Various EU cohesion and regional co-operation funding instruments are among the most important tools at the EU's disposal. It could prove advantageous to bring a variety of EU programmes, initiatives and actions in the European Arctic under a common framework. That may be beneficial both for long-term policy performance and for enhancing perception of the EU within the region.

10.2.5 Policy framework: coherent but adapted to the complexity of Arctic governance

The EU has been criticised for not fulfilling its own objective of developing a "structured and co-ordinated approach" towards the Arctic.[10] However, taking such a comprehensive approach too far may be undesirable and even impossible. There is a need to acknowledge the complexity of Arctic governance[11] and to adjust EU actions to the Arctic landscape rather than to pursue in the future an artificially unified EU policy framework.

Complexity and fragmentation do not have to be seen as disadvantages of Arctic governance. Possibilities for enhancing governance frameworks exist and are highlighted in this report's thematic recommendations. The EU can positively contribute to gradual integration and enhancement within some sectors of Arctic governance, such as shipping or biodiversity. This can be achieved primarily owing to the EU's influence on the relevant international frameworks and participation in the venues of Arctic regional governance.

It may be advantageous for the EU to focus on areas where it has the greatest influence and where its credibility as a policy actor is the highest. That certainly includes climate change, research, technological expertise, and high safety and environmental standards.

Effective co-ordination within the European Commission and the European External Action Service as well as the identification of principles to guide various EU actions in Arctic matters are highly commendable. The Arctic policy framework could play a role in addressing potentially diverging policy objectives, for example simultaneously pursuing climate change goals and energy security or, in the context of land use conflicts, facilitating domestic extraction of minerals while at the same time supporting local and traditional livelihoods and cultures. In the first case, however, long-term strategic actions related to climate and energy are needed, with Arctic-specific policy playing a secondary role.

10.2.6 Co-operation with Arctic partners despite challenges

In order to enhance its legitimacy, presence and influence in the region, the EU has to co-operate closely with Arctic states and local actors.[12] That includes substantial contributions to the work of the Arctic Council in the EU's capacity as an observer in principle (see Chapter 2). While the EU needs to continue working on resolving differences with Canada connected to the ban on the placing of seal products on the EU market and addressing the concerns of some Arctic states regarding the EU's role in the region, these issues should not constrain the EU's active engagement in Arctic co-operation.

Support for and participation in Arctic Council knowledge-building and standard-setting activities regarding maritime shipping, climate change adaptation, black carbon, oil spills, and biodiversity are particularly relevant. Emphasis should be given to the developments at the level of the Arctic Council's working groups.

Furthermore, within the area of greatest EU influence – the European Arctic – the European Commission should engage in more active and substance-oriented participation in Barents co-operation, including encouraging and supporting long-term actions and coming forth with its own proposals. As strongly highlighted by stakeholders, although very challenging (especially after March 2014), collaboration with Russian partners in the region is a necessary element of EU Arctic policy and regional governance in the European Arctic.

10. European Commission (2008). Communication COM/2008/0763 from the Commission to the European Parliament and the Council – The European Union and the Arctic Region; see, e.g., Keil, K. & Raspotnik, A. (5 July 2012). Further Steps Towards a Comprehensive EU Arctic Policy: Is the EU Getting There? The Arctic Institute. *http://www.thearcticinstitute.org/2012/07/further-steps-towards-comprehensive-eu.html*. Accessed 10 February 2014; Keil, K. (14 December 2011). EU Arctic Policy: Caught between Energy Security and Climate Change. The Arctic Institute. *http://www.thearcticinstitute.org/2011/12/4598-eu-arctic-policy-caught-between.html*. Accessed 10 February 2014.

11. See, e.g., Young, O. R. (2011). "If an Arctic Ocean Treaty is Not the Solution, What is the Alternative?", Polar Record 47, 327-334.

12. As has been clearly acknowledged in consequent EU Arctic policy documents.

FACTSHEET

Mining in the European Arctic

EU ARCTIC IMPACT ASSESSM

Overview

The European Arctic contains vast amounts of mineral resources. Mining activity in the Arctic is intensifying in response to growing demand. Mining contributes to economic development, but not without consequences: mining can have considerable impacts on the physical environment, land use and societies.

While mining is often significant for national economies, it is in local Arctic communities that the environmental, economic, and sociocultural impacts are mostly felt. In these communities, extractive resource industries may be viewed both as an opportunity for wealth creation as well as a threat to people's livelihoods. Extracting minerals in the Arctic is both challenging and expensive. It is complicated by the extreme environment, remoteness, lack of roads and limited availability of skilled labour. Yet there is a boom underway in high-tech mining and improved technology have triggered action by mining companies.

This factsheet deals with the increase of mining activity in the European Arctic (areas between 60°latitude and Northern Polar Circle). Mining this trend is developing so quickly that reliable data are hard to obtain. Our focus is mainly on traditional metallic ores.

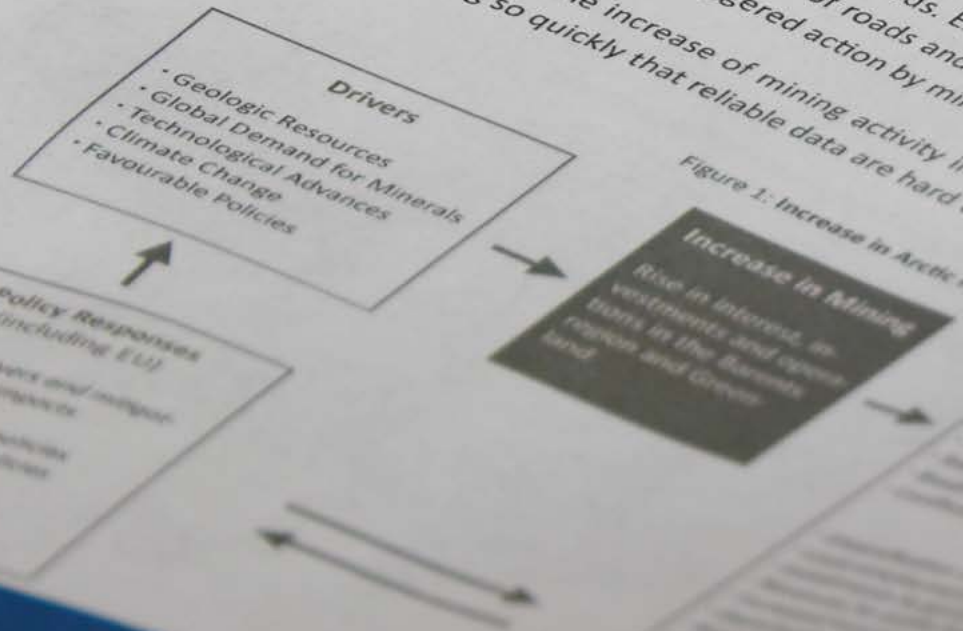

Figure 1: Increase in Arctic Mining Activity: Drivers and Impacts

A ANNEXES

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Annex 3: References

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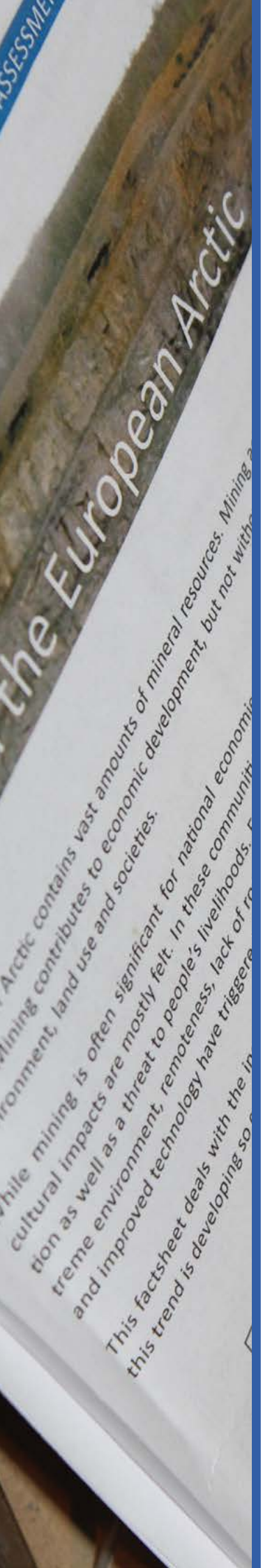
Available only online at *www.arcticinfo.eu*



Chapter cover image: "Mining in the European Arctic" Factsheet
Photo: *Adam Stępień*

The ‘Strategic Assessment of Development of the Arctic: Assessment Conducted for the European Union” report considers the trends and developments taking place in the European Arctic today. That includes a view to 2030, with an emphasis on the uncertainties. The analysis has been conducted on the basis of seven themes focused on change. The implications of Arctic changes for the European Union as well as the role of EU policies and actions in the Arctic are examined. The European Arctic is understood here as the part of the circumpolar Arctic located between Greenland and northwest Russia.

The report is the main outcome of the ‘Strategic Environmental Impact Assessment of development of the Arctic’, a project funded by the European Commission and carried out by a network of 19 European research and communication institutions specialised in Arctic affairs, led by the Arctic Centre, University of Lapland. It contributes to the EU Arctic Information Centre initiative. All project partners participated in the assessment work, but the results and findings are the sole responsibility of the authors of this report.

Enhancing dialogue between Arctic actors, experts and EU policy-makers was a focus. Therefore, involving Arctic stakeholders through workshops, an online questionnaire and direct outreach comprised a key component of the study. The authors developed recommendations by building on ideas proposed by stakeholders.

The annexes, including the reports from stakeholder consultations, are available only in the online version of this report.

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