




European Commission



FWC Policy Support Facility for the Implementation of the EU
Foreign Policy – PSF 2019 Worldwide
Lot 2: Technical assistance
Letter of Contract No. 300002090

Overview of EU actions in the Arctic and their impact

Final Report

June 2021



This project is funded by
European Union



Project implemented by
EPRD Consortium

Service Contract No. 300002090

Overview of EU actions in the Arctic and their impact

Final Report

June 2021

DISCLAIMER

This report has been prepared with the financial assistance of the European Commission. The views expressed herein are those of the consultants and therefore in no way reflect the official opinion of the European Commission.

Authors of the report

Timo Koivurova
Alf Håkon Hoel
Malte Humpert
Stefan Kirchner
Andreas Raspotnik
Małgorzata Śmieszek
Adam Stępień

Contractor name and address

EPRD Office for Economic Policy and Regional
Development Ltd.

Szkolna 36A Street,
25–604 Kielce, Poland

Phone: +48-41-3453271
Fax: +48-41-3452587
E-Mail: eprd@eprd.pl

EPRD internal number: 2010-016

Frontcover picture:
Lyngenfjord in January, Adam Stępień, 2019

Table of contents

| | |
|--|-----------|
| LIST OF ACRONYMS | 1 |
| EXECUTIVE SUMMARY..... | 5 |
| 1. INTRODUCTION AND METHODOLOGY | 13 |
| 1.1. Introduction | 13 |
| 1.2. Objective and methodology of this study | 15 |
| 1.3. Uncertainties at the beginning of the 2020s | 17 |
| 2. CROSS-CUTTING ISSUES | 19 |
| 2.1. Physical and Digital Connectivity | 19 |
| 2.2. EU Space Programmes | 23 |
| 2.3. EU Support for Arctic Research and Innovation..... | 24 |
| 2.4. The EU's external relations and cooperation with international organisations..... | 30 |
| 2.5. Indigenous Peoples and their rights..... | 33 |
| 2.6. Gender | 36 |
| 2.7. Trade and the Arctic | 41 |
| 2.8. The EU's Arctic policy..... | 42 |
| 2.9. Cross-cutting and research policy options..... | 43 |
| 3. CLIMATE CHANGE | 49 |
| 3.1. Climate change in the Arctic and its environmental and social impacts: an overview | 49 |
| 3.2. The influence of EU population and economy on Arctic climate change..... | 50 |
| 3.3. Overview of EU policies relevant for climate change in the Arctic..... | 52 |
| 3.4. Assessment of the impact of EU policies regarding Arctic climate change..... | 54 |
| 3.5. Policy options for the EU's Arctic climate change action | 56 |
| 4. LONG-RANGE POLLUTANTS | 58 |
| 4.1. Overview of long-range pollution in the Arctic | 58 |
| 4.2. Impact of the EU's economy and population on pollution in the Arctic..... | 59 |
| 4.3. Overview of EU policies and actions affecting long-range pollutants..... | 61 |
| 4.4. Assessment of EU policies affecting long-range pollution | 62 |
| 4.5. Policy options for long-range pollutants | 65 |
| 5. MACRO-AND MICROPLASTIC POLLUTION | 66 |
| 5.1. Background: macro- and microplastic pollution in the Arctic | 66 |
| 5.2. Arctic plastics footprint of the EU economy | 68 |
| 5.3. EU policies and their impact | 70 |
| 5.4. Policy options for limiting the EU's Arctic plastic pollution footprint and enhancing its contribution..... | 73 |

| | |
|---|------------|
| 6. BIODIVERSITY | 74 |
| 6.1. Biodiversity in the Arctic: an overview..... | 74 |
| 6.2. The EU economy's influence on the state of Arctic biodiversity | 75 |
| 6.3. Overview of EU policies relevant for Arctic biodiversity and their impact..... | 75 |
| 6.4. Policy options for the EU's contribution to Arctic biodiversity..... | 80 |
| 7. FISHERIES..... | 81 |
| 7.1. Overview of the sub-Arctic and Arctic fisheries | 81 |
| 7.2. The EU's influence on Arctic fisheries | 83 |
| 7.3. Overview of relevant EU policies | 85 |
| 7.4. Impacts of EU policies and actions on Arctic fisheries..... | 89 |
| 7.5. Policy options | 90 |
| 8. MARITIME TRANSPORT AND ITS ENVIRONMENTAL IMPACTS | 91 |
| 8.1. Arctic maritime transport: overview | 91 |
| 8.2. Arctic footprint of the EU's maritime transport sector | 93 |
| 8.3 Overview of relevant EU policies | 96 |
| 8.4 Policy options | 99 |
| 9. ENERGY, INCLUDING RENEWABLES AND OFFSHORE HYDROCARBONS | 101 |
| 9.1 Background: Energy and the European Union..... | 101 |
| 9.2 Arctic Energy and the European Union..... | 103 |
| 9.3 Overview of EU policies | 105 |
| 9.4 Policy Assessment and Outlook | 107 |
| 9.5 Policy options | 110 |
| 10. RAW MATERIALS | 111 |
| 10.1 Overview of the Arctic mining sector | 111 |
| 10.2. Footprint of the EU's economy and population on Arctic mining..... | 114 |
| 10.3. EU policies and their impact on mining developments in the Arctic..... | 116 |
| 10.4. Policy options | 120 |
| 11. REGIONAL DEVELOPMENT IN THE EUROPEAN ARCTIC AND GREENLAND..... | 122 |
| 11.1. Overview of socio-economic challenges in Arctic regions..... | 122 |
| 11.2. EU footprint: interactions between the EU economy and the development of Arctic regions..... | 122 |
| 11.3 EU policies relevant for Arctic regional development and their impact | 123 |
| 11.4. Policy options for the EU's inputs into sustainable regional development..... | 130 |
| ANNEX 1: LIST OF EU LEGISLATION AND POLICY DOCUMENTS MENTIONED IN THE REPORT | 131 |
| ANNEX 2: REFERENCES CITED IN THE REPORT, A LIST OF INTERVIEWEES (INSTITUTIONS), LIST OF FIGURES AND TABLES | 139 |
| ANNEX 3: ASSESSMENT OF PROPOSED POLICY OPTIONS | 160 |
| REPORT AUTHORS: BIOS..... | 172 |

List of Acronyms

| | |
|---------|--|
| α-HCH | alpha-Hexachlorocyclohexane |
| AC | Arctic Council |
| AEPS | Arctic Environmental Protection Strategy |
| AFPA | EU Arctic Footprint and Policy Assessment |
| AHDR | Arctic Human Development Report |
| AI | Artificial intelligence |
| AIS | Automatic identification system |
| AMAP | Arctic Monitoring and Assessment Programme – working group of the AC |
| APECS | Association of Polar Early Career Scientists |
| ASM | Arctic Science Ministerial |
| BAT | Best Available Techniques |
| BBNJ | Marine Biodiversity in areas Beyond National Jurisdiction |
| BC | Black carbon |
| bcm | Billion cubic meters |
| BEAC | Barents Euro-Arctic Region |
| BPAN | Barents Protected Area Network |
| BPfA | Beijing Declaration and Platform for Action |
| CAFF | Conservation of Arctic Flora and Fauna - working group of the AC |
| CAMS | Sulphur Oxides Emission Control Areas |
| CAO | Central Arctic Ocean |
| CAP | Common Agricultural Policy |
| CBAM | Carbon border adjustment mechanism |
| CBD | Convention on Biological Diversity |
| CBMP | Circumpolar Biodiversity Monitoring Program |
| CCAC | Climate and Clean Air Coalition |
| CEDAW | Convention on the Elimination of All Forms of Discrimination against Women |
| CEF | Connecting Europe Facility |
| CEMS | Copernicus Emergency Management Service |
| CETA | EU-Canada Comprehensive and Economic Trade Agreement |
| CFP | Common Fisheries Policy |
| CIS | Commonwealth of Independent States |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CLRTAP | Convention on Long-Range Transboundary Air Pollution |
| CMEMS | Copernicus marine environment monitoring service |
| CMS | Copernicus Maritime Surveillance Service |
| CPAN | Circumpolar Protected Area Network |
| CPAR | Conference of Arctic Parliamentarians |
| CPTPP | Comprehensive and Progressive Agreement for Trans-Pacific Partnership |
| CSA-ACS | Canadian Space Agency |
| DEEA | EP Delegation for Relations with Switzerland, Norway, Iceland, EEA and the North |
| DG ECHO | European Commission-Directorate General for Humanitarian Aid & Civil Protection |
| DG ENV | EC DG Environment |

| | |
|----------|---|
| DG MARE | EC DG for Maritime Affairs and Fisheries |
| DG REGIO | EC DG for Regional and Urban Policy |
| DOPA | Digital Observatory for Protected Areas |
| EC | European Commission |
| ECA | European Court of Auditors |
| ECHA | European Chemicals Agency |
| ECHR | European Convention on Human Rights |
| EDP | European Digital Programme |
| EEA | European Environment Agency |
| EEArea | European Economic Area |
| EEAS | European External Action Service |
| EEZ | Exclusive economic zone |
| EFCA | European Fisheries Control Agency |
| EFFIS | European Forest Fire Information System |
| EFTA | European Free Trade Agreement |
| EGD | European Green Deal |
| EGNOS | European Geostationary Navigation Overlay Service |
| EIA | Environmental Impact Assessment |
| EIB | European Investment Bank |
| EIGE | European Institute for Gender Equality |
| EIP | European Innovation Partnership |
| EIT | European Institute of Innovation and Technology |
| EMEP | The co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (unofficially European Monitoring and Evaluation Programme) |
| EMFF | European Maritime and Fisheries Fund |
| EMSA | European Maritime Safety Agency |
| EP | European Parliament |
| EPB | European Polar Board |
| EPCO | European Polar Coordination Office |
| EPPR | Emergency Prevention, Preparedness and Response – AC working group |
| EPRP | European Polar Research Programme |
| ERA | European Research Area |
| ERC | European Research Council |
| ERCC | Emergency Response Coordination Centre |
| ERDF | European Regional Development Fund |
| ESA | European Space Agency |
| ESF | European Social Fund |
| ETS | Emissions Trading Scheme |
| EU | European Union |
| EUA-BCA | EU-funded Action on Black Carbon in the Arctic |
| EUMOFA | European Market Observatory for fisheries and aquaculture |
| FAO | Food and Agriculture Organization of the United Nations |
| FP7 | 7 th Framework Programme |
| FPI | Service for Foreign Policy Instruments |
| FPIC | Free, Prior and Informed Consent |
| GAC WS2 | EU-Russia Gas Advisory Council |
| GAP | Gender Plan of Action |
| GATT | The General Agreement on Tariffs and Trade |
| GDP | Gross domestic product |
| GEP | Gender equality plan |
| GHG | Greenhouse gases |

| | |
|----------|--|
| GPS | Global positioning system |
| GT | Tonnes gross weight (for ships) |
| GWIS | Global Wildfire Information System |
| HAS | High accuracy service |
| HCB | Hexachlorobenzene |
| HFO | Heavy fuel oil |
| IA | Impact assessment |
| IASC | International Arctic Science Committee |
| ICE-ARC | Ice, Climate and Economics - Arctic Research on Change |
| ICES | International Council for the Exploration of the Sea |
| ILO | International Labour Organization |
| IMO | International Maritime Organization |
| INTERACT | International Network for Terrestrial Research and Monitoring in the Arctic |
| IPCC | Intergovernmental Panel on Climate Change |
| IPY | International Polar Year |
| ITU | International Telecommunications Union |
| IUU | Illegal, Unreported and Unregulated (Fisheries) |
| JRC | EC Joint Research Centre |
| JTF | Just Transition Fund |
| JTM | Just Transition Mechanism |
| LGBTIQ | Lesbian, gay, bisexual, trans, non-binary, intersex and queer |
| LIFE | <i>L'Instrument Financier pour l'Environnement</i> |
| LNG | Liquefied natural gas |
| LULUCF | Land use, land use change and forestry |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MFF | Multiannual financial framework |
| MOPPR | Marine Oil Pollution Preparedness and Response |
| MOSAic | Multidisciplinary drifting Observatory for the Study of Arctic Climate |
| MPA | Marine Protected Area |
| MS | Member State |
| MSFD | Marine Strategy Framework Directive |
| m t | Million tonnes |
| Mtoe | Million tonnes of oil equivalent |
| NAFO | Northwest Atlantic Fisheries Organization |
| NAMMCO | North Atlantic Marine Mammal Commission |
| NAPCP | National Air Pollution Control Programme |
| NATO | North Atlantic Treaty Organization |
| ND | Northern Dimension |
| NDEP | Northern Dimension Environmental Partnership |
| NEAFC | North-East Atlantic Fisheries Commission |
| NEC | National Emissions Reduction Commitments Directive |
| NGEU | NextGenerationEU temporary recovery instrument |
| NGO | Non-governmental organisation |
| NPA | Northern Periphery and Arctic Programme 2014-2020 |
| NPFC | North Pacific Fisheries Commission |
| NSPAs | Northern Sparsely Populated Areas |
| OCT | Overseas Countries and Territories |
| OECD | Organisation for Economic Cooperation and Development |
| OSPAR | Convention for the Protection of the Marine Environment of the North-East Atlantic |
| PAH | Polycyclic aromatic hydrocarbons |
| PAME | Protection of Arctic Marine Environment working group of the AC |

| | |
|-----------|---|
| PBDEs | Polybrominated diphenyl ethers |
| PCB | Polychlorinated biphenyl |
| PCDD/PCDF | Polychlorinated dibenzo-p-dioxins (PCDD) and dibenzofurans (PCDF) |
| PMF | Public financial management |
| PICES | North Pacific Marine Science Organization |
| PM | Particulate matter |
| POPs | Persistent organic pollutants |
| PSCG | Provisional Scientific Coordinating Group |
| PSSA | Particularly Sensitive Sea Area |
| RAMSAR | Convention on Wetlands of International Importance |
| REACH | Registration, Evaluation, Authorisation and Restriction of Chemicals (Regulation) |
| REEs | Rare Earth Elements |
| RFMO | Regional Fisheries Management Organisation |
| RIS3 | Regional Strategies for Research and Innovation for Smart Specialisation Strategies |
| RMIS | Raw Materials Information System |
| ROADS | Roadmap for Arctic Observing and Data Systems |
| SAOs | Senior Arctic Officials |
| SAON | Sustaining Arctic Observing Network |
| SDGs | Sustainable Development Goals |
| SDWG | Sustainable Development Working Group (Arctic Council) |
| SECAs | Sulphur Oxides Emission Control Areas |
| SIA | Strategic Impact Assessment |
| SMEs | Small and Medium Enterprises |
| SOLAS | Convention on the Safety of Life at Sea |
| SPA | Special Protection Area |
| STEM | Science, technology, engineering, and mathematics |
| TAC | Total allowable catch |
| TEN-T | Trans-European Network – Transport |
| TEU | Treaty on the European Union |
| TFEU | Treaty on the Functioning of the European Union |
| UCPM | (European) Union Civil Protection Mechanism (also EUCPM) |
| UK | United Kingdom |
| UN | United Nations |
| UNCLOS | UN Convention on the Law of the Sea |
| UNCTAD | United Nations Conference on Trade and Development |
| UNECE | United Nations Economic Commission for Europe |
| UNEP | UN Environmental Programme |
| UNFCCC | UN Framework Convention on Climate Change |
| USGS | United States Geological Survey |
| USMCA | US-Mexico-Canada Agreement |
| WCDRR | UN World Conference on Disaster Risk Reduction |
| WTO | World Trade Organization |

Executive Summary

The report

The report presents an overview of EU policies, initiatives and projects that are of relevance for the Arctic. The authors consider both Arctic-specific actions as well as the broad spectrum of EU general policies that affect the way it influences the region as a major economy, market for Arctic resources, polluter and a research powerhouse. As background for such an overview, the Arctic environmental and economic footprint of the EU's economy and population is assessed. The study includes policy options aimed at enhancing the EU's Arctic policy impact.

The work is primarily a synthesis of existing knowledge and information, although some new data has been generated as well. All numbers presented below should be seen as simplifications allowing the reader to capture the magnitude and multifaceted character of the EU's Arctic influence.

The definition of the Arctic in this report follows the Arctic Human Development Report (AHDR) boundary and the International Maritime Organization's designation in the case of marine topics. The European Arctic (the European part of the Arctic) includes the northernmost regions of Finland, Norway and Sweden, northwest Arctic Russia as well as Faroe Islands, Greenland and Iceland, depending on the specific context, as indicated under different themes. This is the area where the EU economic influence is the strongest, where the EU programmes operate and where pollution coming from the EU makes the greatest impact. The EU Arctic refers to the northernmost regions of Finland and Sweden, which includes Finnish Lapland and Norrbotten. However, in the context of EU policies, the authors refer also to a broader group of northern sparsely populated regions, including Västerbotten and the seven regions of North-East Finland, in particular in the context of the EU structural and cross-border programmes. Europe or "European continent" refers to the whole of Europe up to the Ural Mountains, Turkey and the Caucasus.

The sections below first outline the Arctic footprint of the EU's economy and population. An overview of the EU's policy impact is then presented by considering the effects of EU policies on the environment footprint and on its role as a market for Arctic products. Further, the EU role in Arctic knowledge-building is discussed. Finally, the special role of the EU in the European Arctic is highlighted.

The Arctic footprint of EU economy and population

The EU's readiness to assess its impact on the Arctic can be seen as a major asset for a responsible EU Arctic policy and distinguishes the EU among actors active in the Arctic. It is an action that is worth being repeated in the future by the EU. Moreover, major economies – both Arctic and non-Arctic - should be encouraged to conduct assessments of their Arctic footprint (policy option P3 in the main text).

As a major economy, population and polluter, the EU, notwithstanding its intentional Arctic policy and engagement, influences the Arctic in a variety of ways. Its footprint in the region is comparatively high because among the major industrialised regions it is the EU that is located closest to the Arctic Circle. The emission of greenhouse gases drives global warming, while pollutants such as persistent organic pollutants, black carbon, heavy metals like mercury, and micro- and macroplastics travel to the Arctic by air and ocean currents. The global system of wind and ocean currents results in the Arctic becoming a sink for many of the pollutants, even though the northern local pollution sources are usually limited in scale. The EU contributes to Arctic warming through an 8% share in global greenhouse gas emissions. In addition, the EU is responsible for around 36% of Arctic deposition of black carbon, which speeds up the warming of the Arctic, the melting of snow and ice surfaces, and is a harmful air pollutant. Black carbon is transported by air into the Arctic via wind patterns together with other pollutants. The European continent as a whole contributes 30-40% of persistent organic pollutants transported into the Arctic region. The EU-27 together with the UK, Turkey and Western Balkan countries make up 8% of Arctic mercury pollution. Part of these pollutants are transported by sea currents

and that is also the key pathway for plastic pollution. It is currently impossible to assess how much of the macro- and microplastics released in the EU ends up in the Arctic's waters and ecosystems. However, the EU is located next to the Gulf Stream which is the main northward pathway of this pollution, and therefore the EU constitutes a considerable source of Arctic marine litter, including that originating from fisheries. Microplastics can also travel by air and two European sources of these particles are of particular concern: the unintentionally released microplastics from synthetic textiles and the road traffic emissions occurring by the wearing down of tyres and brakes.

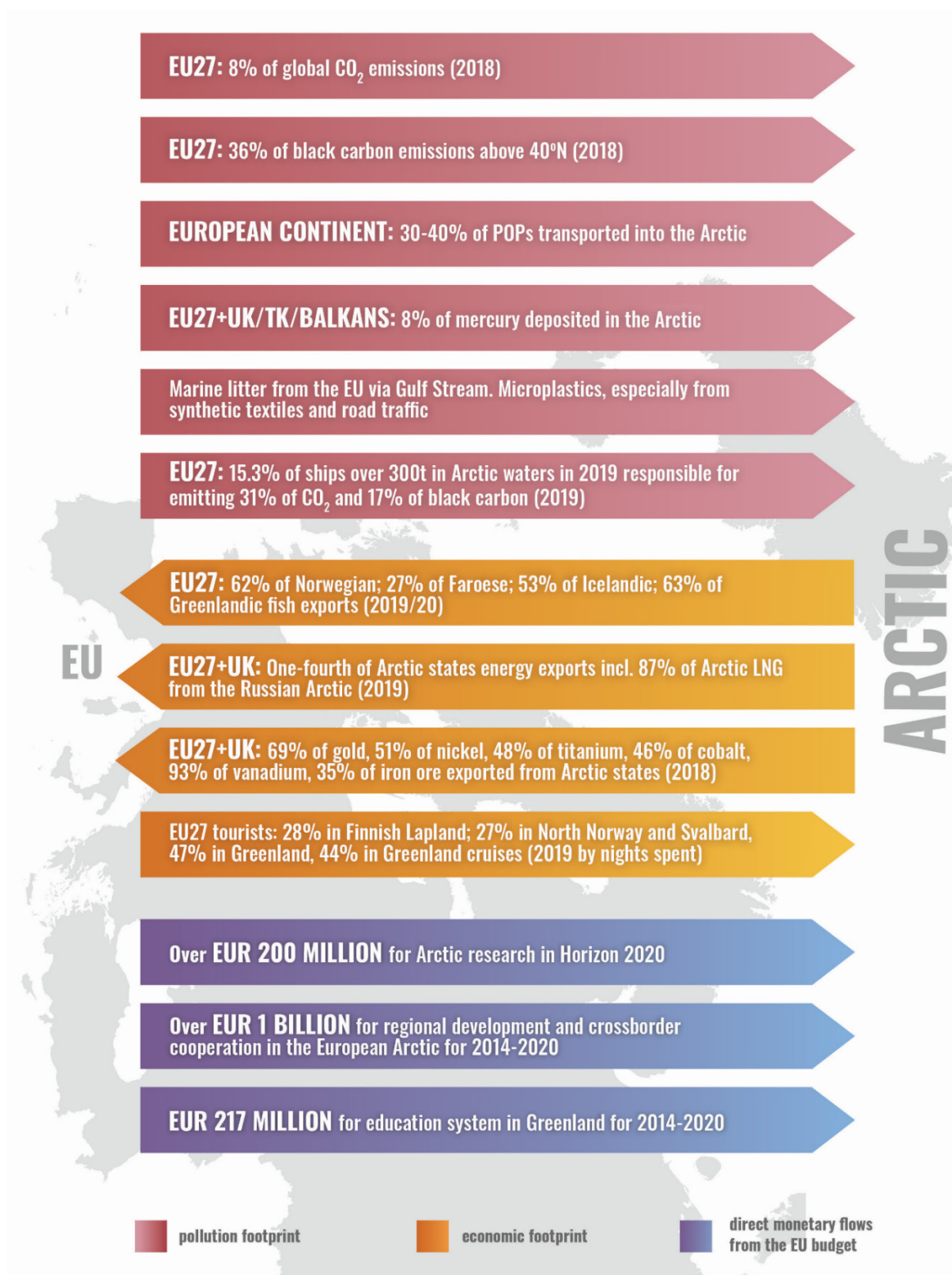


Figure ES1: Illustration of the EU economic and environmental footprint in the Arctic and the financial support for Arctic projects from chosen EU programmes. Illustration design by Gabriela Mlaskawa, EPRD 2021.

As a market for Arctic products, the EU buys roughly one-fourth of Arctic hydrocarbon exports, including 87% of the liquefied natural gas (LNG) produced in the Russian Arctic. Over 15% of vessels above 300 tonnes gross weight traversing Arctic waters fly EU Member States' flags or are owned by EU-based companies, being responsible for 31% of CO₂ and 17% of black carbon emitted by Arctic shipping. The EU has between 25% and 60% share in the imports of fish from North Atlantic countries. It imports numerous raw materials, including critical minerals: 69% of gold, 51% of nickel and 48% of titanium exported by Arctic states find buyers within the EU. In 2019, EU-27 tourists constituted between 27% and 47% of visitors to the different regions of the European Arctic.

The EU contributes financially in a direct way to regional development, with the aim to make it sustainable. Arctic research is also strongly supported. Over EUR 200 million has been spent on Arctic research within the Horizon 2020 research and innovation programme. In the 2014-2020 period, Greenland received EUR 217 million for education as a part of the overseas countries and territories partnership. During the same time, the EU spent over EUR 1 billion on mainstream (i.e. Investment for Growth and Jobs) cohesion policy programmes in Arctic Finland and Sweden, as well as cross-border and transnational programmes across the European Arctic.

EU policies affecting its climate and environmental footprint

The EU's internal policy (influenced by international law and cooperation) on climate change and environmental protection has progressed over the past decades, resulting also in reductions of substances that cause environmental problems in the Arctic. The main concern here is climate change, which is the biggest driver of transformation in the Arctic. The climate mitigation policy of the EU has to a great extent achieved its objectives and has been able to increase its ambition level for the future with the overarching Green Deal. The EU has also had a targeted methane policy, which has led to emissions reductions, which are also important from the Arctic warming viewpoint.

Of importance for this study is the impact of the EU's clean air policy on the EU's black carbon emissions. The EU has already been tackling the amount of this short-lived climate pollutant reaching the Arctic from the EU e.g. by setting particulate matter (PM_{2.5}) targets and encouraging its Member States to report and improve their inventories. Furthermore, the EU has been able to curb its emissions of persistent organic pollutants (POPs) (60-97% reductions since 1990, depending on a specific pollutant) and heavy metals (e.g., over 70% of mercury emissions reductions between 1990 and 2014). The EU is also reducing the harmful emissions from its vessels (some of which are navigating in Arctic waters) through its participation in standard-setting in the IMO and having its own air pollution legislation in place. Paradoxically, the success in reducing sulphur dioxide in the EU also leads to further warming in the Arctic – as sulphur dioxide acts in the atmosphere as a climate coolant – requiring even stronger climate change mitigation measures. There is now increasing awareness that there are co-benefits in tackling various pollutants together, as they are interlinked, an approach underlined in the European Green Deal.

The EU has taken only a few Arctic-specific actions with regard to long-range pollution. It has been active in the context of the Arctic Council and has reported its progress (as a *de facto* observer) to the Arctic Council's expert group on methane and black carbon. The EU also finances the project Action on Black Carbon in the Arctic region, which aims to support work to reduce black carbon and its negative effects on the Arctic. The overall project is led by the Arctic Monitoring and Assessment Programme working group of the Arctic Council. Overall, the EU's participation in the work of the Arctic Council is relatively fragmented, in particular with regard to biodiversity questions.

The EU has continuously supported a heavy fuel oil (HFO) ban for the Arctic and encouraged Member States to take a vocal stance in support of the phasing-out of this type of fuel in the region. The use of HFO results in high emissions of air pollutants, including black carbon, with significant impact on regional climate forcing and serious health effects on local populations. The adoption of an HFO ban has been under discussion for much of the past decade. At the end of 2020 the IMO's Marine Environment

Protection Committee moved to ban the use and carriage of the HFO and the ban is expected to be formally adopted by the full IMO assembly during 2021.

The EU can limit the amounts of plastics transported into the Arctic from EU sources by reducing the mismanaged waste and uncollected litter, as well as limiting landfill deposition. The EU achieved some degree of success in that regard during the last decade. The impact of these measures may be limited at the global level, but significant (although impossible to measure currently) in the Arctic context. A broad range of EU policies have recently been developed or updated with relatively ambitious goals, e.g. a ban on many single-use plastics. An area of particular relevance for the Arctic is microplastic pollution from the EU. The areas of particular importance are unintentionally released microplastics from car tyres and synthetic textiles, where policy actions remain limited, even if there has been progress in recent years.

Global biodiversity is deteriorating at an alarming rate. The situation in the Arctic is relatively good compared to many other regions, but the northern ecosystems are undergoing rapid transformation due to climate change. The EU's biodiversity strategy towards 2020 established clear targets for better protection of species and habitats but a mid-term review of 2015 concluded that not much progress in achieving these targets was taking place and evaluation of these 2020 targets is ongoing, while a new strategy towards 2030 has been adopted.

Policy options:

- The EU could consider committing to a common target for black carbon reductions in parallel to the actions of Arctic States in the framework of the Arctic Council Expert Group on Methane and Black Carbon (ref. policy option P18 in the main text).
- Utilise the Northern Dimension Environmental Partnership towards black carbon work (P20).
- Bring the long-range aspect of pollutants more strongly into the EU's regulatory and institutional framework (P22).
- Improve the understanding of long-distance transport of plastic waste in the North Atlantic and air transport of microplastics (P23).
- Develop policy and technological measures for unintentionally released microplastics from synthetic textiles and road traffic (P24).
- Create a stronger institutional presence of the EU in the work of the Arctic Council's Conservation of Arctic Flora and Fauna working group to advance the protection of Arctic biodiversity (P25).
- Consider establishing an internal policy coordination group of the European Commission to follow and, if necessary, take a stance on what should be the EU's role in biodiversity governance of the Central Arctic Ocean (P26).

EU actions related to its role in Arctic economic development

The EU is a key market for resources extracted in the Arctic and it contributes to developments in Arctic economic sectors, with the stated aim of making this development more sustainable and inclusive. This section outlines the influence of EU policy on its economy's demand for Arctic oil and gas and facilitating the expansion of renewable energy, as well as on the import and production of Arctic raw materials. The EU contributes to the demand for sub-Arctic fisheries and Arctic shipping and takes part in shaping regulatory frameworks governing these activities.

The EU attempts to actively shape its resource consumption and resource security, which will increasingly affect its economic interactions with the Arctic. The EU already had policies aimed at limiting its dependence on hydrocarbons, including in transport. The level of ambition has now been boosted with the adoption of the European Green Deal and increasing the 2030 target of renewable energy consumption to 32%. Taxation, incentives and the support for development and application of green technologies are to contribute to fundamental transformation of the EU's energy system. Nonetheless, so far, EU dependence on oil and gas and their importation remains significant. The currently proposed

carbon border adjustment mechanism could play a role in that regard, although it is at the moment impossible to say how it may affect the Arctic.

The EU is also interested in securing and diversifying access to raw materials including critical minerals, which are crucial for modern technologies including for renewable energy and electric transport. At the same time, the aim is to ensure that the resources imported to the EU are extracted as responsibly as possible, although the EU has only limited competence and influence with regard to Arctic minerals extraction. In the long-term, dialogues with Arctic States and trade relationships, such as the EU-Canada Comprehensive Economic and Trade Agreement (CETA), may contribute to responsible sourcing, but so far, they have produced limited tangible outputs. There is also a possibility in the future for Arctic extractive projects that contribute to EU raw materials security, to receive financing from the European Investment Bank (EIB). It is, however, important that the contribution of extracted raw materials to the global and European transition to the low-carbon economy does not run counter to local sustainability and livelihoods.

In the field of Arctic marine transport, apart from the global regulatory developments mentioned, the EU influences the port state control and inspection regime, which will be crucial for the full implementation of the new Arctic shipping rules under the Polar Code. Over the years, the EU has also contributed to strengthening vessel monitoring systems, positioning, information on sea ice and presence of icebergs through the Galileo and Copernicus programmes. The EU's emergency response capabilities under the European Maritime Safety Agency (EMSA) can also be deployed in Arctic waters. These EU contributions are of value for the economic feasibility of Arctic shipping, just as they are for the environmental performance of maritime transport.

With regard to fisheries, the EU Common Fisheries Policy was criticised in the past, but it has gone through a number of reforms in the last decade, including introduction of a landing obligation, thus limiting the discarding of fish. The EU is one of the leading actors in the combat against illegal, unreported, and unregulated (IUU) fishing, with actions based on EU integrated maritime services from EMSA and the use of space technologies. It is an important member of the North-East Atlantic Fisheries Commission (NEAFC), it has strong fisheries relations with North Atlantic nations and is a signatory to the 2018 Central Arctic Ocean Fisheries Agreement. In the process of implementing the latter, the EU can constructively contribute to scientific cooperation towards evaluating the conditions for future fisheries in the Central Arctic Ocean.

Policy options:

- Contribute to strengthening the Polar Code (fishing vessels and non-SOLAS vessels) (P28).
- Strengthen port state control for Arctic rules (P29).
- Contribute to scientific work and cooperation on central Arctic Ocean fisheries (P27).
- Consider developing a comprehensive Arctic energy policy (P30).

The EU's role in understanding the Arctic and its interactions with the region's peoples and states

The EU is contributing to our understanding of the Arctic. In cooperation with the European Space Agency (ESA), the EU is a key actor in space programmes (e.g. Galileo, EGNOS and Copernicus). These provide services which are of significant value for the people who live in the Arctic, from geolocation data to up-to-date satellite information which allows rapid decision-making in harsh environments, for example concerning sea-ice coverage in Arctic and sub-Arctic waters. The European Marine Observation and Data network (EMODnet) generates in-situ marine data and observations. Copernicus provides a variety of practical services, open and free, including supporting disaster early warning and emergency operations support with rapid mapping. A good example where these capabilities have been utilized is that of large forest fires, which have plagued the circumpolar Arctic in recent years and which are likely to become more common due to climate change.

Findings from EU-funded Arctic-related research projects not only provide important contributions to the work of the Intergovernmental Panel on Climate Change (IPCC) and an understanding of global climate dynamics, but they are also increasingly oriented toward specific needs and challenges faced by Arctic indigenous and local populations. Through the 7th Framework Programme (2007-2013) and Horizon 2020 (2014-2020), the EU has enabled and led the creation of some of the world's largest consortia and networks in terms of polar research and infrastructure. The EU is an active partner in major fora regarding Arctic science, including the Arctic Science Ministerial meetings and it actively contributes to work of the Arctic Council. Also of importance is the innovative co-operation of the Horizon-funded research projects via the EU Polar Cluster.

The EU has many pathways for interacting with Arctic states and peoples. The EU actively engages in issues of direct relevance for the Arctic on an international level via the United Nations and its specialised agencies, such as the IMO. Although formally not an observer, the EU actively participates in the Arctic Council and especially its working groups. It also contributes to the various regional and sub-regional Arctic cooperation fora: the Barents Euro-Arctic Council (European Commission as a member), the Nordic Council, the Conference of Arctic Parliamentarians. The EU's Arctic external relations also include relationships with all non-EU Arctic states, either by bilateral means or, for example, through the Northern Dimension, a joint policy between the EU, Russia, Iceland and Norway, which has undergone a degree of revival in the last few years.

The EU's policy regarding Arctic Indigenous Peoples is evolving. The EU has been organising Arctic Dialogue meetings, where Arctic indigenous representatives and EU officials meet. These events are highly appreciated by indigenous representatives. However, the format of these meetings often does not allow for a more in-depth discussion on concrete problems, concerns and current EU policy developments. A major challenge is ensuring coherence throughout the EU's multifaceted interactions with Indigenous Peoples – globally, in the Arctic, and internally within the EU/EEA area. The 2016 Arctic communication stated the need to pursue such greater coherence. However, so far, general EU policies – for instance the latest biodiversity strategy – mention Indigenous Peoples only in the external context.

Gender equality is increasingly present in Arctic discussions. It is explicitly included in new Arctic strategies of Finland and Sweden and it has been promoted through Iceland's Chairmanship of the Arctic Council. In 2020, the EU has adopted a series of new strategies aimed at achieving gender equality within the EU and around the world with emphasis on the empowerment of women and girls. The EU is also committed to advancing gender equality through the provisions of Horizon Europe.

Policy options:

- Include gender equality as one of the overarching principles in a new Arctic communication (P8).
- Promote and emphasise gender equality, and the empowerment of women in and through EU-funded Arctic scientific research (P14).
- Enhance local, community and Indigenous Peoples' capacity-building to make EU-funded Arctic scientific research more resilient to disruptions such as the Covid-19 pandemic (P16).
- Minimise the environmental impact of EU-funded Arctic research activities (P17).
- Facilitate the EU's contribution to increased satellite connectivity in the High Arctic (P10).
- Coordinate better the EU involvement in the work of the Arctic Council working groups (P5).
- Enhance engagement with the youth and the inclusion of young voices in EU-Arctic matters (P9).
- Enhance the internal coherence and integrated approach to Indigenous Peoples in the EU (P6).
- Make the interactions between the EU and Arctic Indigenous Peoples more action-oriented and concrete, as well as consider establishing more institutionalized dialogue forums (P7).

The EU and the European Arctic

The European Arctic shares a variety of characteristics and challenges with other parts of the circumpolar North, including human capital imbalances, depopulation of rural areas, high dependence on extractive industries, specific challenges related to the Arctic climate and its change, as well as the critical role of air transport for regional development.

The policy influence of the EU in the European Arctic stands out within the EU's Arctic affairs as the territories of two EU Member States are located within the Arctic Circle, and Iceland and Norway are members of the European Economic Area. The EU also has close ties with Greenland. The EU's cohesion policy includes cross-border programmes, which are among the key EU instruments supporting sustainable development across the European Arctic, while other policies also play a role.

The EU cohesion policy programmes in Finland and Sweden as well as several transnational and cross-border programmes channel EU funding to the region and mobilise national resources. These are utilised for green growth projects, boosting local entrepreneurship, SMEs' innovation, digitalisation as well as planning activities. The smart specialisation approach promoted in EU regional policy has, in the last eight years, been taken up and applied in European Arctic regional development planning, including outside of the EU. EU programmes have become indispensable elements of cross-border cooperation across the European Arctic including with northwest Russia. As an element of the EU's Arctic policy, cooperation between these different programmes has been launched, and the effects of this collaboration are evaluated positively by most actors. From 2021, significant EU support for just transition away from peat will be available in northeast Finland and for the transformation of energy-intensive industries in northern Sweden. There are also various possibilities for obtaining financing from the EIB. As EIB loans are linked to sustainability standards, and support EU policy objectives, this financing has a role in prioritising development that is more sustainable. EU funding will become more relevant following the Covid-19 pandemic. Various currently implemented projects already address Covid-19 impacts, but the upcoming multiannual financial framework will bring the response to a much higher level, supporting post-pandemic recovery, which includes the Next Generation EU instrument.

Greenland receives the largest amount of EU support per capita of EU overseas countries and territories (OCTs). This funding has been dedicated thus far to education and vocational training. Currently, there may be possibilities for opening other fields of cooperation, although the relatively low level of education remains a critical challenge in Greenland.

Various EU sectoral policies are of particular relevance in the EU/EEA Arctic. Large areas in the EU northernmost regions are part of the Natura 2000 network. EU funding, while limited in relatively wealthy Nordic states, can support transport investments. EU willingness to facilitate extraction of raw materials within the EU is important in the mineral-rich Fennoscandian Shield, although the EU's direct influence on extractive activities remains limited. However, there are numerous EU projects aiming at making mining activities more responsible and following sustainability standards.

Policy options:

- Strengthen the Northern Periphery and Arctic Programme (NPA) and maintain its role as a facilitator of cooperation between northern programmes (P34).
- Provide stronger support for developing green air transport and mobility (P12).
- Continue promoting small project funds in the Arctic context (P35).
- Support social impact assessments and efforts for improving the awareness, acceptance and trust in raw materials extraction (P33).
- Consider the Indigenous Peoples' rights and interests in Arctic raw materials extraction via dialogue, best practices and guidelines (P32).
- Facilitate further the digital transformation in peripheral regions (P11).

The EU's role in the Arctic

The emphasis on the Arctic is rising with the increasing impacts of climate change in the region. The EU population and economy exert significant influence on the region via its environmental footprint and economic demand and the EU has been able to make progress in some areas partly owing to its regulatory and policy actions. Also in the future, those EU actions that change the way the EU functions as a major global economy will potentially have immense influence on the Arctic. Understanding this EU-Arctic nexus is particularly important at a time when the EU aims at fundamentally transforming its socio-economic system via the European Green Deal and post-pandemic recovery. The key question is whether the EU succeeds in meeting its ambitious transformation goals and whether the rest of the world, including the key global powers, is willing to make a similar effort. Arctic regions themselves will have to engage with transition, but the challenges related to remoteness, sparsity and regional economic profiles may make this road different if not more difficult compared to other parts of Europe. There is a need and there are existing mechanisms for the EU to support Arctic regions in their own transformation towards a sustainable, low-carbon economy while maintaining viable communities and societies.

At the same time, the multifaceted and complex presence and role of the EU in the Arctic makes developing a coherent and focused Arctic policy a highly challenging task. One of the most important pathways for the EU to influence Arctic developments in the long term is stronger integration of concerns specific to the Arctic into the EU's general policymaking. Among possible ways this could be achieved is including more often Arctic perspectives in the EC's regulatory impact assessments (P1). The oversight and coordination of the EU Arctic actions could be reconsidered, reflecting, e.g., the role of the EU cohesion policy programmes in the European Arctic and the significance of the European Green Deal for the current and future presence and role of the EU in the Arctic (P2).

1. Introduction and methodology

1.1. Introduction

The Arctic, located at the northern tip of the globe is a region of roughly 4 million people and 20 million km² (only the area above the Arctic circle, including 14 million km² of the Arctic Ocean), 4.5 times the size of the EU. Arctic regions have been undergoing profound changes driven by the forces of globalisation and global climate change. The latter occurs in the circumpolar North two-to-three times faster than the global average (IPCC, 2018). Significant impacts on Arctic biodiversity and the status of its ecosystems have already been recorded (Arctic Biodiversity Assessment, 2013, 2017). The Arctic environmental change has implications for the wider world as well as for the livelihoods, cultures and economies of Arctic peoples (IPCC, 2015). Indigenous Peoples constitute about 10% of the Arctic population within the boundaries of the area of the Arctic Human Development Report (AHDR 2004). Indigenous communities represent different cultures and their position in the legal, political and social framework of respective states differs across the region.

Several socioeconomic megatrends (Rasmussen 2011) are present in Arctic regions. The share of extractive industries in regional economies is relatively high. Different resources are extracted in different regions, including fisheries, forestry, raw materials and hydrocarbons. Overall, 14% of Arctic (defined by the AHDR boundary) jobs are in the primary sector, compared to 4.5% for the EU-27+UK (data for 2016, EC n.d.). A big part of public spending often comes from national budgets, while Arctic regions usually significantly contribute to national economies. Administration and public sectors constitute a proportionately high percentage of labour employment especially in Nordic countries and northern Canada. The situation of Arctic Indigenous Peoples differs between parts of the region, but challenges related to land rights, cultural change and loss, as well as access to resources are common.

Arctic societies change and are able to produce innovation and show high levels of entrepreneurship (in addition to resource-driven economic development) (Stepien and Koivurova, 2018). The Arctic regions have always been linked to the global economy, primarily by resource extraction. Today, these linkages become more complex, and the developments in Arctic services, expertise, and manufacturing are a part of global economic flows. Digitalisation is changing the Arctic as much as it affects the rest of the globe. The regions continue to experience demographic changes (Heleniak, 2020), with urbanisation, depopulation of Arctic rural areas, as well as gender and age imbalances due to stronger out-migration and movement towards urban centres of women and young people. At the same time, new migrants appear in the North. The nature of these changes varies across the different parts of the Arctic, since circumpolar regions are characterised by dissimilar ecosystems and societies.

The Arctic of the 21st century is a truly global region; not only is it disproportionately affected by climate change, but it has also been equally impacted by international developments, which in turn have made it increasingly connected to and embedded in global political and economic frameworks over the past two decades. Today's Arctic is characterised by a combination of classic security challenges, with both a regional and global dimension, and new environmental and socio-economic security threats, as well as economic opportunities. In addition, long-term global changes, such as generational shifts, increasing digitisation, the greening and decarbonisation of the world's economies or the international advance of 'alternative facts' will further impact the future of the Arctic region (Dolata, 2020, p. 9).

Actors from outside the Arctic have a profound and multifaceted impact on the developments taking place across the Arctic. These impacts and influences include, among others, long-range pollution, demand for Arctic resources, contribution to knowledge-building on the Arctic, and participation in setting rules of international governance of relevance for the region (Shibata et al., 2019).

Only 0.74% of the population of the EU lives in Arctic regions (as defined by the Arctic Human Development Report, 2004). That number, however, does not reflect the EU's interlinkages with and the influence on the Arctic. The EU's environmental, social and economic impacts on the Arctic are complex (Stepien et al., 2014; Koivurova et al., 2012; Stepien, 2015; Liu et al., 2017). The EU's population and economy influence the Arctic via its environmental footprint (pollution) and economic footprint primarily owing to demand for resources generated by the EU market. The global demand to which the EU contributes, fuels (primarily extractive) activities in the Arctic, which in turn have impacts on the Arctic environment and societies. The same activities can also have positive impacts on the socio-economic development in the North (jobs, municipal and regional incomes, economic diversity, demographics, etc.).

The EU, as a regulator, policy-maker, source of funding, and international actor can actively shape developments in the region. The EU can mitigate its negative footprint through e.g. environmental regulations and support for Arctic monitoring activities. The EU can influence knowledge-building about the region through research funding and assessment activities. The EU institutions can also influence international processes that are highly relevant for the Arctic, for example within the International Maritime Organization (IMO) or the UN Framework Convention on Climate Change (UNFCCC). This also includes active participation in Arctic cooperation at circumpolar Arctic Council (AC), and European Arctic (e.g. Barents cooperation) levels. Numerous institutions and companies based in the EU are involved in Arctic developments and research. The EU has instruments to influence these actors in various ways, such as by creating and supporting networks, providing research and development funding, or establishing reporting requirements for environmental damage (e.g. hydrocarbon extraction activities by EU companies). The EU engages Arctic stakeholders and rights holders, creating spaces for dialogue and policy inputs.

The definition of the diverse role of the EU in the North is even more complicated due to the fact that part of the Arctic region lies within the EU (northern Finland and Sweden) and that Norwegian and Icelandic regions of the European Arctic are covered by the European Economic Area (EEA) Agreement (see our definition of the Arctic in section 1.3). Consequently, the EU's policy influence varies between different parts of the Arctic and within different sectors, with some Arctic regions being directly covered by EU regulatory frameworks. Linkages between the EU and the Arctic range from full coverage of the EU *acquis communautaire* and policies in Finland and Sweden, to cross-border cooperation and projects under the Northern Dimension (ND), a joint policy of the EU, Russia, Norway and Iceland. Greenland and the Faroe Islands, while not part of the EU, are self-governing territories within the Kingdom of Denmark, an EU Member State (MS). In the European Arctic, certain policy areas are particularly relevant, including transport in northern Europe, environmental policies and regulations, local climate adaptation, regional development and the promotion of innovation and entrepreneurship. The EU is also an important fisheries actor due to quota sharing and its membership in the regional fisheries management organizations. International cooperation within the European Arctic revolves around cross-border and inter-regional cooperation, as well as North Atlantic and Barents fora. In contrast, circumpolar matters are chiefly of a marine and more global character, relating to maritime shipping, ocean governance and the Arctic Ocean's high seas. This circumpolar dimension also covers general climate change mitigation and long-range pollution, neither of which is Arctic-specific, as such, within the EU's policy making. The circumpolar Arctic dimension is partly related to the EU's external actions, including the EU's involvement in the AC as a *de facto* observer and participation in Arctic-relevant international processes, such as the instruments for persistent organic pollutants (POPs) or for Arctic shipping. The EU is indisputably one of the key policy actors in the European Arctic, as a source of regulation and funding, and as a facilitator of networks of cooperation. In the circumpolar Arctic, the EU is an important but not the main player - with the exception of research, where it is among the key funders and network-builders. The EU's influence, footprint and responsibility, and its limitations, therefore need to be considered from the perspective of its different roles in different sectors and areas.

The report focuses on EU action rather than that of its Member States. The EU has a broad range of competences to act in the abovementioned sectors (see e.g. Koivurova et al. 2012). In some policy areas, the EU has exclusive competence, in particular with regard to the conservation of marine biological resources under the common fisheries policy or the common commercial policy. In other areas, the EU shares competence with its Member States or can coordinate, supplement or support actions of Member States.

1.2. Objective and methodology of this study

The objective of this study is to amalgamate existing knowledge in order to produce an overview of the positive and negative impacts of EU policies on the Arctic. As background, the Arctic footprint of the EU as a major economy, polluter and technology and research powerhouse was considered, both in terms of Europe's contributions and pressures on the Arctic peoples and environment. The study includes policy options aimed at enhancing the impact of EU Arctic policy. These policy options refer primarily to general EU policy making rather than to the process of formulating the EU's Arctic policy statement.

The study is a synthesis of existing information and knowledge. Therefore, no new research or modelling was carried out. The sources of information included scientific peer-reviewed papers and reports by trusted organisations (such as the AC's working groups) and by EU institutions themselves. The authors also conducted a series of interviews with EU policymakers and experts and stakeholders from the Arctic. The interviews guided the focus of the assessment, pinpointing policies and issues to be considered in this study. Interviewees, listed in Annex 2, are in no way responsible for the information included in this report, or the assessment/evaluation carried out by the authors.

First, in order to provide background, the experts review the status of a given theme in the Arctic. Second, the level and scope of the footprint (influence) of the EU as a major economy and population (rather than a policy actor) is considered, both in terms of negative influence (or pressures) on the Arctic environment and livelihoods as well as the positive influence (or contributions) to Arctic developments. Third, the EU policies relevant for each theme are presented and lightly assessed. The focus is on policies and actions at the EU level and not those of the EU Member States. The assessment was carried out with the aid of guiding questions, providing limited quantification only when it was reliable and useful. Fourth, based on the policy assessment, a small number of targeted recommendations were developed. For some themes, projections for the evolution of the EU's footprint and the future impact of its policies towards 2030 or 2040 are provided, if such are available in existing sources. The "footprint" is understood here as the extent to which the EU population and economy influence environmental and social status and changes in the Arctic, in terms of both direct pressures and the indirect influence on the drivers of Arctic changes (e.g. climate change or global demand for Arctic resources). The term is applied here without reference to its use in the EU (policy footprint) and European Environment Agency (EEA) documents (ecological footprint) and the main purpose of footprint assessment is to identify EU policies that are relevant for the Arctic. The willingness to understand, calculate and publicize its impact on the Arctic distinguishes the EU as an actor that aims to present itself as being responsible and accountable.

For the purpose of this study, the Arctic is understood to include the regions defined as Arctic by the AHDR (2004, 2014, see Figure 1.1). Under this definition, the northernmost parts of the EU are located within the Arctic region, and the EU has a direct regulatory influence over Arctic regions of the non-EU European Economic Area states (Norway and Iceland). However, the authors used different boundaries of the Arctic depending on the specifics of the given theme, which is particularly the case for marine topics. For some statistical data purposes, whole Arctic states are considered rather than their region falling within the AHDR boundaries, as often no regionally-disaggregated data is available, while the data for whole Arctic states remain informative in the context of this study. For the data on the EU, the departure of the UK as well as the availability of aggregated data for the EU and its closest European partners (like Norway, Iceland, Switzerland, etc.) rather than for the EU-27, means that it was not always possible to provide information referring to the EU-27 across the report. Each time, the authors made

clear the geographical scope of the statistical data being provided. The European Arctic (that is the European part of the circumpolar Arctic) refers to the northernmost regions of Finland, Norway and Sweden as well as northwest Russia and areas located in the North Atlantic including the Faroe Islands, Greenland and Iceland. In specific cases, the text of the report states to which parts of this diverse area a given dataset or reference applies (e.g. the Northern Fennoscandia, the Nordic Arctic, EU/EEA Area Arctic, etc.), as the coverage of policies or data naturally differs between sectors. The EU Arctic refers to the northernmost regions of Finland and Sweden, while some data cover a broader definition of northern sparsely populated areas (NSPAs), when relevant from the point of view of EU action.



Figure 1.1: The definitions of the Arctic: Arctic Human Development Report boundary in red. Map produced by Nordregio and NLS Finland, 2004. Cartographer: Johanna Roto.

The report opens with issues that cut across all EU Arctic-related policymaking: research policy, connectivity, Indigenous Peoples' rights, gender equality, EU activity in external relations, trade and the EU's overarching Arctic policy. Main chapters of the report follow: climate change, long-range pollution, biodiversity, plastic pollution, energy, maritime transport, fisheries, raw materials, and regional development. Each chapter includes an overview of the sector, definition of the EU's footprint on the Arctic, description of relevant EU policies, limited assessment of their impact and a short set of policy options. The authors, however, adjusted their work and the structure of each chapter to the specifics of a given topic.

The authors are grateful to all EU officials who shared their insights and knowledge via interviews and personal communication, as well as to other interviewees. It is also important to acknowledge all those who commented on early versions of this report both EU officials and other experts, including Arild Moe (Fridtjof Nansen Institute) and Michał Łuszczuk (Maria Curie-Skłodowska University). The completion of this study would be impossible in particular without the support of the staff of the European Commission Service for Foreign Policy Instruments, the EC Directorate-General for Environment and EPRD.

1.3. Uncertainties at the beginning of the 2020s

The study refers in several places to projections of Arctic developments and the impact of EU policies towards the future, primarily made in existing, cited analyses. These Arctic, European and global projections, however, are related to numerous uncertainties, in particular at the onset of the 2020s. Below, we discuss several of these uncertainties.

1.3.1. Covid-19 pandemic

The Covid-19 pandemic has disturbed Arctic economies just as it has the global economy. While the short-term impacts on some industries (transport, tourism) have already been recorded, the long-term effects of the pandemic on the global, European and Arctic economies, societies and even environment is highly uncertain.

The Arctic regions, perhaps apart from Russia, have dealt reasonably well with the health crisis caused by the pandemic. While sparse populations and relatively small urban centres limit the spread of the disease, the relatively good situation has not been a given and may still deteriorate in some areas during 2021. Arctic communities experienced critical impacts of infectious diseases during the 20th century, including the Spanish Flu epidemic of 1917-1919. In some Arctic regions, large numbers of foreign tourists constituted a risk in the beginning of 2020.

The industry most visibly affected by the pandemic has been Arctic tourism, which in some areas experienced almost complete collapse. Communities dependent on international travel were affected by bankruptcies, layoffs and a decrease in municipal income. Arctic creative industries were also impacted. Arctic cooperation, based on close relations between Arctic officials, experts and policymakers, continued to operate smoothly, but the intensity and depth of diplomatic interactions have been adversely affected.

In the long term, the Arctic will be affected by the yet not well understood changes that the pandemic brings to the global economy. What would be the developments in resource markets? Would international tourism be the same after the pandemic? How would the transport systems, on which Arctic regions depend for their access to population and economic centres and to the global markets, be affected in the long term? The Arctic will in the long-term be affected by the changes brought about by the epidemic. On the other hand, the rise of remote working could have advantages for those living in peripheral regions. The recovery programmes introduced by governments around the circumpolar North, including major efforts by the EU, can have major effects on the direction of developments also in the Arctic. Will these programmes indeed not only support economic recovery, but also facilitate green

growth, movement to decarbonisation and social change towards greater equality as professed by policymakers?

1.3.2. The future of global trade

Globalisation and gradual liberalisation of international trade had been the hallmark of the world following the dissolution of the Soviet Union and the socialist block. The development of GATT and eventually the WTO (where all Arctic states are members), accession of China into the WTO, European economic integration as well as regional and bilateral free-trade agreements have contributed to that process. For the Arctic, agreements such as the EU-Canada Comprehensive Economic and Trade Agreement (CETA), the US-Mexico Canada Agreement (USMCA), the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the EEArea Agreement are highly relevant. However, the recent decade saw increasing difficulties for a number of free trade negotiations. Various political movements in the West, which originally had been the key advocate of free trade, are concerned about the departure of manufacturing overseas, and the environmental, labour rights and health objectives put in doubt the wisdom of introducing high standards for production domestically while allowing imports of goods from regions not abiding by the same standards. The digital revolution further affects many traditional trade patterns. In fact, the value of international trade after rapid expansion in the early 2000s has been stagnant since 2015 and its role in global growth is decreasing (UNCTAD 2021). At the moment, it is difficult to predict the future of global trade.

1.3.3. Brexit

The United Kingdom had been a significant contributor to the EU's Arctic presence: from the legacy of Polar exploration, sheer geographical proximity, presence of major research powerhouses such as the British Antarctic Survey, to British companies involved in Arctic developments. Therefore, the departure of the UK from the EU has implications for the EU's role as an actor in the Arctic. Despite reaching agreement on trade relationships, the final outcome of Brexit is still not fully clear, including with regard to the eventual level of long-term involvement of UK research institutions in EU research programmes. In addition, Brexit affects the EU budget, and the related change to European production systems, trade and consumption may affect the EU's economic growth to a difficult to foresee degree. That, in turn, would influence the EU's demand for Arctic products or the level of public and private investments coming from the EU to the region.

1.3.4. Changing place of Europe in global systems

Europe has experienced a decline in its share of global GDP and this trend is expected to continue. The economic power shifts towards Asia-Pacific and current emerging economies, are visible in trade and investment. The observed and expected economic shift is accompanied by continuation of current demographic trends, with Europe becoming an aging continent and populations is stabilising in the countries currently constituting the developing world (EC knowledge4policy website). It is unclear how these changes affect the place of the EU in the Arctic.

1.3.5. Political developments in Arctic states

Arctic cooperation has proven to be relatively resilient to global tensions, even those occurring between Arctic states. The most prominent example of this is the continued work of the Arctic Council and negotiations on fisheries despite tensions between Russia and the West following the annexation of Crimea and East Ukrainian crisis from 2014 onwards. However, Arctic cooperation has been highly susceptible to national political developments. For instance, the policies of the Trump administration did disrupt, to an extent, the work of the AC on climate change and sustainable development. Governmental politics has influenced the course of AC chairmanships. Future political changes in Arctic states are likely to further influence Arctic cooperation in unpredictable ways.

2. Cross-cutting issues

2.1. Physical and Digital Connectivity

2.1.1. Connectivity in the Arctic

The Arctic is characterized not only by low population density and great distances between population centres, but also by limited infrastructure. The people who live in the Arctic, including in particular the EU/EEA Area Arctic, are connected with each other across borders. The homeland of the indigenous Sámi people, Sápmi, is today administered by Norway, Sweden, Finland and Russia. Norway, Sweden and Finland had open borders long before they became part of the Schengen area, and crossing borders is a common aspect of life in the northern regions of Norway, Finland and Sweden (Nordland, Troms and Finnmark, Norrbotten, Västerbotten, Lappi, Pohjois-Pohjanmaa and Kainuu). Everywhere in the Arctic, connectivity is essential to acquire vital goods and services, including healthcare and education. In the following, emphasis shall be placed on three major aspects of connectivity: transport, energy and telecommunications.

2.1.2. Transport by Sea and Waterways

Due to the rapid melting of Arctic sea-ice as a consequence of anthropogenic climate change, the transport of goods and people by sea is one of the key issues which attracts outside attention for the Arctic. In addition to the global attention and economical importance also beyond the Arctic, ship operations in the Arctic have important practical implications for local communities, in particular in coastal and remote areas. This includes for example the provision of externally produced goods, such as certain foods. That is of particular importance for instance for the people of Greenland and similarly remote coastal areas.

2.1.3. Rail Transport

Rail connections in the Arctic are sparse and mainly concentrated in the European Arctic. From an economic perspective, rail connections are crucial in the Arctic, in particular for the transport of raw materials from and visitors to Arctic Europe. Investments in rail infrastructure provide a good example of how the EU can make contributions to the economic development of the region.

Like in many other cases of the EU's engagement with the Arctic, the 2008 Communication (European Commission, 2008) emphasised maritime transport and satellites, but largely ignored other aspects of connectivity. This has changed in recent years, not only in terms of statements but also with regard to practical measures taken by the EU. Since 2011, the EU has provided approximately EUR 2.96 million, around 10% of the total cost, for the Kalix-Haparanda railway as part of the 2010 annual Trans-European Network - Transport (TEN-T) call (Innovation and Networks Agency 2011). Located at the northern end of the Bay of Bothnia in the heart of the EU Arctic, the Swedish border town of Haparanda forms one agglomeration with the neighbouring Finnish town of Tornio. By connecting Haparanda to the rest of the Swedish railway grid, and to the Norwegian port of Narvik, a major gap in European rail transport infrastructure has been closed, allowing connections around the northern rim of the Baltic Sea, and connecting the Arctic with Central Europe. Combined with existing road infrastructure between Haparanda and Norwegian ports along the north-western coast, the connection to Tornio and the position of the latter in the Finnish railway network, provides the twin city of Tornio-Haparanda with the potential to become a major transshipment hub, a hope which has also been expressed by local industry experts. In addition to providing development benefits for a region which has long depended on forestry, the Kalix-Haparanda railway connection also has indirect benefits for indigenous Sámi and non-indigenous reindeer herders in Finland. The Haparanda-Narvik railway line already exists and is vital for the mining industry in Norrbotten. A connection between Tornio and Narvik might also

remove the need for the proposed Arctic railway between Rovaniemi and Kirkenes, which is opposed by the Finnish Sámi Parliament. With limited investment, the EU contributed to the economic development of the Tornio-Haparanda region while simultaneously playing a small role in allaying the concerns of local, including indigenous, residents further north. The funding for the Kalix-Haparanda railway line is a good example of the importance of connectivity and for the interconnectedness of many issues in the Arctic. Currently, core TEN-T corridors of the European transport networks do not cover the European Arctic, although connections north of the national capitals form lifelines for many local residents due to the dominant role of the capitals for the national economies.

Railways across the European Arctic also have the potential to contribute to efforts to reduce greenhouse gas (GHG) emissions across the EU, especially from truck transport and personal vehicles. Combined with long distances, this leads to a significant carbon footprint. EU efforts to reduce air pollution and GHG emissions from transport are therefore particularly relevant in the region. The European Commission's 2011 White Paper "Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system, White Paper" (European Commission, 2011) envisioned a 50% shift of medium-distance transport of goods and people from road to rail. Improved rail connections utilising existing infrastructure in the European Arctic can contribute to this endeavour.

The CEF2 investment program recently included the main north-south railway line in Finland as an extension to Rail Baltica. In Finland, the connections to both Haparanda (and via Haparanda to Norway and the rest of Sweden) and to Rail Baltica is hoped to provide an impetus for improvements to the main railway network, including the potential to turn Tornio-Haparanda (where transshipment infrastructure is required due to different gauges used in Sweden and Finland) into a major transport hub.

2.1.4. Road Transport, Rivers and Ice Roads

The Connecting Europe Facility (CEF) has funded NordicWay 2, an Arctic intelligent road transport corridor along the E8, including projects in both Finland and Norway, from 2017 until 2020 (Transport Research and Innovation Monitoring and Information System, 2021), thereby contributing to smart mobility in the region. In the context of the European Green Deal, it becomes easier than ever before to imagine EU funding for charger stations for electric vehicles in Sweden and Finland, which could make a significant contribution towards reducing GHG emissions from vehicles in both Member States, in particular as the charger density in both countries is lagging behind that of neighbouring Norway.

In parts of the Arctic, climate change obliterates the existing road infrastructure, in particular in areas where roads have been constructed on permafrost. The permafrost in the Arctic "is melting decades earlier than scientists expected" with negative impacts on the infrastructure of the region, particularly roads and homes (Holthaus 2020: 9). Road infrastructure is also affected by migration from rural to urban areas. Because of lower population numbers, reduced road use and lowered municipal tax income, several municipalities in Finland, for example, have mulled plans to convert paved roads into unpaved gravel roads to reduce maintenance costs. Road maintenance costs in the Arctic are usually related to frost damage. Although innovative technical solutions are being developed by local companies to detect damage to paved roads, these challenges are likely to plague Arctic communities for the foreseeable future. Also, the use of ice roads over frozen bodies of water, which have provided important connections for generations, is no longer feasible because rivers and other bodies of water no longer freeze sufficiently. This dramatically impacts connectivity in remote regions of the Arctic. Smaller rivers in the northern parts of the EU Arctic remain relevant for local traffic during the winter, in particular with snow mobiles. Climate change is threatening this eminently practical form of personal transportation in remote regions of the European Arctic.

2.1.5. Air Transport

In addition to transport over waterways, air transport is crucial for Arctic communities in areas which are affected by large scale melting of permafrost because the melting of permafrost often leads to a loss of regional road infrastructures, as is already happening in parts of Russia and Canada. Also in the EU Arctic, air transport between Arctic cities and national capitals, plays an important role for connecting residents and for making national centres and Arctic peripheries accessible to each other. The European Parliament's 2011 Resolution on a sustainable EU Policy in the High North still had a strong maritime focus but also emphasised the role of aviation and the importance of railway connections within the Barents-Euro-Arctic Transport Area (Beata) for international trade and extractive industries (European Parliament 2011: para. 10). This approach highlights that a little as a decade ago, the Arctic was perceived as an area which is to be used either for the extraction of wealth from the region or merely as a region through which goods are to pass. Economically, air transport is particularly important for the tourism industry. In particular the continental European Arctic could be reached relatively easily prior to the pandemic. The reduction in flight connections due to the pandemic has also negatively impacted the connectivity of the Arctic, which affects not only visitors but also local residents. Notably, intra-Arctic air connections are often missing, requiring multiple layovers on trips within the European Arctic. Depending on flight times and prices, air travel between locations in the European Arctic can require layovers in places as far from the Arctic as London (which is directly connected to Tromsø) or Berlin (for connections between Finland and Iceland). This leads to GHG emissions. Limited intra-Arctic connectivity by air has not only practical implications for the people who live in the Arctic and want to access the medical, educational or other services, which are only provided in larger cities, but also for connectivity within the region. Similar situations exist outside the EU Arctic, for example between Nuuk, Greenland and Iqaluit, Canada. The ongoing development of electrically-powered aircraft for short to medium distances, combined with the use of renewable energy sources, can contribute significantly to the reduction of GHG emissions while helping to meet the transport needs of local communities.

2.1.6. Connectivity and the European Green Deal

Across the European Arctic, the European Green Deal is seen as a promising instrument on the way to achieving a desired reduction in GHG emissions, and a planned sustainable and smart mobility package as part of the European Green deal is eagerly anticipated by businesses and decision-makers in the European Arctic. In 2014, long before the adoption of the European Green Deal, the European Parliament “[c]all[ed] on the Commission and the Member States to focus on transport corridors such as roads, railways and maritime shipping with a view to maintaining and promoting cross-border links in the European Arctic and bringing goods from the Arctic to European markets; [and wa]s of the opinion that as the EU develops its transport infrastructure (Connecting Europe Facility, TEN-T) further, the links to and within the European Arctic need to be improved” (European Parliament 2014: para. 52). But this is not a one-way street; connectivity is essential for Arctic communities also from the perspective of food security. Food prices in remote parts of the Arctic can be very high, and although the problem may not be as severe in the northern areas of Finland and Sweden as it is in parts of Canada or Greenland, it would have behoved the European Parliament to also take note of the supply needs of local communities in the European Arctic. Ships (and in the European Arctic trains and trucks) play a key role in this context. The impact of potential modifications to TEN-T in the European Arctic remains unclear, too. If ships and flights beyond the EEArea will be included in emission trading schemes, this might raise living costs in remote areas, for example for foodstuffs which are transported over great distances. In addition to transport, connectivity on land also concerns telecommunications and energy. In the European Arctic, electricity is often generated locally through hydropower, which has the benefit of being a form of renewable energy but which has negative impacts on the local natural environment in the rivers of the European Arctic. Elsewhere in the Arctic, the situation is very different. Reliance on nuclear power remains high and floating nuclear power plants are currently being deployed along the Russian Arctic coastline. A functioning and well-connected energy infrastructure allows the European Arctic nations to continue on the path to carbon neutrality in energy supply.

2.1.7. Telecommunications

Digitalisation is a global megatrend - also across the Arctic. The EU/EEA northernmost regions are among Europe's leading areas in terms of mobile digital communications. Although mainly covered by national regulations, it is in this field that the impact of the EU's policies is felt most immediately by the people who live in the European Arctic. While open borders between Norway, Finland and Sweden were a reality long before the three countries joined the Schengen Area, it is the absence of roaming fees between different countries in the EEA with which the EU has greatly contributed to facilitating the lifestyle of many residents in the northern regions of Finland, Sweden and Norway, who cross borders as a matter of course. The practical positive impact of Regulation (EU) No 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications networks within the Union for many residents in the EU/EEA Arctic is not to be underestimated. While mobile internet services in the EU/EEA Arctic are generally excellent, this is not the case in many other parts of the Arctic, although functioning communications systems can be a matter of life and death in a region with a harsh climate and multiple dangers to human life and health. Satellite-based telecommunications therefore will continue to remain relevant at least in remote parts of the Arctic, although higher latitudes (approximately north of 70°N) suffer from limited satellite connectivity. Telecommunications connectivity is also a concern for the Indigenous Peoples, a fact recognised by the International Telecommunications Union (ITU) when it established an indigenous ICT Task Force (Kuhn 2020: 78). Representation and a seat at the table matter also when it comes to issues such as telecommunications or logistics.

2.1.8. EU Emergency Preparedness and Response Capacities, including Satellite-Based Systems

The EU has developed instruments and capacities to respond to natural and man-made disasters in the Arctic. Many of the relevant services are a part of the EU space programmes, as discussed in the next section. The Union Civil Protection Mechanism (UCPM) was created to facilitate cooperation of EU Member States as well as partner countries (or participating states), including Norway and Iceland. It supports prevention and preparedness and allows rapid response to emergency situations by pooling states' resources via the EU Emergency Response Coordination Centre (ERCC). For instance, in 2018, Sweden was assisted in tackling widespread forest fires and best practices have been shared between officials from the northern and southern nations. The ERCC is the entry point for the activation of the Copernicus Emergency Management Service, which for example was activated in 2017, 2018 and 2019 for wildfires and iceberg movements in Greenland. It may also be an entry point for the CleanSeaNet satellite-based oil spill and vessel detection service of the European Maritime Safety Agency (EMSA). More recently, CleanSeaNet images were provided for suspected pollution areas in Iceland (2019 and 2020) and Greenland (2021). Joint exercises are organised as a part of preparedness-building, such as the upcoming Arctic Rein exercise in Norwegian Lofoten, which will be dedicated to radiological emergency response. In 2019, the UCPM started acquiring its own capacities and response infrastructure via rescEU, which includes or plans to include planes, helicopters, field hospitals, stockpiles of medical equipment, CBRN response capacities, shelter and others (see DG ECHO website). Similarly, the EU has developed capabilities for maritime response via the European Maritime Safety Agency (EMSA), which can be also activated through the ERCC. Both land and emergency operations are supported by dedicated Copernicus emergency services and maritime surveillance services, which provide fast mapping observation and forecasts over the Arctic in case of distress.

2.2. EU Space Programmes

The European Union, especially in cooperation with the European Space Agency (ESA), is a key actor in outer space operations and policies. In addition to its own activities, the EU facilitates space activities. Space operations also provide services which are of significant value for the people who live in the Arctic, from geolocation data to up-to-date satellite information which allows rapid decision-making in harsh environments, such as sea-ice coverage in Arctic and sub-Arctic waters. The EU's activities in space, in cooperation with the European Space Agency contribute significantly to safety and science in the Arctic, in particular through the flagship programmes, Galileo, EGNOS and Copernicus.

Galileo is a navigational satellite network and Europe's alternative to GPS and GLONASS. By providing very precise open access location data, Galileo contributes not only to navigational safety at sea and in the air but provides the technical capacity for applications such as automated cars and trucks. In addition to the open service for end users with consumer-grade navigational devices (with a precision of 1 metre), a free high accuracy service (HAS) exists, which eventually will provide location data with accuracy in the cm-range. The same service can also be used for signal code authentications. In addition to these public services, the Galileo system will provide specific services for government entities. The entire Galileo system is expected to be operational in 2021.

The EU's European Geostationary Navigation Overlay Service (EGNOS) provides a partial solution to the challenge of limited satellite connectivity in high latitude areas. The European Space Agency is cooperating with the Canadian Space Agency (CSA-ASC) to develop technical solutions for navigation at high latitudes. Currently, these solutions mainly concern navigational applications rather than telecommunication. EGNOS will remain particularly relevant for Galileo users in the High Arctic.

In the framework of the Copernicus programme, the Sentinel fleet of Earth observation satellites produces up to date data which is made available to everybody free of charge. This data sharing leads to very valuable benefits in the Arctic and beyond. Through Copernicus, raw data is made available open access for everybody. This includes actors outside the EU and commercial users. The Copernicus Services and Space Component provide a wide range of services and products with particular relevance for the Arctic. On top of raw data, Copernicus Services operate public free information services in six areas: climate change monitoring, atmosphere monitoring, ocean and marine resources, emergency and security. These services are available across the Arctic and provide either real time information, fast response, or forecasts and climate projection of the Arctic environmental and safety situation. A dedicated Arctic Ocean forecasting centre is operated in Norway. Emergencies at sea and on land are tackled. Arctic climate reports are made available monthly and annually to report on climate trends. In addition, users can also rely on the private sector to turn this data and core information products into practically useful products for local users, merging space-based information with local social, environmental or economic data and models. Practical uses include support during major disasters, such as the large forest fires which have plagued the circumpolar Arctic in recent years and which are likely to become more common due to anthropogenic climate change. Climate change effects, for example on the flora in the Arctic, also become visible thanks to Copernicus. The European Marine Observation and Data network (EMODnet) contributes to the knowledge of the Arctic marine environment. Through EMODnet's work it is also possible to identify relevant in-situ observation gaps and identify imminent observation needs. Among the best-known applications stemming from Copernicus is sea-ice information delivered by the Arctic – Monitoring Forecasting Centre (ARC MFC) to ice services. This is partly based on regional partnership with Norway on Arctic monitoring and forecasting centre and a sea-ice observation centre that provides daily real time observations and ocean forecasts while reporting monthly on the evolution of Arctic climate. Another example of the relevance of Copernicus applications in the Arctic, developed by EU agencies and freely available for users are the forest fire information systems – the European Forest Fire Information System EFFIS and the Global Wildfire Information System (GWIS) (see biodiversity chapter 6), which cover circumpolar Arctic and have been used for example during peatland fires in Greenland in 2017.

The relevance of Copernicus and Galileo for the Arctic regions of Sweden and Finland has already been noted by the European Parliament (European Parliament 2020: 33), which has taken up key ideas which were already included in the Council Conclusions on Space Solutions in a Sustainable Arctic, and which were adopted during the Finnish presidency of the Council of the European Union in 2019. Copernicus is clearly a success story, both in the EU and abroad. Ongoing efforts by the Russian Federation, with the first launch of a satellite of the Arktika programme, and plans by the People's Republic of China concerning polar orbit satellites for Earth observation indicate that the EU has been a trailblazer in this context. The availability of open access data and information products greatly benefits end users in the Arctic and beyond. Through Copernicus, the EU makes an essential contribution to science and human safety in the Arctic. Cooperation agreements are in place with many countries such as USA and soon Canada. Even when only taking into account the most spectacular examples of wildfires and sea-ice, it seems safe to assume that Copernicus is saving human lives in the Arctic. Thanks to the scientific research which is made possible due to the open access to Earth observation data, decision-makers in the Arctic can be better informed about the changes caused by global warming, thereby adding a layer of knowledge.

The EU and Copernicus Programme, and in particular its Emergency Management Service, support many European and global emergency and risk management services, relevant both for the European Arctic and for the whole circumpolar North. This includes the Global Disaster Alert and Coordination System (GDACS), a joint framework between the UN, the EU (EC JRC) and disaster management authorities globally. The Copernicus Emergency Management Service (CEMS) also includes the European Drought Observatory (EDO) and Global Drought Observatory (GDO), covering the circumpolar Arctic.

In the frame of Copernicus, three polar task forces of the Arctic composed of experts and users have met since 2017 in order to define the future essential contribution to the Arctic in terms of dedicated satellites and innovative space-based Arctic services. The Copernicus programme has commenced the design of three new innovative space systems dedicated to the Arctic and expected to be launched between 2027 and 2030. The Joint Research Centre published a thorough overview of the role of EU space programmes for the Arctic (see Boniface et al. 2020).

2.3. EU Support for Arctic Research and Innovation

2.3.1. Arctic science in general

Science and research constitute the basis of international circumpolar collaboration. Since the International Polar Year (IPY) (2007-2008), international Arctic research collaboration has grown and expanded significantly, driven by the recognition of the increasing pace and scope of Arctic socio-environmental change, of the role that the region plays in global climate dynamics, of the multiple and complex connections between the Arctic and the rest of the planet, and of the impacts of Arctic change that extend beyond the Arctic Circle into the mid-latitudes. The disproportionally high climate-related risk to the Arctic and the global consequences of it have been noted in the most recent IPCC special reports on the ocean and cryosphere in a changing climate and on global warming of 1.5 °C (IPCC 2018; Meredith et al. 2019). Scientific research and observations along with indigenous knowledge are key to identifying, understanding, predicting, and addressing challenges and opportunities related to the evolution of changes in the Arctic, and their impacts from regional to global scales.

Concurrently, the scale and complexity of many of the Arctic challenges exceed the capabilities of any individual country or actor to address them. In terms of scientific research, the region's vastness, remoteness of observation sites, low population density, and extreme conditions remain a continuous challenge and generate costs on average eight times higher than conducting/pursuing similar research at a southern location (Hoag 2018; Mallory et al. 2018). The differences in costs are related principally to the much higher expenses of travel and shipping (typically 4–10 times higher for Arctic work), as well

as, in many locations, to the good practice of meaningful engagement and consultation with northern communities that represent approximately 10% (4%–25%) of project costs and that require separate arrangements and additional travel (Mallory et al. 2018). Costs of Arctic research can be reduced by sharing and optimising the use of research infrastructure, integrating observing systems, making data freely and openly accessible in a timely fashion, and by improving its interoperability (EU-PolarNet 2020). To achieve those, a high level of collaboration is key.

In order to facilitate it, along with increasing global interest in the Arctic, there has been a surge of initiatives, fora, platforms, instruments and institutions involved with Arctic science. Since 2013, the AC admitted as Observers 13 new non-Arctic states and organisations, many of them with significant expertise in Arctic science and with the ability to support the work of the AC through partnerships with AC Member states, Permanent Participants (organisations of Arctic Indigenous Peoples), and through the AC working and expert groups (Graczyk and Koivurova 2015; Smieszek 2020; Smieszek and Kankaanpää 2015).

In 2011, at the AC Ministerial meeting in Nuuk Arctic states decided to establish the Sustaining Arctic Observing Network (SAON), the joint body of the AC and the International Arctic Science Committee (IASC), to strengthen multinational engagement in and coordination of pan-Arctic observing. Following a period of conducting inventories, community-building and partnership development including Arctic and non-Arctic countries and Indigenous Peoples, since 2016 SAON moved toward systematic analysis of societal needs and benefits served by a holistic Arctic observing system. In its 2018-2028 Strategy, SAON identified the need for a Roadmap for Arctic Observing and Data Systems (ROADS) as a tool to move from the design to the deployment phase of an integrated Arctic observing system (Starkweather et al. 2020). Continuing multinational cooperation via SAON was supported by the second Arctic Science Ministerial (ASM2, see below), and partnership with SAON was included in the recommendations from the EU-PolarNet – both endorsements helped in mobilising new resources to advance SAON's work. Among others, requirement for partnership with SAON was included in the EU Horizon2020 call LC-CLA-20-2020.

In order to further increase cooperation in Arctic science, the United States organised the first Arctic Science Ministerial (ASM1) meeting in September 2016 in Washington, D.C. The meeting brought together science ministers from 25 governments, the EU and representatives from Arctic Indigenous Peoples' organisations, and it was followed by the second Arctic Science Ministerial (ASM2) co-organised by the European Commission, Finland, and Germany in October 2018 in Berlin. The ASM2 focused on 3 themes, where an improved and better coordinated international effort can be of significant added value: (1) strengthening, integrating and sustaining Arctic observations, facilitating access to Arctic data, and sharing Arctic research infrastructure; (2) understanding regional and global dynamics of Arctic change; and (3) assessing vulnerability and building resilience of Arctic environments and societies (2nd Arctic Science Ministerial, 2018). The third Arctic Science Ministerial (ASM3) was originally scheduled to take place in autumn 2020, but was postponed due to the Covid-19 pandemic. It will be co-hosted by Iceland and Japan and organised in May 2021 in Tokyo. In addition to the themes of earlier ministerial meetings – to observe, understand, and respond to Arctic change – ASM3 emphasises the urgent need to strengthen education, capacity building, and networking for future generations, and young scientists and knowledge holders. Empowering citizens is also highlighted as important for fostering a stable observation system that includes community-driven observation (3rd Arctic Science Ministerial, 2020).

At the AC Ministerial meeting in Fairbanks, Alaska in May 2017 foreign ministers of eight Arctic states signed the Agreement on Enhancing International Arctic Scientific Cooperation that aims to enhance cooperation in scientific activities to increase effectiveness and efficiency in the way the scientific knowledge about the Arctic is developed (Article 1) (Agreement on Enhancing International Arctic Scientific Cooperation, 2017). Toward that goal, the Agreement facilitates access by scientists of eight Arctic states to Arctic areas that each state has identified for purposes of the Agreement and which are described in its Annex 1. The facilitation includes entry and exit of persons, equipment, material, data

and samples (Article 4); access to national civilian research infrastructure, facilities and logistical services (Article 5); and access to terrestrial, coastal, atmospheric and marine research areas. The parties shall also facilitate access to scientific information; open access, distribution and sharing of data and metadata, and encourage the publishing of results with minimum time delays (Article 7). Furthermore, the Agreement promotes education and training opportunities to build the capacity and expertise of future generations of Arctic researchers (Article 8) and it encourages utilisation, as appropriate, of traditional and local knowledge in the planning and conduct of scientific activities (Article 9). It also obliges its parties to designate their competent national authority or authorities as the responsible points of contact for the Agreement – all listed in Annex 2 (Article 13). Importantly, regarding cooperation with non-Parties, or non-Arctic states, the Agreement provides that if scientists coming from those countries are partnering in a project with an Arctic state, they would effectively benefit from the provisions of the Agreement (Article 17). The Agreement, as two previous legally binding agreements that originated from the Arctic Council Task Force, is not the AC agreement *per se*, but it was negotiated under its auspices (Smieszek 2017). It entered into force on 23 May 2018.

Scientific research is also the integral element of the legally binding Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAO) (see chapter 7 on fisheries).

Simultaneously, Arctic research faced unprecedented disruptions due to the Covid-19 pandemic. While some research based on satellite data has been able to continue largely uninterrupted, essential in situ field research has been severely impaired because of travel limitations and concerns over spreading the virus into remote communities and among indigenous and non-indigenous local populations. The situation highlighted not only the vulnerability of Arctic communities, but also of the research infrastructure that relies on them. It resulted in calls for more resilient and adaptive Arctic science through enhancing collaboration, fostering community-science and supporting levels of competence held locally in the Arctic to enable observations, research, and knowledge co-production capable of withstanding disturbances such as the pandemic (Petrov et al. 2020).

2.3.2. EU in Arctic research

From the outset, science and research have been the cornerstone of the EU's engagement in Arctic affairs (Council of the European Union 2009, 2014, 2016; European Commission 2008; European Commission and High Representative 2012; 2016; European Parliament 2008, 2014, 2017). Over time, the EU has consistently been one of the major funders of Arctic research, an active partner in the ASM and a co-host and co-organiser of ASM2 in 2018, supporter and contributor to SAON and work carried out by the AC working and expert groups, and a party to the aforementioned Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean that includes a very strong science component. Five out of eight Arctic countries are either members of the EU (Denmark, Finland, and Sweden) or associate countries (Iceland and Norway), and the three other Arctic states (Canada, Russia, and the United States) have had cooperation agreements with the EU's Horizon 2020 programme (see below). At ASM2, as well as the EU Commissioner for Research, Innovation and Science, there were representatives of the ministries of science of 12 EU Member States (Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Poland, Portugal, Spain, Sweden), and research institutions from 11 EU Member States participated in MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate), the largest expedition in history to explore the Arctic climate system in the central Arctic (2019-2020) (MOSAIC, 2019). The EU's support for international scientific collaboration in the Arctic is a part of the larger EU science diplomacy approach. Beyond that, experts and scientific findings from EU-funded projects provide important contributions to work of the Intergovernmental Panel on Climate Change (IPCC) and to the overall body of knowledge on Arctic and global climate dynamics, its connections and impacts. EU funding enabled and led to the creation of some of the world's largest consortia and networks in terms of polar research and infrastructure.

Under the Seventh Framework Programme for Research and Technological Development (FP7, 2007-2013), the EU allocated approximately EUR 200 million on research related to different dimensions

of the Arctic environment (EUR 141 million) and for supporting research infrastructure (EUR 45 million). Among the projects funded under FP7 were ArcRisk assessing the influence of climate change on the long-range transport of contaminants and the impact thereof on human health in the Arctic and Europe (EUR 3.5 million); ICE-ARC (Ice, Climate and Economics - Arctic Research on Change) that sought to assess and quantify the impact of change in the Arctic on regional and global scales (EUR 8.8 million); ACCESS dedicated to assessing and quantifying climate change impacts on key economic sectors in the Arctic, along with their implications for governance (EUR 11 million); INTERACT – a multidisciplinary network of land-based research stations from all Arctic countries and northern regions (EUR 7 million); and a foundational support for the preparatory phase of SIOS (Svalbard Integrated Arctic Earth Observing System) to assemble under a common structure all existing research infrastructure in Svalbard (EUR 4 million) (EU Directorate-General for Research and Innovation 2014).

In the last five years, the EU Arctic research priorities have been largely aligned with the three main priority areas of the EU Arctic policy, as reflected in the 2016 Joint Communication from the European Commission (EC) and the High Representative (HR) of the Union for Foreign Affairs and Security Policy: (1) climate change and safeguarding the Arctic environment, (2) sustainable development in and around the Arctic, and (3) international cooperation on Arctic issues (European Commission and High Representative 2016).

Under Horizon 2020, - to a great extent within the Societal Challenge 5 (Climate Action, Environment, Resource Efficiency and Raw Materials) - EU funding exceeded EUR 200 million on Arctic-related research projects, cooperation activities, and development and international access to Arctic research infrastructure throughout Europe. Beyond the continued support for ICE-ARC (nearly EUR 9 million EU contribution) and INTERACT (EUR 10 million), the EU funded ARICE (Arctic Research Icebreaker Consortium) to enhance Europe's marine-based research in the ice-covered parts of the Arctic (EUR 6 million), and to ensure safety of maritime transport activities, it funded GRACE (approximately EUR 3 million) and SEDNA (EUR 6.5 million). It contributed to developing an improved and sustained Arctic observation system, among others, via INTAROS (EUR 15 million); and through projects like APPLICATE and BLUE-ACTION (jointly over EUR 15 million in EU contributions) invested into improved understanding of the impact of Arctic change on weather and climate in the Northern Hemisphere. Under the space topic of Horizon 2020, the KEPLER coordination and support action (EUR 2.9 million) was launched to assess which should be the next priorities in terms of space investments in new satellites to better monitor the Arctic environment, ocean, ice and climate. In order to determine the impact of thawing land, coast and subsea permafrost on both the global climate and people in the Arctic, and to develop targeted and co-designed adaptation and mitigation strategies, it funded NUNATARYUK (EUR 11 million) (EU Directorate-General for Research and Innovation 2018). In the second part of Horizon 2020, the EU funded the coordination and support action project CAPARDUS for capacity-building in Arctic standardization development; three major projects related to Arctic biodiversity (ECOTIP, CHARTER and FACE-IT, with joint funding of EUR 15 million), and two projects that aim to create and implement regional development strategies for reconciliation of new economic opportunities with traditional livelihoods (ArcticHubs, EUR 6 million) and to explore the multitude of ethical systems that coexist in the Arctic, with a view to assessing the viability of new economic activities in the region (JUSTNORTH, EUR 6 million). Grants for projects in Arctic research have also been provided by the European Research Council (ERC) and, finally, contributions to Arctic science also come from projects without specific Arctic focus.

Through Horizon 2020, the EU funded EU-PolarNet 1 (2015-2020, over EUR 2 million) and EU-PolarNet 2 (2021-2024, over EUR 3 million). From 2015-2020, EU-PolarNet 1 improved and enhanced coordination among 22 European polar research institutions, it catalogued European polar infrastructure, and, based on extensive stakeholder consultations and experts' engagement, it developed and delivered the Integrated European Polar Research Programme (EPRP), along with the implementation plan for its infrastructure. The EPRP indicates the overarching European interests in polar research and, as such, will play a role in calls coming in the Horizon Europe programme (2021-2027). EU-PolarNet 2 is the world's

largest consortium of expertise and infrastructure for polar research and with 25 participating institutions (1 per country) it involves all EU Member States and associated countries with well-established polar research programs. In addition, the European Polar Board (EPB) is a full partner in the project. The aim of EU-PolarNet2 is to establish a sustainable and inclusive platform to co-develop and advance European polar research actions that, after the end of the project, will be sustained in a European Polar Coordination Office (EPCO), which will be a permanent office. The operational preparation for EPCO will take place within EU-PolarNet 2 and the office is to be established after the end of the project. Beyond the direct focus on polar regions, throughout its duration EU-PolarNet 2 will contribute to ensuring that the poles are also included in the All-Atlantic Ocean Research Alliance, a commitment that has been a part of the 2013 Galway Statement on Atlantic Ocean Cooperation between the EU, Canada, and the United States, that has not been fully implemented in practice thus far.

In 2017, in order to further increase the return on investment into individual projects, the EU Arctic Cluster, further expanded into the EU Polar Cluster, was launched as a network of EU polar projects funded from FP7 and Horizon 2020. The objective of the Cluster is to provide one entry point to EU funded polar research, to create synergies between activities already planned in the projects, to support projects' better engagement with stakeholders through better coordination of consultations, to pool resources (financial, human) to upscale efforts, to maximize impact and visibility of European polar research, to increase knowledge sharing and improve communication from science to policy makers and society, and finally, to maintain legacy of finished projects (EU Polar Cluster 2020). Toward these goals, the EU Polar Cluster has five cross-cutting task groups dedicated to communications, stakeholder engagement, data management, education and training, and policy advice. Its operation is presently supported through dedicated funding via EU-PolarNet 2 and the upcoming EU project on the Arctic observing system.

Beside the activities directly supported by the EU programmes, EU Member States have a very strong reputation in polar research and provide national funding to Arctic-related scientific projects across a wide range of disciplines and in many locations in the circumpolar North. They also provide investments and support very significant research infrastructure in the Arctic, including 17 stations, nine research vessels operating in polar waters, and two research aircraft. Some of the European research institutes dedicated to Arctic science are among the biggest internationally and belong to a relatively small group of institutes that operate at both poles. While a very useful overview of individual countries' Arctic research activities is provided in their submissions to the Arctic Science Ministerial, these submissions thus far have not contained information on funding and it is difficult to provide the exact information on European spending on Arctic research because funds provided for it do not come from separate budget lines but are often part of broader research calls and spending dedicated to climate change, oceans, and other scientific inquiries.

The last and biggest call under Horizon 2020 was the European Green Deal call that closed in January 2021 and aimed to “accelerate just and sustainable transition to a climate-neutral Europe by 2050”. Both the call and the new Horizon Europe programme agreed in December 2020 support the European Commission's European Green Deal, a roadmap to make Europe the first climate-neutral continent by 2050 through twin, green and digital, transitions – both areas where research and innovation is expected to have an impact on the Arctic through reducing the EU's carbon and environmental footprint and through supporting more sustainable and inclusive forms of development. Among others, Horizon Europe Cluster 5, entitled “Climate, Energy and Mobility”, is likely to address many of the concerns existing in the Arctic with regard to the sustainability of transportation needs.

2.3.3. Overview of developments in EU Arctic research

Research and scientific findings from EU-funded projects play a key role in filling critical gaps in the understanding of regional and global climate processes and the impacts thereof. As previously mentioned, costs of conducting research in the Arctic are extremely high and often exceed funding capacities of institutes and countries. The funding provided by the EU helps to bring further investment

onboard and upscale the efforts of parties on the ground. Moreover, given that five Arctic states are either EU members or associated with EU research programs, that there are association agreements with Canada, Russia, and the United States, and that participation in EU research programs is open to any other country, it is important to note the very important role of the EU in promoting and enabling international Arctic scientific collaboration. The EU is involved on a regular basis in projects and activities of the AC it plays a major role in fora like the ASM, and its Arctic research continues to evolve. Many of the largest EU Arctic-related research projects are ongoing and new ones are about to launch so full assessment is not yet possible. However, looking back at the last decade and since FP7, it is possible to note several positive developments in the EU's approach to Arctic-focused research.

First, compared to FP7, throughout Horizon 2020 there has been a discernible trend to move toward greater interdisciplinarity and stronger inclusion of social sciences and humanities to improve the understanding of impacts of biophysical changes in the Arctic on northern societies and indigenous people, as well as to shaping tailored responses and more suited adaptation strategies – both areas of steadily increasing importance. While the bulk of research funded by the EU is of a technical nature and based on the natural sciences, the EU's financial support for research into the human dimension of climate change and measures to mitigate its effects are particularly laudable because by including both natural and social sciences within the frameworks of research and innovation programmes, it becomes possible to approach the challenges faced by the European Union, including the European Arctic and the people who live there, in a holistic manner, and to deliver practical benefits on a local level, too. Second, over time both collaboration with Indigenous Peoples and co-design and co-production of knowledge have taken a much more central role in EU Arctic projects. Consultations and meaningful engagement with northern Indigenous Peoples and local communities are not only today specifically listed in EU research calls, but they are also increasingly recognised as central to the success of research projects, where, for example, in EU-Polarnet 2, the International Centre for Reindeer Husbandry is involved as a full partner in the consortium. Science funding which leads to actual benefits for the people who live in the Arctic and which includes Arctic, in particular indigenous, communities already in the design phase of research programmes, can contribute to changing perceptions and to enhancing trust between the EU and different local Arctic actors, both within and outside EU Member States. Third, whereas in earlier projects and in FP7 there appeared to be a greater focus on research *about* the Arctic and what consequences its change could have for Europe and the rest of the world, Horizon 2020 projects have begun to more strongly emphasise research *for* the Arctic and they have been more centred around the needs of Arctic peoples. The evolution of research funding mechanisms from Horizon 2020 to Horizon Europe with the increasing role for local needs is a step in the right direction. Fourth, there has been a steady effort to bring Arctic science closer to decision- and policy-making processes within EU institutions, accompanied by significant work toward better coordination among European polar research institutes, regarding usage of research infrastructure, and among EU-funded research projects, as exemplified by the EU Polar Cluster. Finally, there has been an important development toward ensuring the legacy of projects beyond their duration. Whereas earlier on, there was little or very little continuity in conducted work once a project was over and it was difficult, if not impossible, to sustain the project's products and deliverables beyond its lifetime, some of the presently launched projects include from the outset provisions on how their work will be supported after the end of the project. The establishment of the European Polar Coordination Office (EPCO) should be another important step in addressing this matter.

2.4. The EU's external relations and cooperation with international organisations

For the EU, today's Arctic has so far presented a unique set of policy-related challenges. The EU has no coastline to the Arctic Ocean, and EU law applies in the Arctic directly only to Finland and Sweden, and via the EEArea Agreement, to Iceland and Norway (excluding the Archipelago of Svalbard). Hence, foreign policy plays an essential role in respect to EU Arctic activities.¹ This includes, for instance, the EU's cooperative efforts with Russia in the European Arctic, and its engagement within the AC (Raspotnik & Stępień, 2020, p. 132). Thus, from a policy perspective, the Arctic is always of a dual nature – both domestic and foreign policies, covering EU-internal and regional matters, or tackling issues of cross-border or even of a circumpolar nature. As such, the Arctic is both a backyard as well as a neighbourhood for the EU (Dolata 2020, p. 8; Raspotnik 2021).

As highlighted throughout this report, many EU regulations and policies affect the Arctic indirectly, via what could be called 'external governance'. Many of these efforts are further determined by the EU's Arctic international cooperation efforts – a key theme of the EU's Arctic policy documents ever since the first Communication in 2008. As such, the EU actively engages in issues of direct relevance for the Arctic on an international level via the United Nations and its specialised agencies, such as the IMO. Further, the EU has always encouraged the full respect of the United Nations Convention on the Law of the Sea (UNCLOS) and related customary international law.² Although not (yet) an observer, the EU actively participates in the AC and further contributes to the various regional and sub-regional Arctic cooperation fora: the Barents Euro-Arctic Council (BEAC), the Nordic Council, the West-Nordic Council or the Conference of Arctic Parliamentarians (CPAR). The EU's Arctic external relations also include relationships with all non-EU Arctic states, either via bilateral means or via the EU's very own Northern Dimension.

Arctic Council

The AC is the leading body of Arctic cooperation, composed of eight Arctic states, three of which are also EU Member States: Denmark (in relation to Greenland), Finland and Sweden. When Paavo Lipponen, then the Prime Minister of Finland, floated his idea for the EU to have a Northern Dimension in 1997, he also urged the EU to become an observer to the AC. This proposal was followed by a Russian suggestion in 1999 of the AC to be the EU's window into the Arctic. After attending several ministerial meetings as ad hoc observers, the Commission officially applied, on behalf of the EU, for observer status in December 2008. Yet ever since, the EU's application has been blocked. First by Canada in response to the EU's restrictions on the marketing and trading of seal products; a disagreement that was essentially resolved in 2014. Second, and until today, by Russia in response to the EU's imposed economic sanctions against the Russian Federation since 2014. With the EU still upholding restrictive measures against Russia, the EU's AC observer status application remains indefinitely locked in a stalemate (Raspotnik 2018, pp. 91–92). Despite this, the EU actively contributes to the work of the AC working groups, task forces and expert groups, and continues to participate as a *de facto* observer (in 2013, the EU's application was received affirmatively but a final decision on implementation was deferred until the AC ministers agreed by consensus). One of the key substantial inputs to the work of the AC is the involvement of the Commission's Joint Research Centre (JRC). For example, JRC experts are involved in forest fires work

¹ Born in 1993, the European Union's Common Foreign and Security Policy (CFSP) experienced substantive institutional development in the following years and was formalised in successive treaties: the Common Security and Defence Policy (CSDP), the creation of the High Representative of the Union for Foreign Affairs and Security Policy and the EU's very own diplomatic service (European External Action Service, EEAS) (Franco 2021, p. 2). Yet, in contrast to the CFSP's institutional development, its legal base – as stipulated via the EU treaties – is rather weak, with foreign policy very much remaining an individual Member State domain. The political interests of the Member States and their diplomatic relations are determined by economic, geographic, historical, religious, cultural and other factors (Franco 2021, p. 3).

² Unlike its geographical opposite, the Antarctic, the Arctic Ocean is not subject to an international treaty regime explicitly purpose built for the region. In fact, the law of the sea and the combination of UNCLOS and customary international law stipulates the respective sovereignty and sovereign rights of the Arctic coastal states and further constitutes the area beyond national jurisdiction (Raspotnik 2018, p. 37).

under the Emergency Prevention, Preparation and Response (EPPR) and Conservation of Arctic Flora and Fauna (CAFF) working groups, providing analysis of the impacts of increased fires on Arctic ecosystems. Further, JRC contributes to the SDWG's Arctic Demography Index project and was also involved in the renewable energy work of the SDWG (AREA handbook). The JRC also participates in the FPI-funded Arctic Monitoring and Assessment Programme (AMAP)-led action on black carbon. However, the JRC is primarily responding to the data needs within various AC projects, its involvement in the work of the AC working groups is generally *ad hoc* in nature. The *ad hoc* character of the EU involvement in the work of the AC working groups is a more general challenge. At the political level, the EU is represented by an official from the Commission and its DG MARE as Arctic-lead Directorate-General, as well as a representative from the EEAS, mainly the Ambassador at Large / Special Envoy for the Arctic. Apart from involvement of EU officials in the activities of the working groups, a number of EU-funded projects within the Horizon 2020 programme have involved the working groups in project implementation, often as formal partners.

Barents Euro-Arctic Council

The Commission was one of the signatories of the Kirkenes Declaration that established the BEAC in 1993 in an effort to increase the EU's regional visibility in Finland, Norway and Sweden as well as in Russia (Airolti 2008, p. 23). Together with its Regional Council, BEAC promotes cooperation in the Barents region, covering a wide range of cross-border environmental, economic and home affairs issues. A Barents Parliamentary Conference is convened every two years, bringing together representatives from regional, national and indigenous assemblies, including the European Parliament and its Delegation for Relations with Switzerland, Norway, Iceland, EEArea and the North (DEEA) (Stang 2016, p. 12). Similar to the Northern Dimension, see below, BEAC is particularly helpful for the EU in addressing important issues at regional level, also *vis-à-vis* Russia. As such, the EU actively contributes to the work of the BEAC, mostly via people-to-people cooperation efforts and in the related working groups for culture, education and research, energy, health and social issues, tourism and youth. The EEAS represents the EU in the BEAC's Committee of Senior Officials, which *inter alia* prepares BEAC ministerial decisions.

Nordic Council

The Nordic Council and the Nordic Council of Ministers is an inter-parliamentary and intergovernmental forum for Nordic cooperation between Denmark, Finland, Iceland, Norway and Sweden. Mainly focusing on cooperation efforts with the Baltic States in the immediate post-Cold War era, the Arctic region has taken a more prominent place in the work of the Nordic Council over the past two decades – predominantly via the Nordic Council's Arctic Cooperation Programmes. The European Parliament, via the DEEA, participates in the annual plenary session of the Nordic Council.

West Nordic Council

Another parliamentary body of Arctic/Nordic cooperation is the West Nordic Council, initially founded in 1985 under the name West Nordic Parliamentary Council of Cooperation. The main aim of this joint forum, consisting of parliamentarians from the Faroe Islands, Greenland and Iceland, is to cooperate on common problems and to conduct positive and constructive cooperation regarding the West Nordic (or North Atlantic) issues with the Nordic Council as well as other organisations. Members of the European Parliament's DEEA meet annually with members of the West Nordic Council to discuss both North-Atlantic and Arctic cooperation.

Conference of Arctic Parliamentarians

CPAR is a biennial conference for delegations elected by the parliaments of the eight Arctic states and the European Parliament (via the DEEA), and also includes representatives of Indigenous Peoples. The Standing Committee meets 3-4 times per year in the different Arctic countries, and further

participates as an observer in AC meetings. The CPAR, which was first held in 1993, addresses topics such as maritime transport, education and research, human development and climate change (Stang 2016, p. 11).

Northern Dimension

ND policy was initiated in 1999 as an EU cross-cutting framework and renewed in 2006 as a joint policy framework between four equal partners – the EU, Iceland, Norway and Russia. This rather flexible policy framework aims to promote dialogue and cooperation especially in the sectors of environment, public health and social well-being, transport and logistics, and culture in both the Baltic and Barents regions.³ The ND involves regular meetings of foreign affairs ministers, deputy ministers as well as senior officials and includes a parliamentary body — the Northern Dimension Parliamentary Forum — of which the European Parliament is a founding member.

Despite the many similarities between the ND, and the BEAC and the AC, its linkages, both political and practical, with the direct EU-Russia relationship are unique and offer a kind of “back door” for positive cooperation and the exchange of messages between the EU and Russia (Bailes and Ólafsson 2017, p. 55). Over the years, the EU contributed over EUR 100 million to ND projects, including EUR 84 million for the ND Environmental Partnership (NDEP), although most ND projects have been implemented outside the Arctic regions. NDEP funding has been extended until 2027, with support for projects aiming at reducing black carbon emissions among possible actions.

Bilateral Cooperation

Both Iceland and Norway are members of the EEArea and thus closely linked to the EU’s single market. The two NATO members openly support the EU’s application for AC observer status.⁴ As comprehensively outlined in this report’s chapter 9 on energy, the EU has maintained a regular high-level energy dialogue with Norway since 2002, held between the Commissioner of Energy and the Norwegian Minister for Petroleum and Energy. This is further supplemented by an EU-Norway Energy conference.

Arctic relations with Canada have improved significantly since the disagreement over the trade in seal products was resolved in 2014. Canada is now positive toward the admittance of the EU to the AC as an observer, and is itself an observer in the ND (Stang 2016, p. 14).

Despite noticeable cooling in bilateral relation ever since 2014 (and arguably before), the EU and Russia continue to cooperate in multiple local, regional but also multilateral Arctic venues. This relates in particular to cross-border cooperation in the Barents Euro-Arctic region (Sebentsov 2020). Despite the imposed sanctions against Russia, cooperation in the BEAC remains pragmatic, essentially focusing at the moment on youth, education, logistical and infrastructure cooperation, as well as the broader question of climate change adaptation. Also, the ND remains an active mechanism and provides a good example of the selective engagement efforts and related confidence building measures with Russia as emphasised in the Global Strategy of 2016. Cross-border cooperation, collaboration on forest fires and aspects of emergency response are other areas of the well-functioning engagement.

In addition to these non-EU Arctic states, the relationship between the EU and Greenland and the EU and the Faroe Islands also has distinct external characteristics, as both are self-governing entities within the Danish Realm, yet explicitly not part of the EU. Although geographically belonging to North America, Greenland is commonly understood as being part of the European Arctic – predominantly due to its political bond with Denmark. After obtaining home rule from Denmark in 1979, Greenland withdrew from the then European Economic Community in 1985. Today, Greenland is linked to the EU

³ As part of the ND’s very first action plan and as early as 2000, the Commission attended the AC’s second Ministerial Meeting to further explore possibilities for cooperation in the Arctic (Raspotnik 2018, p. 88).

⁴ The Arctic has, however, only been of low-order concern for both the EU and Iceland during Iceland’s EU membership negotiation talks between 2009 and 2013 (Raspotnik 2018, p. 69).

through the association of OCTs. As such, Greenland is not directly subject to the EU's *acquis communautaire* but has a special associate status based on the Overseas Association Decision, which is furthermore complemented by a Fisheries Partnership Agreement and an additional comprehensive Partnership Agreement (Raspotnik 2018, p. 70).

The EU in the Arctic security environment

The United States and Russia, in an ever-deteriorating relationship, are Arctic states and China is increasingly demonstrating its (strategic) northern interests (Raspotnik & Østhagen, 2021). The return of security policy to the Arctic will also have consequences for the EU and its continuous efforts to foster international cooperation in and for the Arctic region. The essential challenge lies in the fact of an EU Arctic policy always being characterised by both internal and external policy aspects, as well as Eurasian and North American Arctic policy issues, and the necessity to balance them (Dolata 2020, pp. 7–8).

As highlighted throughout this report, the EU already has a broad toolbox of regional competences, expertise and initiatives at its Arctic disposal. This “EU Arctic spectrum of capabilities” could further serve as a framework for an updated policy and – if properly implemented – act as a trigger for a more confident and trustworthy relationship with Russia. A framework that starts with concepts on small but nevertheless important confidence-building measures, such as search and rescue efforts and cross-border environmental cooperation might possibly extend to more challenging areas of cooperation. This “spectrum structure” might offer the possibility for the EU to be the region's honest broker and to act in the Arctic without artificially fuelling conflict narratives or being perceived as an Arctic security actor (Raspotnik 2020).

2.5. Indigenous Peoples and their rights

The Arctic, including the regions which currently make up the territories of Sweden and Finland, has been home to Indigenous Peoples for thousands of years. The contemporary homeland of the indigenous Sámi people is an area larger than Germany which stretches across large parts of Norway and Sweden as well as the northernmost part of Finland and parts of the Kola peninsula in the Russian Federation.

In the last century, the international protection of indigenous rights has undergone a substantial transformation, from attempts to assimilate Indigenous Peoples into dominant societies to a wide-ranging recognition of the right to self-determination. The latter is contained in the International Covenant on Civil and Political Rights (ICCPR) and in the International Covenant on Economic, Social and Cultural Rights (ICESCR), both of which date back to 1966, although practical implementation is still lacking in many respects. Article 27 of the former treaty has long been used by indigenous litigants, especially from the European Arctic, to seek protection for the cultural rights of the Sámi people. Over the last decades, human rights litigation initiated by indigenous persons and groups from the European Arctic has played an essential role in the development of international indigenous rights law. The key international treaty dedicated solely to the protection of indigenous rights, the International Labour Organization's Convention No. 169 of 1989, has been ratified by several EU Member States, including Denmark (with regard to Greenland), as well as by Norway. It has not been ratified by Sweden and Finland. In addition, the European Convention on Human Rights has been used to seek protection for indigenous rights (Koivurova, 2011). The EU Charter of Fundamental Rights, which is interpreted in parallel to the European Convention of Human Rights, could likewise be used as a basis for human rights litigation on behalf of Indigenous Peoples, which expands the issue of indigenous rights from the realm of the Member States to that of the EU.

In material terms, indigenous rights law is often concerned with cultural rights, which often are interwoven with land rights. Land use conflicts form the basis for many legal issues involving indigenous rights. In recent years, self-determination of Indigenous Peoples, which is to be realised within nation states, has gained more attention in international law, as reflected also in the 2007 United Nations Declaration on the Rights of Indigenous Peoples.

EU law and policies directly impact Indigenous Peoples in Greenland, French Guiana, Finland and Sweden and, through the EEA, Norway, as they affect all EU/EEA citizens. The EU regulatory framework may have therefore indirect influence on the observance of indigenous rights in the EU Member States. For that reason, Sámi rights are specifically safeguarded in Protocol 3 to the Accession Treaty for Finland and Sweden, ensuring that the EU law does not undermine exclusive rights of its indigenous citizens. Greenlanders, as citizens of Denmark, are also citizens of the EU, although Greenland itself is not part of the EU.

Indigenous communities in the European Arctic are recognised by the EU, which is engaging in dialogue. What is missing are mechanisms which allow for the views of Indigenous Peoples to actually have a practical impact. The concept of Free, Prior and Informed Consent (FPIC), which is part of public international law, requires good faith consultations but does not provide a veto power for Indigenous Peoples. Given the direct effect of EU legislation and the practical impact of the policies of the EU on Indigenous Peoples, the realisation of FPIC at the EU level has to be improved. Giving a voice to local communities is essential for sustainable development. Because EU measures can affect indigenous rights, the EU would be well advised to take into account the emerging international legal concept of FPIC (Heinämäki & Kirchner 2017) when preparing decisions, actions or legislation which will directly affect Indigenous Peoples.

2.5.1. Indigenous issues in the EU's foreign, Arctic and internal policies

Lack of a coherent EU indigenous policy

Despite the call for the creation of focal points in the 2017 Council Conclusions on Indigenous Peoples, the EU is lacking a single institution responsible for contacts with Indigenous Peoples. As in the case of the EU's approach to the Arctic as a whole, indigenous issues are simultaneously part of the foreign policy portfolio and part of the internal life of the EU within the Member States. The strong focus on development aspects in the EU's work on indigenous rights also might lead to a stronger focus on developing and emerging economies, which in turn might explain why Indigenous Peoples in highly developed and democratic Arctic nations such as Norway or Canada are given almost no attention in non-Arctic policy contexts. While cross-cutting issues such as the rights of Indigenous Peoples might not easily be subsumed under one executive portfolio or another, an institutional clarification would be desirable. It could also enhance the effectiveness of any EU efforts to protect indigenous rights inside and outside the EU and would help avoid the omission of Indigenous Peoples in documents concerning the Arctic (as has happened in the past).

The need for institutionalised dialogue

Arctic stakeholders have received more attention from policy-makers in recent years (Schram Stokke 2015, p. 5), a trend to which the EU is contributing as well. In the past, EU policy decisions have been marked by a lack of awareness of the reality of the life of Arctic Indigenous Peoples and their needs. This has led to resentment towards the EU, the effects of which are still visible today. More recently, a willingness on the part of European institutions and actors to engage with Arctic indigenous communities and to gain a more thorough understanding has become visible. There is a continued risk of paternalistic attitudes on the part of public officials in the EU towards Arctic indigenous communities.

The language of some EU documents may have created the impression that sensitivity towards Indigenous Peoples is not always present, for example the 2020 "Protecting Indigenous Peoples is pursuing a better world" (EEAS 2020), which reflects the paternalistic attitude common in the 1980s (in the run-up to the 1989 ILO Convention 169). It describes Indigenous Peoples - without much distinction - as in need of protection from the outside due to an inability of indigenous communities "to protect themselves" (EEAS 2020). Although well-intentioned, this language might be indicative of a need to more closely evaluate the relationship between the EU and Indigenous Peoples. This refers not only to the Indigenous Peoples living within its borders (both in the Arctic and elsewhere, e.g., in French Guiana) or in the OCTs of the EU Member States, with which the EU has a special relationship (for example

Greenland, French Polynesia or New Caledonia) but also with regard to Indigenous Peoples elsewhere. This is of particular relevance for the Arctic, due to the presence of a large number of indigenous persons and peoples in the circumpolar North. In this context, there seems to be potential for a holistic approach, although it has to be kept in mind that there is not a “one size fits all” solution to dealing with the needs and interests of different actors in indigenous homelands.

Specifically within the domain of Arctic policy, EU officials fairly quickly realised the value of direct dialogue with Arctic Indigenous Peoples (although closer EU relations with the Sámi Council were already present since Finland and Sweden joined the EU in 1995, including in the sphere of development cooperation). The adoption of the ban on placing seal products on the EU market (Regulation EC/1007/2009, see section 2.7 in this chapter) met with a particularly strong response from the Arctic indigenous communities, in particular the Canadian and Greenlandic Inuit, which, among others, contributed to Canada’s lack of acceptance of the EU application to become an observer on the Arctic Council. Since 2010, the EC has been organising so-called Arctic Dialogue meetings, where the EU officials meet Arctic indigenous representatives. Recently, these meetings were combined with the Arctic Stakeholder Conferences. These events are highly appreciated by indigenous representatives, especially when in some years an EU commissioner was present. However, they usually lack discussion on concrete problems, concerns and current EU policy developments (Stepien 2017). As part of the Arctic Stakeholder Conferences, the Arctic Dialogues have become more like conference sessions than a format dedicated to a direct and more in-depth exchange. On the other hand, in 2020, DG Maritime Affairs and Fisheries funded a small project promoting dialogue and cooperation with the Sámi, including by distributing information and increasing awareness of Sámi rights and issues. The project aimed at complementing the Arctic Dialogue.

Shared values and interests

For the indigenous Sámi people who live in the EU/EEA Area Arctic, the connection to their natural environment is essential (Kuhn, 2020: 104). In the past, different approaches to the natural environment have been at the core of misunderstandings between EU institutions and Indigenous Peoples in the Arctic. However, the interests of the EU and the Indigenous Peoples of the Arctic often align, for example when it comes to the protection of biodiversity, a goal pursued in a range of EU legislative measures, including e.g. the Maritime Strategy Framework Directive (cf. Rowan Wright, 2020: 41). Among the values shared with the EU is a commitment to international law. Indigenous rights have evolved in recent decades due to the active use of international human rights law, in particular by litigants from the European Arctic. In general, the Arctic is a region which emphasises the rule of law. International law, in its different forms, is the bedrock of international cooperation in the Arctic. With the notable exception of the Russian Federation, the governments of all Arctic states are committed to, *inter alia*, democracy, human rights and the rule of law. These values are shared by the EU (Craig & de Búrca 2020: 44 et seq.), as is evidenced by Article 2 of the Treaty on European Union (TEU), which means that they can serve as a foundation for future consultations.

Another area of interest which is shared by the EU and Indigenous Peoples is the protection of biodiversity. In this context, EU measures, which take into account the knowledge and needs of indigenous communities, might benefit from a higher degree of effectiveness when it comes to protecting biodiversity, including in the European Arctic, while opening another door for continuing conversations between the EU and Indigenous Peoples.

2.5.2. Examples of positive contributions by the EU

Suicide prevention

Several Arctic regions exhibit some of the world’s highest suicide rates, especially among indigenous residents. That is seen as being connected to a disconnection from culture (cf. Widdowson 2019: 339; see also MacFarlane 2019: 153) and structural inequalities (cf. Widdowson 2019: 340). Although the competences of the EU in the health sector are limited, the EU’s involvement in this regard is

noteworthy. Between 2008 and 2013, the EU funded the project “European Regions Enforcing Actions against Suicide” (euregenas), which also covered the cities of Helsinki and Mikkeli in Finland and the region of Västra Gotland in Sweden. Although neither of these regions are located in the Arctic per se, the project led to the creation of tools which can be of use in the Arctic regions of Sweden and Finland as well, such as suicide prevention guidelines (Dumon & Portzky 2014).

Research Funding and Indigenous Interests: European Green Deal and Horizon Europe

Early information about the new Horizon Europe funding scheme, which replaces Horizon 2020, indicates a greater willingness to take into account the needs of the people who live in the EU (and beyond) when funding research. The EU is a key source of funding for research and other activities in the Arctic. In light of the focus on the European Green Deal, it seems reasonable to assume that the relative and absolute importance of EU funding for the Arctic region is going to grow. The European Green Deal and the implementation of an effective climate change policy, which considers the needs of local communities, provides an opportunity for closer interaction between the EU and Arctic, including indigenous communities. This could have direct positive effects for Arctic indigenous communities. Needs of Arctic residents, which are far from uniform, should therefore be taken into account when designing future research programmes. In this manner, the EU could continue the successful research funding provided with past programmes. Providing research funding for projects which promise tangible benefits for the people who live in the Arctic, including especially for indigenous communities, can be an additional way to enhance mutual cooperation.

“The history of Arctic exploitation, settlement, and governance is one where northern communities have played second fiddle to southern powers and constituencies, located thousands of miles away from the Arctic” (Dodds and Nuttall 2019: 159). Today, the work of the EU already contributes to improving the situation of the people who live in the EU Arctic, including indigenous groups and individuals. The aforementioned existing dialogue could be a first step towards more institutionalised cooperation between the EU and its Indigenous Peoples. In the context of the Arctic Council, the factual participation of indigenous representative organisations is often limited by capacities (Wilson Rowe 2018, p. 117), e.g. in financial terms, human resources or technical capacity. Existing EU funding schemes could play a greater role in capacity building in the future.

2.6. Gender

2.6.1. Gender equality in general

The attainment of equality between women and men, and the elimination of all forms of discrimination against women are human rights and United Nations values, and gender equality is a fundamental political and legal obligation for most of the world’s states. The international basis for state obligations to promote, protect and fulfil the equal rights of women and men is the 1979 Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) and the 1995 Beijing Declaration and Platform for Action (BPfA). The BPfA recognises women’s rights as human rights and is considered to be the most comprehensive global policy framework for the rights of women, under which the EU and its Member States, along with other governments, is committed to achieving concrete targets in twelve critical areas of concern. These areas include, among others, addressing inequalities, inadequacies, and unequal access to education and training, violence against women, inequality in economic structures and policies, inequality between men and women in the sharing of power and decision-making at all levels, inequality in women’s access to and participation in all communication systems, and gender inequalities in the management of natural resources and safeguarding of the environment (United Nations 1995).

Among the 17 Sustainable Development Goals (SDGs) adopted in September 2015 by all United Nations member states, gender equality and empowerment of all women and girls is enshrined as a goal

in its own right (SDG 5). It also cuts across all other goals and is reflected in 45 targets and 54 indicators. It is increasingly recognised that gender equality can be a catalytic policy intervention — an accelerator — that triggers positive multiplier effects across the whole spectrum of development agenda. As evidence shows, gender equality is central to achieving a wide range of sustainable development objectives, from reducing poverty to promoting economic growth, strengthening human capital through health and education, attaining food security, addressing impacts of climate change, strengthening resilience to disasters, and ensuring more peaceful and inclusive communities (Dugarova, 2018). In other words, attaining gender equality is critical as a goal in and of itself, and as an effective means of achieving sustainable development.

Gender equality is also integral to effective, efficient, and equitable environmental protection and over the last decade there has been a discernible shift in the commitment to gender equality and the recognition of gender in international environmental agreements (UNEP 2016). International policy frameworks and global summits have made an explicit link between gender equality and the state of the environment, including climate change, biodiversity, and pollution. Many of them established their respective gender action plans and have now incorporated gender mainstreaming as a strategy for advancing gender equality.

The reason for the increased attention being paid to gender and intersectional perspectives is the recognition of differentiated impacts that climate and environmental changes have on different persons and groups within societies. Gender and sociodemographic factors like age, wealth, and class are critical to the ways in which climate change is experienced (Vincent et al. 2014). Existing inequalities affect the impact of climate change and the ability to respond to it. The experiences of women and men, during and after times of climate and other natural crises, are different based on their work roles, sociocultural norms and practices, economic conditions, and access to resources (Alston 2013). Likewise, measures introduced to reduce climate change or to adapt to it also have different effects on people, according to their gender, class, wealth, ethnicity, physical ability, and the intersections of those. There are gender differences in the contributions to climate change, in attitudes towards it, in access to climate decision-making, adaptation capacities, and in preferences regarding suitable and adequate means of response — much in a similar fashion as they exist in the management of natural resources, primary industries, and across the entire development spectrum (Smieszek & Prior, 2021). Advancing equality enables people's ability to become agents of change in facing the challenges ahead of their communities and societies at large.

The intersection of climate change and gender equality is recognised as an overarching principle in the Preamble to the Paris Agreement adopted in 2015 and gender issues are explicitly referenced in the Agreement in the context of adaptation and capacity building. In Article 7, paragraph 5, the Parties acknowledge that climate change adaptation action should follow a country-driven, gender-responsive, participatory, and fully transparent approach, and in Article 11, paragraph 2, they reiterate that capacity-building should be an iterative, participatory, cross-cutting, and gender-responsive process (United Nations 2015). In 2019, UNFCCC COP25 in Madrid agreed to the renewed 5-year enhanced Lima Work Program on Gender and its Gender Action Plan, and in February 2020, the Intergovernmental Panel on Climate Change (IPCC) adopted a Gender Policy and Implementation Plan, which will be overseen by the Gender Action Team (GAT) whose aim is to enhance gender equality in IPCC processes.

The Convention on Biological Diversity (CBD) was the first multilateral environmental agreement to have a Gender Plan of Action (GAP) in 2008. At COP14 of the CBD in November 2018, Parties to the Convention agreed that the process to develop the post-2020 global biodiversity framework would be gender-responsive through the systematic integration of a gender perspective and ensuring appropriate representation, particularly of women and girls, in the process (United Nations Women 2018). Similarly, the integration of a gender perspective in all policies and practices, along with the promotion of women's and youth leadership, is listed among the guiding principles of the Sendai Framework for Disaster Risk Reduction 2015– 2030, which was adopted at the Third UN World Conference on Disaster Risk Reduction (WCDRR) in Sendai, Japan, in March 2015. Also in 2015,

the Conferences of the Parties to the Basel (the control of transboundary movements of hazardous wastes and their disposal), Rotterdam (the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade) and Stockholm (POPs) Conventions, committed to gender mainstreaming within their respective Secretariats and in their Secretariat's projects, programs, and training activities. Finally, in May 2020, it was agreed that gender perspectives will be incorporated into the implementation of the Minamata Convention on Mercury and that the Secretariat of the Convention will develop a gender strategy with the objective of mainstreaming gender within its work programme.

Concurrently, despite the significant advances in legislation and international commitments, the review of women's rights at the 25th anniversary of the Beijing Declaration in 2020 revealed that the progress to realising its vision has been partial and uneven, that environmental crisis is likely to annul many of the development gains achieved to date, and that some of the advances made are already reversed, including by the Covid-19 pandemic (Azcona et al. 2020; UN Women 2020). It is now established that the Covid-19 pandemic in 2020 negatively and disproportionately affected women, directly and indirectly, in relation to care responsibilities, employment and participation in the labour market, domestic violence, restricted access to health service, etc.

2.6.2. Gender equality in the Arctic

The question of gender equality in the Arctic has been raised in the early days of institutionalized circumpolar collaboration, most notably with the conference "Taking Wing" organised during Finland's first Chairmanship of the AC in 2002 and with two projects of the Sustainable Development Working Group (SDWG) of the AC focused specifically on women's participation in decision making in Arctic fisheries (2002–2004) and natural resource management in the rural North (2004–2006) (Ministry of Social Affairs and Health 2002; Sloan 2004, 2006). Gender issues have been raised in the Arctic Human Development Report (AHDR) from 2004 and debated at a dedicated conference in 2014 in Akureyri, Iceland, which was a part of the Gender Equality in the Arctic project of the SDWG (Phase I, 2013-2015) (Williamson et al., 2004). A pan-Arctic report on gender equality in the region is now awaited, being one of the deliverables from the SDWG at the Ministerial meeting in May 2021 at the end of Iceland's Chairmanship of the AC (2019-2021).

With the exception of the abovementioned initiatives, however, gender equality and gender issues have been until recently largely absent from the agenda of circumpolar collaboration. Gender dimensions and gender analysis have generally been missing from the work of the AC and its working groups, and research on gender has remained largely on the margins of Arctic scholarship. Even though all Arctic states remain committed to advancing gender equality through their respective national legislation and policies, this commitment has not been specifically reflected in the first iteration of their Arctic strategies, with the exception of Sweden, whose strategy 2011 mentioned bringing the gender perspective to the fore in Arctic-related cooperation bodies among its Arctic ambitions (Ministry for Foreign Affairs of Sweden 2011).

This situation has gradually changed over the last few years and today gender equality and gender issues are increasingly raised in Arctic discussions. Not only is there a steady growth in the scholarship on gender and gendered dimensions of developments in the Arctic, but there is also a growing number of networks, platforms, and NGOs that focus on gender issues and seek to promote gender equality in the region. It is recognised that issues such as migration and mobility, education, employment, characteristics of work in extractive and primary industries, knowledge about environmental change and climate change adaptation strategies have strong gender and intersectional dimensions that need to be adequately addressed in order to enable sustainable development in the Arctic. Importantly, Arctic states have begun to explicitly address gender equality in their statements and Arctic policies. In its Arctic and Northern Policy Framework from 2019, Canada listed the employment of analytical tools such as Gender-Based Analysis Plus among the principles meant to guide the implementation of the Framework (Government of Canada 2019). In its new Arctic strategy launched in October 2020, Sweden expressed

a commitment that international cooperation in the Arctic is to be guided by the tenets of its foreign and security policy that include the goals of Agenda 2030 and principles of gender equality. In line with its feminist foreign policy and the objectives of its gender policy, Sweden intends to work to have the gender policy perspective applied throughout the activities of Arctic-related cooperation bodies, including the AC and the BEAC. It also notes that the full enjoyment of human rights by all women and girls, men and boys is a legally binding undertaking for all Arctic states (Ministry for Foreign Affairs of Sweden 2020). In a draft of its new Arctic strategy from February 2021, Finland emphasises that the principles of sustainable development and gender equality should permeate all Arctic cooperation and that Finland is committed to working for gender equality in all aspects of Arctic cooperation. In a similar fashion, in her speech at the Arctic Frontiers conference in February 2021, Iceland's Prime Minister, Katrín Jakobsdóttir, noted that there is no sustainable development in the Arctic without gender equality.

2.6.3. EU and Gender Equality

Gender equality is a core value of the EU reflected in the Treaty on the European Union (Articles 2, 3(3), and 21), the Treaty on the Functioning of the European Union (TFEU) (Article 8), and the EU Charter of Fundamental Rights (Articles 21 and 23). Over decades, the EU has developed a considerable body of legislation pertaining to issues such as equal treatment in employment and occupation, reducing gender pay gaps, and increasing female labour market participation. Beyond those, the EU is committed to promoting equality between women and men in decision-making, combating gender-based violence, and promoting gender equality and women's rights across the world, in line with both the Beijing Declaration and the SDGs.

Despite many advances, gender equality is not yet fully realised in any European country nor anywhere in the world, and since 2020, the EU has taken a number of steps to accomplish that goal. In line with the von der Leyen Commission's commitment to achieving a Union of Equality, the EC presented in March 2020 a new Gender Equality Strategy 2020-2025 based on a dual approach consisting of key actions to achieve gender equality combined with enhancing the integration of a gender perspective in all EU policies and major initiatives (European Commission 2020a). The key objectives of the Strategy are ending gender-based violence, challenging gender stereotypes, closing gender gaps in the labour market and achieving equal participation across different sectors of the economy, addressing gender pay and pension gaps, closing gender care gap, and achieving gender balance in decision-making and in politics. In its pursuit of a Union equal for all, beyond gender mainstreaming, the EC is committed to addressing intersectional forms of discrimination across all its policies, and in the 2021-2027 budget gender equality-related projects will be supported through a number of EU funds and programs. In order to ensure implementation of the Strategy's key actions and gender mainstreaming at operational and technical levels, the Commission has set up a Task Force on Equality composed of representatives of all Commission services and the EEAS.

While the Gender Equality Strategy focuses on actions within the EU, in November 2020 the European Commission and the High Representative of the Union for Foreign Affairs and Security Policy put forward EU Gender Action Plan III for gender equality and women's empowerment in EU external action. GAP III makes the promotion of gender equality a priority of all external policies and action based on five pillars: (1) 85% of all new actions throughout external relations are to contribute to gender equality and women's empowerment by 2025; (2) developing a common approach for working together with stakeholders, including civil society organisations and youth at national, regional and multilateral levels, and for focusing on selected strategic issues; (3) accelerating progress, focusing on the key areas of engagement, including bringing gender perspectives to new policy areas, such as green transition and digital transformation; (4) leading by example of establishing gender-responsive and gender-balanced leadership at top political and management levels, (5) measuring results and annually monitoring the progress of implementation of GAP III (European Commission and High Representative 2020). Also in November 2020, the European Commission presented the first ever EU Strategy for

lesbian, gay, bisexual, trans, non-binary, intersex and queer (LGBTIQ) equality (European Commission 2020b).

Beyond overarching gender equality measures, at the end of 2019 the EU established a Gender and Climate Change Focal Point to support work carried out under the UNFCCC in relation to the Lima Work Program on Gender and its Gender Action Plan, to ensure that gender in the context of climate policy is addressed adequately at the EU level, and that it remains politically salient. Whereas the EU identifies both climate change and gender equality as cross-cutting issues that need to be mainstreamed across the entire spectrum of policies, there has been thus far a tendency to consider gender equality primarily in the context of employment, labour market, and social protections – not as the overarching issue that intersects with matters such as pollution, conservation of biodiversity, or resilience and adaptation to climate change (Allwood 2020). This observation corresponds with findings from the studies, which suggest that among the OECD countries there is a prevalent understanding of linkages between gender and biodiversity or gender and climate change as more relevant and applicable to the Global South countries, not within their respective national policies (Bunce and Ford 2015; Gilligan and Clabots 2017). In order to address this gap and develop more effective and tailored measures, collection of sex- and gender-disaggregated data among European countries is the first step that is now to be undertaken by the European Institute for Gender Equality (EIGE).

The EU has been a frontrunner with regard to promoting gender equality and inclusion of gender perspectives in research and innovation, the area, as previously asserted, of key importance in the context of EU Arctic engagement. Since 1999 and the European Commission's Communication "Women and Science: mobilising women to enrich European research", the promotion of gender equality has been a part of the EC's strategic approach in the field of research and innovation, and a priority of the European Research Area (ERA), as stated in the EC's 2020 ERA Communication (European Commission 2020c). The commitment to fostering gender equality and the integration of a gender dimension in research and innovation content was for the first time specifically mentioned in the Framework Regulation of Horizon 2020 and gender equality has been listed as a cross cutting issue throughout Horizon 2020, its programs and projects. With Horizon Europe, the Commission reaffirms its commitment to gender equality in research and innovation. The legal base for Horizon Europe sets gender equality as a crosscutting priority and introduces strengthened provisions for its advancement (Council of the European Union 2020). The main novelty is that the integration of the gender dimension into research and innovation content (i.e., sex and gender analysis) becomes a requirement by default across the whole program. Moreover, having a gender equality plan (GEP) in place will gradually become a new eligibility criterion for public bodies, research organisations and higher education institutions to get access to Horizon Europe funding. Finally, specific funding will be dedicated to gender and intersectional research, developing inclusive gender equality policies in support of the new European Research Area, and empowering women innovators. The overarching goal of these measures is not only to improve the European research and innovation systems and to enhance gender equality within them, but also to improve the quality and relevance to society of produced knowledge, technologies, and innovations through better integration of a gender dimension in projects.

All these changes will have important implications for EU-funded Arctic-related research, including major upcoming calls and projects. There has been some progress on that matter already and the new EU project on the integrated Arctic observing system has among its partner institutions an NGO, Women of the Arctic, to focus specifically on incorporation of gender perspectives into Arctic monitoring and the design of new pilot services.

2.7. Trade and the Arctic

The EU maintains close trade relations with all Arctic states, which are among the top ten EU trading partners, the U.S. (2nd), Russia (5th) and Norway (8th) (Eurostat, 2021; see table 2.1.). Moreover, the EU's single market covers an extensive part of the European Arctic (Raspotnik, 2018, p. 75). The closest EU trade relations with Arctic states are those with Iceland and Norway as due to the EEArea Agreement, these states are part of the EU's single market. Greenland, while not a party to the EEArea Agreement, also has broad access to the EU's single market and it belongs to the category of OCTs.

Whereas EU-US trade constitutes one of the largest trade partnerships globally, very little within it has an Arctic dimension. This is different for Russia, as a significant part of Russian exports of hydrocarbons and raw materials to the EU originate from the country's northern regions. This trade relationship is also the most problematic due to tense political relations between the EU and Russia as well as due to considerable environmental impacts of extractive industries in Russia.

Formal trade diplomacy allows the EU to engage Arctic states regarding sustainability and environmental concerns. Dialogues with Arctic states take place to that end, although with divergent results. Russia generally declines the EU's right to discuss the environmental performance of Russian extractive industries, while dialogue on sustainability is an integral component of CETA.

Trade relations with Canada, also in the Arctic context, have been in focus recently due to the adoption of CETA, which while not yet fully ratified is provisionally applied with the exception, among others, of investment protection provisions. CETA reaffirms commitments to effectively implement multilateral environmental agreements to which Canada and the EU are parties. The CETA Joint Committee also adopted, at its first meeting, the Recommendation on Trade, Climate Action and the Paris Agreement. The prevention of Illegal, Unreported and Unregulated (IUU) fishing is also part of the CETA chapter on Trade and Environment.

The impacts of CETA have been assessed before its conclusion, also in terms of sustainability and biodiversity (e.g. on the EU side a SIA was conducted in 2011, Trade 10/B3/B06). The first three years of implementation demonstrate positive impact of CETA on EU-Canada trade. In 2019 (before the effects of the pandemic), total trade flow between the EU and Canada witnessed an increase of 24.3% for goods, and 25% in services as compared to the three years preceding the entry into force of CETA (2015 to 2017) (EC 2020; EC 2020, SWD(2020) 263 final).

A number of EU regulatory measures affect products imported to the EU as these measures concern the characteristics of products and thus the "Farm to Fork" strategy in agriculture under the European Green Deal (EC 2019) will be relevant for the import of Arctic fish produce. A regulation on electric batteries and resulting waste (COM(2020) 798/3) proposed by the EC in 2020 would introduce mandatory requirements for end-of-life management and a labelling scheme, the latter possibly being of relevance for future imports of metals such as nickel or lithium from Arctic states.

In the Arctic context, a trade issue that received a great deal of publicity and attention was the EU ban (Regulation EC/1007/2009) on the placing of seal products on its internal market. Originating both

| | EU27 imports (EUR bln) | EU27 exports (EUR bln) |
|---------|---------------------------|---------------------------|
| Canada | 20.9 (8%) | 38.3 (13%) |
| US | 232.6 (16.3%) | 384.4 (18.1%) |
| Russia | 144.5 (42%) | 87.8 (35%) |
| Norway | 54.1 (60%) | 51.6 (55%) |
| Iceland | 2.8 (60%) | 3 (45%) |

Table 2.1: Trade in goods between the EU27 and non-EU Arctic states in 2019 in EUR bln. In parentheses the percentage of the EU27's share in Arctic country's exports and imports (the role of the EU as an Arctic states' trade partner). Data by Eurostat and EC DG Trade.

from animal welfare concerns and the introduction (or the processes leading to the introduction) of bans by several Member States, and underpinned by powerful campaigns by animal rights organisations, the so-called seal ban affected the livelihoods of both commercial sealers in Canada and Inuit hunters (Sellheim 2014; Government of Nunavut 2012). The latter, while in principle exempted from the ban, claimed they were impacted owing to the overall collapse of the global sealskin market following the introduction of the EU ban. The ban caused serious concerns among many Arctic communities as well as Inuit organisations and – for several years – led to Canada preventing the EU from gaining formal observer status on the Arctic Council (see, e.g., Garces de los Fayos 2015). Canada, supported by states such as Norway, brought the EU Seals Regulation to the WTO dispute. As a result of the dispute, the EU revised its regime in 2015, maintaining the general ban but modifying the criteria for certification, mostly affecting the Inuit exemption. Authorised attesting bodies were identified in Canada and Greenland, with capacity to issue certificates that allow importation into the EU. While some technical problems remain (as noted in the consultation carried out by the EC with attesting bodies), the existing system of imports for exempted seal products appears to work (see EC 2020, COM(2020) 4 final). Currently a labelling scheme is being considered for products meeting EU import exemptions.

An important new development concerning trade relations with Arctic states is the development of the carbon border adjustment mechanism (CBAM) under the European Green Deal. The EC is to issue proposals before summer 2021. While not a stated purpose of the measure, such a mechanism may support European industry which is to bear the significant costs of actions towards reducing GHG emissions, including industries located in the European Arctic. The mechanism will likely be a complex instrument, challenging both to design and to implement.

2.8. The EU's Arctic policy

The EU has been developing its over-arching Arctic policy for over ten years, starting with a Resolution of the EU Parliament and a Communication of the European Commission in 2008. Over the years, the Union has made much progress in clarifying its approach to the Arctic, moving towards more nuanced and cautious approaches, as visible from the Joint Communication from 2012, and later Conclusions of the EU Council. Over time, the EU's understanding of its role in the region has expanded towards appreciating the place of the European Arctic within the EU and within the circumpolar North and including new policy sectors of relevance to the region. The latest of this series of policy statements is the 2016 Joint Communication on 'An integrated European Union policy for the Arctic'. It is structured around three broad themes:

- Climate change and safeguarding the environment;
- Sustainable development in the (European) Arctic;
- International cooperation on Arctic issues.

While more focused than its 2012 predecessor, the EU's Arctic policy statement from 2016 remains an overarching umbrella, bringing together a broad spectrum of Arctic relevant issues. The Arctic policy is not a sea basin strategy or a macroregional policy. Rather, it informs the EU policy-making community, general public and Arctic actors of the EU's own understanding of its place in Arctic affairs. The policy does not include specific targets. Its influence is via focusing EU action, pinpointing activities that need to be continued, and highlighting aspects of EU policy-making that have relevance for the Arctic. The specific EU sectoral policies and actions like those on climate change, research, sustainable regional development, and cooperation with Arctic states are what makes a tangible difference in the Arctic. The Arctic policy is only one of many considerations shaping such sectoral actions.

Discussions with EU officials show that the Arctic policy has allowed for a strengthening of the Arctic dimension in several areas over the past five years, such as the EU's space programmes, research, as well as its interregional and cross-border cooperation.

In fact, the only truly novel actions introduced by the 2016 document relate to cross-border cooperation and regional development of the European Arctic. First, the Northern Periphery and Arctic Programme (NPA) was given the political green light from the EC to commence cooperation between different EU interregional and cross-border programmes, an action which has been generally assessed as a very successful undertaking although its further continuation is in question due to changes in the NPA programme related to Brexit. Perhaps a new iteration of the EU's Arctic policy could provide an incentive for the continuation of cooperation activities. Second, the process of defining the key investment and research priorities for the European Arctic was launched by the 2016 Joint Communication and carried out by the European Arctic regions. The final report was produced in 2018 but its influence appears to be very limited. These questions are discussed in greater detail in [chapter 11 which deals with regional development](#). Furthermore, a new forum for EU-Arctic discussion was established, the Arctic Stakeholder Conference. Two such events have taken place so far and focused to some degree on different sustainable development questions, especially in the European Arctic.

There is also a less tangible dimension of the influence of the EU's policy statements. The work on developing the EU Arctic policy documents allows EU officials to gain a broader overview of the EU's presence in the region as well as emphasising the Arctic-relevance of their work within specific policy areas and portfolios.

2.9. Cross-cutting and research policy options

P1. Considering Arctic-specific impacts of EC policy proposals

The EU could make its diverse actions more Arctic-aware and Arctic-relevant by considering the impacts of policy and regulatory developments on Arctic regions. Arctic concerns can be communicated to general policy-making processes via regulatory impact assessments (IAs). IAs are conducted by the European Commission – sometimes with input from external experts or consultancies – in order to consider different alternatives and review the expected impacts of applied policy instruments, including those for different constituencies and regions. The European Commission's IAs of proposed policies or regulations could systematically incorporate a special focus on how new policy or legislative proposals influence the Arctic. Due to the complexity of both Arctic realities and EU policy frameworks, the identification of policies that have consequences in the Arctic constitutes a major challenge and requires stakeholder engagement. Taking Arctic issues into account is particularly important in areas where EU policies designed for a broad European constituency may yield specific consequences in the context of Arctic-specific challenges, such as the faster pace of warming, remoteness, long distance, Arctic nature-based livelihoods, sparse population or vulnerability of the Arctic environment, and presence of Indigenous Peoples. This is likely the case especially for legislation or policies in fields such as climate change, energy, transport, environment, ocean governance or rural policy. For instance, as the Arctic warms at over two times the global average, EU emission reductions and international action have particular significance for the region. The EU actions on microplastic or fisheries plastics litter have a clear long-term Arctic pollution dimension. Specific implications for other regions, such as the Baltic and Mediterranean, are often highlighted in impact assessment documents.

P2. Enhance the role of DG REGIO and EU northern programmes in the EU's Arctic policy

The EU's Arctic policy is by nature a cross-sectoral undertaking. It has been led so far by DG Maritime Affairs and Fisheries (DG MARE) and the EEAS. While there is no reason to change the leadership roles, DG Regional and Urban Policy (DG REGIO) should become increasingly involved in shaping the Arctic policy and in EU-Arctic developments. Arctic policy has a strong regional sustainable development dimension and the vast majority of EU funding related to Arctic policy questions is disbursed within the mainstream structural funding for northern Sweden and north-east Finland, transnational programmes (NPA), and cross-border programmes. These programmes are among the key instruments for the EU to

affect developments taking place in the European Arctic (see chapter 11). They are also important components of the EU presence in the region and its credibility as an Arctic actor. They are crucial for international cooperation in Arctic Europe, including with Faroe Islands, Greenland, Iceland, Norway and Russia but also with Alaska and Canada.

P3. Continued assessment of own footprint and promoting this action towards other actors

The EU was a frontrunner in terms of assessing its impact on the Arctic region, commissioning the first study in 2010. The current report, while not focused primarily on footprint assessment, contributes to an understanding of the Arctic influence of the EU's economy and population. The EU should conduct such studies regularly and channel its research funding, monitoring services, and its contribution to the work of the Arctic Council towards increasingly better understanding of its footprint. As such action shows a responsible approach to the region, other major economies, both Arctic and non-Arctic states, should be encouraged to carry out assessments of their own impacts on the region.

P4. Considering organising an EU Arctic roundtable

In order to make use of the current Arctic momentum, exemplified by the applications for AC observer status of the Czech Republic, Estonia and Ireland, and to raise Arctic awareness in Brussels and the capitals of the Member States, the EU should organise an EU Arctic Roundtable bringing together Member States. The roundtable should reflect on the best way the EU and Member States could support each other in achieving European goals in the Arctic and share experience of involvement in Arctic affairs in different sectors and fora.

P5. Coordinated and consistent contribution to the Arctic Council working groups' activities

The EU acts as a *de facto* observer on the Arctic Council. It has made significant contributions to its work, especially within the AMAP working group and the current work on black carbon. However, the involvement of EU officials and experts from EU agencies is very often *ad hoc*. The EC Joint Research Centre usually responds to the particular needs of the projects of the AC working groups, e.g. with regard to demography and forest fires. EU officials attend meetings, but it often depends on available resources, work portfolios, and personal interest. A more sustained and coordinated approach, identifying long-term areas of interest for the EU, and continued participation ensuring institutional memory, would benefit both the AC and the EU, and its image as an Arctic actor. It could also facilitate better communication of the outputs from the assessment and guidelines-defining work of the AC working groups into the EU's decision-making processes as there would be clearly identified persons who could bring the relevant AC outputs to the attention of EU officials not involved in Arctic issues directly. Both EC services and the representatives of EU agencies such as the EEA or EMSA could play such a role. For example, while each EU cohesion or cross-border programme has its own priorities and decision-making processes, they have the potential to translate the outputs of the Arctic Council's (as well as Barents cooperation) assessment and policy-shaping work into concrete projects. Northern Dimension Environmental Partnership (NDEP), for instance, is likely to support black carbon actions, which resonates with the current focus area in the work of the Arctic Council.

P6. Enhance internal coherence and integrated approach to Indigenous Peoples in the EU

The EU interacts and affects Indigenous Peoples globally via its economic footprint and development cooperation actions in the Arctic as well as directly within its territory, in both external and internal policies. The 2016 Joint Communication on the EU's policy (EC/HR 2016) towards the Arctic committed the EU services "to work on advancing consistency between the EU's internal and external policy towards Indigenous Peoples". In 2016, a staff working document on Implementing EU External Policy on Indigenous Peoples was published. The breadth and diversity of EU-Indigenous Peoples nexus makes this a challenging task. All DGs as well as EEAS can be concerned with indigenous issues, in particular with indigenous rights, in the course of their normal operations. The possible inconsistencies between the EU's internal and external actions pose a risk of undermining the EU's credibility. The EU services

should more pro-actively work together towards streamlining the EU's indigenous-related actions. Several approaches are possible. First, the awareness of internal and external indigenous issues and rights among staff dealing with sectoral policies such as biodiversity or agriculture should be enhanced. A staff working document could be prepared - in consultation with indigenous representatives - identifying and analysing areas where EU actions are of particular relevance for Indigenous Peoples and their rights. Establishment of an inter-service group within the EC with involvement of EU human rights bodies and e.g. the European Environment Agency, could be considered.

P7. Make the interactions between the EU and Arctic Indigenous Peoples more action-oriented and concrete, as well as consider establishing more institutionalized dialogue forums

The EU should create a specific institutional structure or structures to be available as a point of contact to Arctic Indigenous Peoples within the EU and outside it. Many general EU decision-making processes - e.g. in the field of biodiversity, agriculture or raw materials - can have indigenous-specific implications and these may be easily overlooked without sustained interaction with indigenous representatives. The existing formats of interaction - such as the Arctic Dialogue - with Indigenous Peoples should be made more oriented towards concrete policy developments. Institutionalisation would allow a learning process on the part of the EU to be continued and intensified, increasing Arctic awareness in the EU institutions. First, the existing Arctic Dialogue meetings could be enhanced by partly focusing on the areas in which current EU policy developments may be of particular importance for Arctic indigenous communities. The EU has developed elaborate consultation procedures for citizens and organisations' engagement with regard to EC policy proposals. Indigenous organisations have full access to these participatory procedures. However, as indigenous institutions and organisations usually have limited human capacities and may not be able to identify the EU decision-making processes of relevance, the Arctic Dialogue meetings could be places for jointly defining where indigenous input is needed. This is particularly important for general policy developments, which for instance may affect environmental law or extraction of European Arctic resources, and thus affect indigenous communities, but where a possible indigenous-specific aspect is not clearly stated. Such expansion of the Arctic Dialogue format would require proper background preparation on the part of both the EC and indigenous representatives. The aforementioned 2020 project financed by DG MARE on Sámi involvement in decision making was a good step in that direction. Second, the EC should consider appointing a dedicated official responsible for scanning the EU policy-development process from the point of view of Indigenous Peoples and communicating those of relevance to the indigenous organisations. Third, the creation of a civil dialogue group dedicated to indigenous affairs should be considered. Such a group should have a cross-cutting character. Fourth, the possibility of establishing a Sámi representation in Brussels should be revisited. While the EU funding options are limited, the EU could discuss the funding possibilities with the Nordic states and indigenous organisations, including especially Sámi parliaments. The action could first be implemented as a multi-year pilot and consideration should be given to the Indigenous Peoples' rights, and not only the advocacy/lobbying dimension of such a representative office.

P8. Include gender equality as one of the overarching principles in a new EU Arctic Communication.

In line with a series of its new strategies promoting gender equality, as well as the fact that both Finland and Sweden in their new national Arctic strategies put forward gender equality as a prerequisite for sustainable development in the region, the EU should include gender equality as one of the overarching principles in its new Arctic Communication and use it to promote gender equality and gender mainstreaming within Arctic-related activities and collaboration. Not only is gender equality central to the realisation of Agenda 2030, serving as an accelerator for all other SDGs, but also it is essential in effectively addressing challenges of climate change, loss of biodiversity, and pollution - all areas of fundamental importance in the Arctic and in which the EU has been very active.

P9. Enhance engagement with the youth and inclusion of young voices in EU-Arctic matters.

The inclusion and accounting for input and perspectives of young people is increasingly recognised as central to effective and sustainable future-oriented policies and actions, including actions to ensure the sustainability of small communities in the European Arctic, for example by ensuring digital and physical connectivity. Successful examples of those include, among others, very active engagement of young people in the preparation of the latest High North report of the Norwegian government as well as the central role of young people in the Arctic Biodiversity Congress organised by the CAFF working group of the Arctic Council. The EU should explicitly call for involvement of the youth in its future Arctic calls and projects, both through seeking input from young people throughout consultations as well as through encouraging collaboration with organisations representing young voices.

P10. Enhance Satellite Services – Connectivity and Observation - in the High Arctic

EU funding for the European Green Deal, Galileo, Copernicus and EGNOS should be continued. This will require significant financial commitment beyond 2027. In particular the funding for EGNOS ground stations and for updates and hardware replacements for the Galileo and Copernicus/Sentinel fleets have to be guaranteed for the foreseeable future. In particular in the context of communication and navigation satellites, connectivity in high latitudes, especially north of 70°N, remains a challenge, which requires innovative technical solutions. The EU should encourage and support further research with a view towards timely practical implementation of solutions which provide similar levels of connectivity both south and north of 70°N. This could be undertaken by providing research funding to search for technical solutions through Horizon Europe or by increasing the number of satellites, in particular those which operate in polar orbits.

P11. Facilitate Digital Futures for Remote Regions

The EU should support the digitalisation of rural areas, in particular the availability of mobile high bandwidth / high speed internet connections. While connectivity in the European Arctic is relatively good, including also in rural areas, the continuously developing digital economy, the evolution of which is accelerated by the reaction to the Covid-19 pandemic and the disconnection between places of formal employment and actual work locations, demands high bandwidths and speeds. By embracing digital work, rural communities can counter trends of outmigration and secure their survival. This requires investments in infrastructure as well as in knowledge; the stated goal of the EU to enhance digital capacity requires both infrastructure and digital skills. In light of the existing infrastructure, the focus should be on securing advanced digital skills. Of the EUR 7.5 billion 2021-2027 budget for the European Digital Programme (EDP), EUR 580 million have been earmarked for the development of advanced digital skills. Investing a substantial part of this in rural regions, in particular in the European Arctic, would make a meaningful contribution to efforts to safeguard the future of small and remote communities in the region. Small and medium-sized enterprises in the European Arctic would also benefit from funding to enhance the accessibility of artificial intelligence (AI), which is one of the aspects foreseen in the AI part of the EDP, which has a budget of EUR 2.1 billion (2021-2027).

P12. Provide stronger support for developing green air mobility

The EU should support the development of electricity-powered aircraft or low-carbon fuel options and the creation of the infrastructure necessary to ensure their operation with renewable energy in the European Arctic. While the development is global in nature, it is of particular importance for Arctic communities often highly reliant for transport and access to European and global markets on air transport. This would contribute to enhancing connectivity and mobility in the Arctic, in particular intra-Arctic mobility, while simultaneously reducing GHG emissions from transport. Assuming the use of 100% renewable sources for electricity, the transition from road transport based on combustion engines to electricity-powered aircraft would create a win-win situation for the European Arctic, which is already disproportionately affected by climate change. Given that the development of electricity-powered

regional aircraft is still at a relatively early stage. For instance, the Norwegian airline Widerøe and the UK-based engine producer Rolls Royce plan to have the first model aircraft ready for deployment by 2026 (correspondingly, Canadian airline Harbour Air conducted the first electricity-powered flight in 2019 with a 1957 de Havilland DHC-2 Beaver retrofitted by the Australian company magniX). Support for such measures should come in the form of research funding. Such research funding would fit into the framework created by the EGD and the resulting products could serve an emerging need. Funding in this field could also have positive long-term economic effects not only in regional economies of the European Arctic but also for the European aircraft industry, which can still catch up with competitors outside Europe.

2.9.1. Policy options for the EU's Arctic research

P13. Emphasise in a new EU Arctic Communication a need for collection of sex- and gender-disaggregated data in Arctic research projects.

The dearth of sex- and gender-disaggregated data constitutes one of the main challenges and obstacles in improving the understanding of developments and their impacts on the ground, in the Arctic and elsewhere. As reported by the United Nations Environment Program (UNEP) and Arctic studies, information discussing the differences between women's and men's needs, resource uses, and responsibilities across all the sub-sectors under sustainable development, environment, and conservation is extremely limited, which inhibits tailored and more effective responses to challenges faced by communities and societies. Addressing this gap is of paramount importance and the EU could play a very significant role in it by highlighting the issue and, subsequently, contributing to closing the gap through the research projects it funds. Since the principle of collecting sex- and gender-disaggregated data is already incorporated in the Horizon Europe, including it in a new EU Arctic communication could further enhance its visibility and prominence in an Arctic context, and further underline the EU's positive contribution to research and sustainable, inclusive development in the region.

P14. Promote and emphasise gender equality and empowerment of women in and through Arctic research.

In line with new provisions under the Horizon Europe programme, the EU should put much greater emphasis on the integration of gender and intersectional perspectives into content of Arctic-related projects in order to improve research quality as well as the relevance of produced knowledge, technologies and innovations to northern communities and societies at large. Moreover, the EU should more explicitly seek to empower women scientists and advance gender equality in STEM in its Arctic research activities and projects. Mentorship schemes toward that goal could be included as a requirement in future research calls. Importantly, to highlight its own contributions in this area and set a valuable example, the EU should highlight this part of its research policy in the Arctic context – both for engaged European polar partner institutions as well as within international venues such as the ASM, AC and in research collaboration partnerships with Canada, US, and Russia.

P15. Support early career scientists in Arctic science.

Given that very high costs of conducting research in the Arctic might constitute an additional barrier in comparison to projects in more southern locations, it is necessary to encourage, promote, and provide explicit and multifaceted support to early career scientists as the next generation of Arctic experts. A good example here is offered by a Horizon 2020 NUNATARYUK project, where presentation of research results has been done in tandem by both a senior and an early career scientist – a recommendation that could be commended to other EU-funded projects. Offering not only education, but also mentorship training through EU-funded Arctic research could be of significant added value to future European polar research and could be well supported within the European research community. It could also be facilitated

through the EU Polar Cluster, more systematic work with the Association of Polar Early Career Scientists (APECS), and, in future, through the European Polar Coordination Office.

P16. Enhance capacity-building for resilient science.

The Covid-19 pandemic exposed vulnerability of scientific research dependent on travels to distant locations and on the hospitality of small communities for whom contact with researchers coming from other places might present an imminent danger to their health and to their ability to cope with a new threat. Thus, in moving forward, the EU should enhance the capacity-building element of its Arctic-related projects, in particular when it comes to supporting and consequently building local and community competence for observations and monitoring of atmospheric, marine, terrestrial, biological, and social variables. Not only would it significantly enhance the quality and systematisation of Arctic observation and monitoring, but it would also ensure its long-term viability and sustainability.

P17. Minimise environmental impact of Arctic science.

As the EU seeks to become the first climate-neutral continent by 2050 through the European Green Deal and related research and innovation, it is imperative that it aligns its policies with that goal. For that reason, as it seeks to advance its Arctic research, the EU should work on developing guidelines and, ultimately, standards for minimising the environmental and carbon footprint of EU-funded science operations in the region - Arctic research projects could become an important testbed and frontrunner in this field. To facilitate a start of the process, a relevant study could be conducted and methodology developed by the JRC and/or other relevant units in the Commission.

3. Climate change

3.1. Climate change in the Arctic and its environmental and social impacts: an overview

Climate change, the critical global environmental, social and economic challenge, has impacted the Arctic since the 1970s, interacted with other factors of transformation and is clearly predicted to be the biggest driver of changes in the Arctic in the years to come. The region is warming by more than twice the global average rate, even more so in winters (see, e.g., AMAP 2019). In turn, the changes in the Arctic affect the rest of the world including via sea level rise and changing weather patterns in mid-latitudes.

Scientists and the region's inhabitants observe increasingly melting Arctic sea-ice and glaciers (and other cryospheric changes), ecosystem changes, as well as challenges to human societies and cultures, and economies. The most recent observations are that “the volume of Arctic sea-ice present in the month of September has declined by 75 percent since 1979” (AMAP 2019). Warming temperatures and extreme events are affecting the Arctic terrestrial landscape in many ways, e.g. through expansion of shrubs into tundra, increased vulnerability to insect disturbances, regional declines in tundra vegetation, and increases in severe fire years. In a similar vein, the marine areas are influenced by climate change, e.g. “the loss of sea-ice has triggered shifts in marine algal blooms, with potential impacts throughout the food web including krill, fish, birds, and mammals in marine ecosystems” (Ibid.). The Arctic glaciers, in particular the Greenland ice sheet, are the largest land-ice contributors to global sea level rise. These glaciers will continue to lose mass over the course of this century, even if the Paris agreement and mitigation measures in general are successful (Ibid.). In the terrestrial European Arctic, the changes to snow cover may have even greater impacts than the diminishing sea ice. It is also of vast importance to note that even if the mitigation measures would be able to curb greenhouse gas emissions, “the Arctic of the future will certainly be very different regardless of the emissions scenario” (Ibid.). Hence, Arctic glaciers, ice caps, and the Greenland ice sheet will continue to melt even if we are able to take strong mitigation measures, thus contributing significantly to long-term sea level rise. It is hence obvious that there is a need to adapt to significant climate change impacts in the region, given that no matter what climate reduction measures will be achieved, the region will undergo fairly significant change.

The main cause of the global climate change are the anthropogenic emissions of greenhouse gases (GHG), primarily carbon dioxide (CO₂), which remains in the atmosphere for centuries (e.g., IPCC 2018). Methane is a greenhouse gas and stays in the atmosphere about nine-years, and is hence mixed throughout the global atmosphere. Its warming influence is many times more than the same amount of carbon dioxide. Methane is the second most important anthropogenic contributor to current global warming. Similar to carbon dioxide, emissions of methane anywhere in the world also contribute to Arctic warming.

In contrast, the emissions of black carbon – a particulate matter that has a strong warming impact in areas where there are white surfaces (e.g. snow and ice) with high albedo – closer to the Arctic tend to have greater influence on Arctic warming. By removing the highly reflective surfaces, black carbon causes strong regional warming. It also directly absorbs solar radiation, which then warms the atmosphere. In addition, the residence time of black carbon is only days or weeks in the atmosphere and its sources are fairly close to the Arctic. This means that black carbon has a disproportionately strong impact exactly in the Arctic as black carbon can reach the cryospheric surfaces of the Arctic. As estimated by the Arctic Council's AMAP working-group, the warming impact of black carbon in the Arctic is comparable with that of methane, although the level of uncertainty is greater (Arctic Monitoring and Assessment Programme, Summary for Policy-Makers: Arctic Climate Issues 2015). Since black carbon

can reside only for a short time in the atmosphere - compared e.g. to carbon dioxide that stays for centuries - there is potential to reduce Arctic warming quite quickly by reducing black carbon emissions. Of the black carbon emissions, the Arctic states are responsible for about 30% of Arctic warming and the remainder comes from black carbon emissions outside the region (AMAP 2015). The short-lived climate pollutants are at the same time air pollutants that affect human and ecosystem health, both in the regions where these are emitted and in parts of the planet to which these are transported. Correspondingly, actions aimed at GHG reductions often also influence air quality. This warrants close interaction between climate and air quality policies and actions. Climate change-related emissions inventories include black carbon only in some countries. See also chapter 4 for a broader discussion.

Paradoxically, because of the successful air policy measures worldwide, there has been a decline in the emissions of sulphur dioxide, which have also cooled the Arctic climate. This has had a major impact on Arctic warming as during 1990-2015 the warming revealed by this unmasking effect from declining sulphur dioxide emissions is of a similar magnitude to the Arctic warming caused by carbon dioxide emissions. This means that even stronger measures need to be taken to tackle both the long-lived and short-lived climate forcers (AMAP 2021).

3.2. The influence of EU population and economy on Arctic climate change

As a major economy, the EU is one of the significant emitters of greenhouse gases globally. Estimates are that the EU-27 is responsible for approximately 7.8-8.0% of the emissions of greenhouse gases (ClimateWatchData; EEA; Ge and Friedrich 2020; excluding LULUCF; see figure 3.1). However, the EU's share of the greenhouse gases has been decreasing since 1990, with emission reductions in the EU-27+UK falling below 1990 levels by 26% in 2019 (EEA 2020). According to a recent estimate, the EU-27's total GHG emissions continue declining. With currently existing measures, they will decline by over 30% by 2030 compared to 1990 levels, lowering further the EU footprint, although missing the EU's current target of 40% reductions by 2030 (EEA 2020).

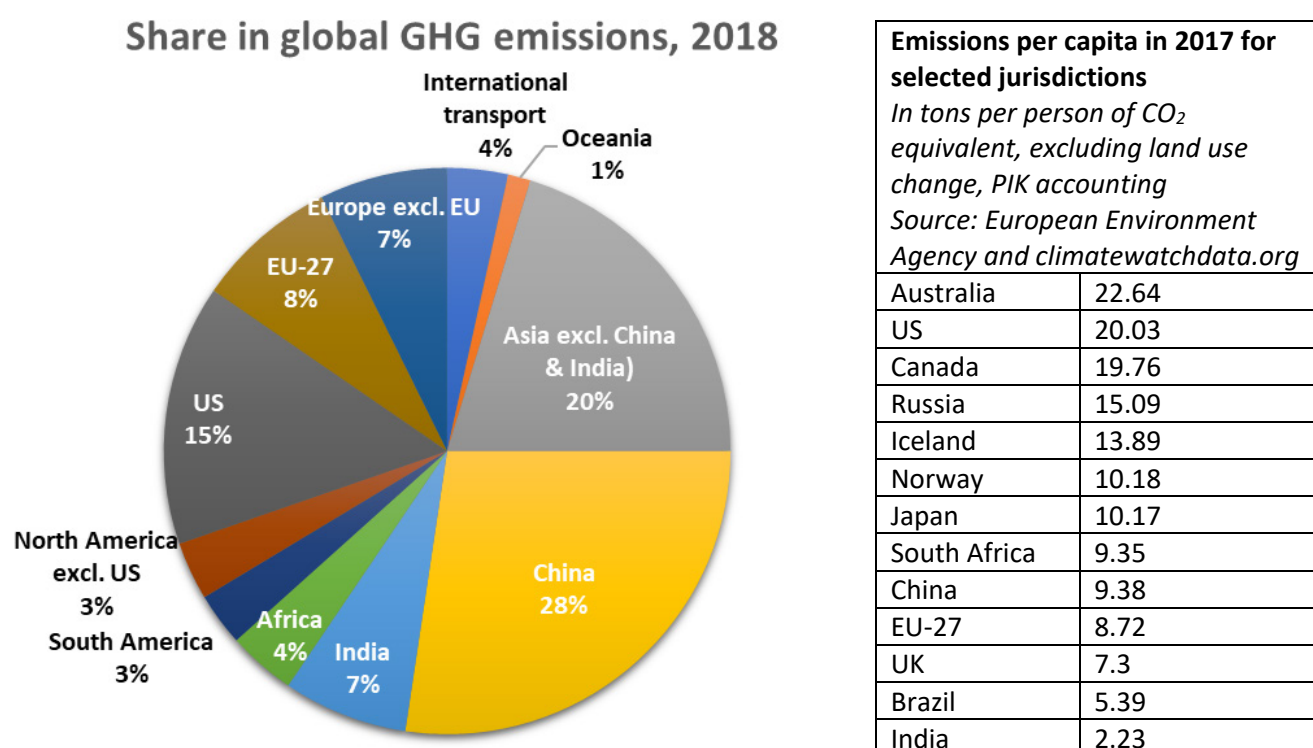


Figure 3.1: Share of countries and regions in global CO₂ emissions in 2018. Data excluding land use change. Table: Emission of GHGs per capita. Tons per person in 2017. Based on PIK accounting. Source: ClimateWatchData and European Environment Agency.

Methane accounted for about 10% of total GHG emissions in the EU-27+UK in 2017. However, a big part of methane emissions originates from hydrocarbon extraction and transport and takes place before the natural gas reaches EU borders, thus not being accounted in EU emissions. In the Arctic, the most problematic source country in this respect is Russia, partly due to old infrastructure and remoteness of extractive activities, taking place partly in the country's Arctic zone. Outside the Arctic, the exploitation of resource via fracking is of concern.

Since black carbon has not been part of climate change reduction measures under the UNFCCC, there are no global emission inventories such as for GHGs and the Paris agreement transparency framework did not include these. There are, however, efforts to gradually address this data gap (CCAC 2018; AMAP website for the EUA-BCA project). The emission inventories for black carbon have been developed, for instance, around the United Nations Economic Commission for Convention on Long-Range Transport of Air Pollution (UNECE CLRTAP) (notably its amended Gothenburg Protocol), the EU's National Emissions reduction Commitments Directive (NEC, (EU) 2016/2284) and the Arctic Council Framework on Enhanced Black Carbon and Methane Emissions Reductions. There are also possibilities to extend these reporting systems further via the Climate and Clean Air Coalition (CCAC). Currently, the estimates of global shares of black carbon emissions are based on various sources of black carbon being located in different continents (CCAC 2018:7). The EU Arctic Footprint and Policy Assessment of 2010 estimated that European continent, of all the source regions, releases 59% of black carbon emissions that end up in the Arctic. The study used an extensive notion of Europe - European continent (including West Russia) and also parts of North Africa and the Arabian Peninsula (AFPA 2010: 32) - and it is still very difficult to make any relevant assessments for the purposes of the current study. Most of the black carbon that ends up in the Arctic comes from mid-latitudes, not from the region itself. As EU Member States are relatively close to the Arctic (and partly located in the European Arctic), their black carbon emissions have a clear impact on the Arctic. In 2019, the EU-27's black carbon emissions were at the level of 181 gigagrams. It could be estimated that in 2011 the current EU-27 was responsible for about 36% of black carbon emitted north of 40°N that potentially was deposited in the Arctic.⁵

Importantly, the EU Member States have been relatively diligent with reporting their black carbon emissions, while other states have difficulties in establishing quality inventories. The data presented above are therefore approximate.

Share of black carbon emissions above 40°N in 2011

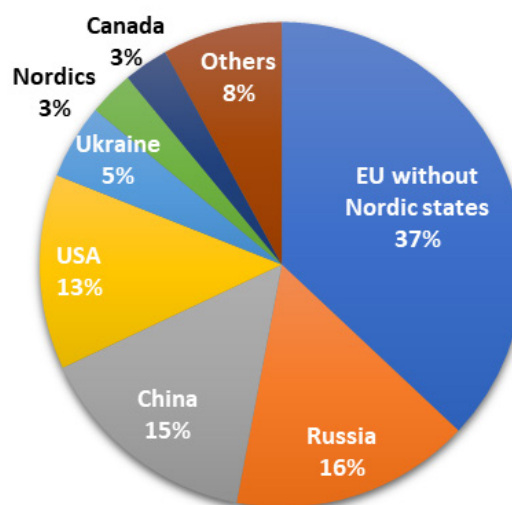


Figure 3.2: Share of black carbon emitted north of 40°N potentially deposited in the Arctic. Source: AMAP 2011

⁵ The estimate of 36% is based on the 2011 calculation by AMAP, where the EU share as calculated excluding the AC member states but included the UK – a member state at that time. The EU accounted for 37% of black carbon emissions ending up in the Arctic and Nordics about 3% - as the UK constituted about 10% of EU emissions and Finland Sweden and Denmark about 2.5%, the current EU-27 amount to around 36%.

3.3. Overview of EU policies relevant for climate change in the Arctic

The current Arctic climate footprint of the EU's economy – as outlined above – has been partly shaped by EU policies over the last three decades. The EU's climate policy commenced its development as a reaction to the first IPCC report and, more clearly, the adoption of the UN Framework Convention on Climate Change (UNFCCC) in 1992. At the time, the EU agreed to stabilise GHG emissions at 1990 levels by 2000. This UNFCCC goal was reflected in three main fields of EU policy: reducing GHGs, promoting renewable energy sources and improving energy efficiency, most of which have been focal areas of climate policy of the EU ever since. The next major change came as a result of the adoption of the Kyoto Protocol in 1997, whereby the EU committed to an 8% reduction of GHGs during the commitment period of 2008-2012 as compared to 1990 levels. In 2000, the European Climate Change Programme was initiated, which for instance led to the launch of the European Emissions Trading Scheme (ETS), together with a renewable electricity directive. In 2007, the European Council adopted the so-called 20-20-20 targets for 2020: GHG emissions reduction by 20%, increase in the share of renewable energy consumption by 20% and energy efficiency improvement by 20%. The EU implemented these targets via the Climate and Energy Package. The EU was one of the main architects of the 2015 Paris climate agreement, revising its own climate policy and law to set out via the 2030 Climate and Energy Package. The current 2030 targets are to cut GHG emissions at least 40% (from 1990 levels), have a 32% share for renewable energy and improve energy efficiency by 32.5%.

Greenhouse gases have been reduced in the EU via a system where some sectors of the economy are within the Effort Sharing legislation, which established binding annual GHG emission targets for the Member States for 2013–2020 and set new ones for 2021–2030 and some are covered by the EU ETS, which applies also to Iceland and Norway since the scope is the whole EEA area). Effort Sharing legislation covers e.g. transport, buildings, agriculture and waste whereas the EU ETS - the world's first major carbon market and the biggest one - includes e.g. power and heat generation, energy-intensive industry sectors and “domestic” commercial aviation within the European Economic Area. There are some sectors, which have required extra attention as the emissions have not decreased in the same way as in others. The emissions from transport started to decrease as late as 2007 and still remain higher than in 1990. For this reason, in 2016, the EU adopted A European Strategy for Low-Emission Mobility, which presents various ways to transfer to low-emission transport (EC 2016, COM(2016) 501 final), e.g. increasing the efficiency of the transport system, speeding up the deployment of low-emission alternative energy for transport or moving towards zero-emission vehicles.

The major change in the EU's climate policy took place with the adoption of the 2019 European Green Deal that aims to ambitiously respond to the long-term goals of the Paris climate agreement: keep the increase in global average temperature to well below 2°C above pre-industrial levels, with the aim to limit the increase to 1.5°C. The EU has set out the ambition to become the first climate-neutral continent by 2050. The Green Deal aims to not only mitigate and adapt to climate change consequences, but comprehensively transform the way the EU functions as an economy and society. This means not only revising the existing climate legislation of the EU, but making it more ambitious, and mainstreaming climate considerations to all possible sectoral policies of the EU (transport, energy, etc.), and also to budgeting, financing, preventing climate leakage, etc. With respect to climate action, for instance, the Commission proposes to further cut emissions by at least 55% by 2030, enact European Climate Law to enshrine the 2050 climate-neutrality objective into EU law, and to introduce a European Climate Pact to engage citizens and all parts of society in climate action. The Commission is also proposing to revise the Regulation on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry (LULUCF). In addition, a new adaptation strategy was adopted in 2021.

The EU is increasingly paying attention to short-lived climate pollutants, not only globally but also specifically in the Arctic context.

As part of the European Green Deal, the EC developed a new EU strategy to reduce methane emissions (EC 2020, COM(2020) 663 final), a first update of the 1996 strategy. The actions started in

1996 resulted in limited reductions in the agriculture and energy sectors and significant emission cuts in the waste sector. Limiting landfill deposition of biodegradable waste and better waste management were key to this success. The new strategy aims to improve measurements and reporting of methane emissions and improve surveillance utilising Copernicus in Europe and globally, by detecting major global emitters and major methane leaks. The EU is to consider prohibition of routine flaring and venting practices, a measure likely relevant in the Arctic states as an example of best practice, if it is successfully adopted and implemented. In the agricultural sector, the EC wants to focus on technological progress and utilising agricultural residue streams into biogas, biomaterials and biochemicals. The review of the Effort Sharing Regulation (2018/842) and adding additional sectors into the Industrial Emissions Directive (2010/75/EU) will be considered. The EU is also to discuss with its energy trading partners, including those in the Arctic, methane emission of energy imported into the EU during production and transport. Enforcing such standards would constitute a major advance in terms of EU influence on Arctic extractive developments. Such standards or border adjustment for emissions accounting would always follow the actions adopted first internally within the EU.

Black carbon is fine particulate matter that is being tackled by clean air legislation and policy in the EU. The National Emissions reduction Commitment (NEC) Directive ((EU)2016/2284) entered into force on 31 December 2016, replacing earlier legislation on national emission ceilings. This directive now also covers fine particulate matter, with an obligation to report specifically on black carbon emissions where available and to prioritise reduction of black carbon emissions when reducing fine particulate matter. Annex III of the NEC Directive also provides a list of measures for Member States to consider for black carbon reduction notably from the agricultural sector. The directive also transposes the 2020-2029 reduction commitments for EU Member States under the 2012 revised Gothenburg Protocol under the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP or Air Convention); the directive also adds more ambitious reduction commitments for 2030 and beyond. The EU is also active regarding this in the context of the Arctic Council (AC). As a *de facto* observer to the AC, the EU has participated in the work of the AC expert group on black carbon and methane, and it has reported its progress in emissions reduction and policy development. The EU also funded a project "Action on Black Carbon in the Arctic region" in the period 2018-2021. This project led by the Arctic Monitoring and Assessment Programme, aimed to support work to reduce black carbon and examine its negative effects on the Arctic (health, climate and environment).

The impacts of climate change in the Arctic require increasingly ambitious adaptation measures. It is therefore important how the EU supports adaptation to climate change impacts in the European Arctic. From the mid-2000s, the EC started to consider the need to adapt to changes in Europe's climate, and for this purpose a White Paper was adopted in 2009. The first adaptation strategy was adopted in 2013 (EC 2013, COM/2013/0216 final). It promoted greater coordination and information-sharing between Member States, and attempted to ensure that adaptation considerations are taken into account in all relevant EU policies. In the 2013 Adaptation Strategy, Arctic regions (among others) are identified as particularly vulnerable. According to the strategy, adaptation needs to be taken into account in various EU policies: transport, health, migration, cohesion, agriculture, disaster insurance, fisheries, maritime and coastal issues. In February 2021, a new climate strategy was adopted. While the Arctic is not identified as a particularly vulnerable region, it is mentioned as one of the regions where cross-border climate change impacts are pronounced (together with macro-regions or river basins (EC 2021, COM(2021) 82 final). The new strategy is built on the idea of providing smarter and faster adaptation, as we must adapt more quickly and comprehensively as effects of climate change are already present. Adaptation actions are to be informed by robust data. The strategy also calls for more system-wide adaptation, as climate change impacts will touch all levels of society and all sectors of the economy. The EU will also increase the support for international climate resilience and preparedness through the provision of resources.

With such a major transforming set of policies and legislation enacted or soon to be adopted, it is clear that the EU's climate policy has an impact on all policy areas relevant in the European Arctic:

towards EU businesses that operate in the region; how the regional development and cohesion funds are disbursed; how much and what kind of climate research is undertaken in the Arctic; how adaptation actions in the European Arctic is funded, etc. Climate mitigation and adaptation need to be considered in all policy fields, especially in view of the EU initiative for a just transition to a low-carbon economy, which is likely to be a major challenge in sparsely populated areas like those in the EU Arctic. For 2014-2020 the EU adopted a target of 20% of its budget to be dedicated to supporting EU climate goals. This target has been raised to 25% for the years 2021-2027, including an even higher target of 30% for the European Regional Development Fund (ERDF), which funds cohesion policy and cross-border cooperation. Furthermore, the Just Transition Fund (JTF) and Just Transition Mechanism (which includes, among others, EIB loans) have been established under the Multiannual Financial Framework (MFF) 2021-2027 (EC website, JTFMechanism). The Fund will support transition away from fossil fuels in different EU regions. In the European Arctic context, the JTF will provide over EUR 400 million for transition away from peat burning in Finland as well as EUR 150 million for the transition to low-carbon economy in two northernmost regions of Sweden, which are highly dependent on carbon-intensive industries, including the steel industry (these indicative amounts include a share of ERDF/EFS funding dedicated to the JTF). In addition, a big part of the Covid-19 recovery funds is to be used in line with the Green Deal objectives.

A challenge that the EU shares with other actors is accounting for the emissions caused by consumption of imported goods during their production. Lack of accounting for carbon footprint in the price of imports also has potential to put EU industry at a relative disadvantage. The European Green Deal envisaged the introduction of a carbon border adjustment mechanism (CBAM). The European Commission is to propose appropriate measures by June 2021 (EC website, CBAM). The instrument is, however, complex and difficult to fairly and appropriately design and implement. In the long-term and if developed, it could also include emissions of black carbon and methane from Arctic hydrocarbon and minerals extraction, affecting in particular Russian exports into the EU. During 2021, the EC launched consultations and has been internally discussing stronger action on methane standards for the production and transport of natural gas along the whole supply chain, including for the gas imported in the EU (EC website, 2021, February 10).

3.4. Assessment of the impact of EU policies regarding Arctic climate change

The most important EU contribution to the mitigation of Arctic climate change is via the reductions of its own GHG emissions. Overall, the mitigation policy of the EU has achieved its main objectives and it has been able to increase its ambition level for the future. The future targets are not yet matched, however, with the commensurate policy action. The EU's 20-20-20 targets for GHG emissions, the share of renewables in energy consumption, as well as for energy efficiency were mostly achieved by the EU. Already in 2014, emissions were below 20% from the levels at 1990 (EEA 2018) and in 2019 this trend was confirmed (EEA 2020). It is also highlighted in evaluations that the average pace achieved between 1990 and 2018 would not curb emissions enough to reach the 2030 target of a 40% reduction, which means that increased effort is needed (EEA 2020: 6) (see figure 3.3). A problematic sector is transport, as its greenhouse gas emissions have continued to increase, in particular from road transport (EEA 2020).

The use of renewable energy continues to increase in the EU, and it was 19.7% of gross final energy consumption in 2019 (8.9% for transport), close to the 20% target for 2020 (the share of renewables in final energy consumption; based on Eurostat 2020). With respect to the energy efficiency target, the EU committed itself to a 20% reduction of energy consumption by the year 2020 to be less than 1474 Mtoe of primary energy or no more than 1078 Mtoe of final energy. Even if the EU seemed to be on its way to achieving its energy efficiency target already in 2014, primary energy consumption increased and in 2019 it was 2.6% above the 2020 target level (based on Eurostat 2020).

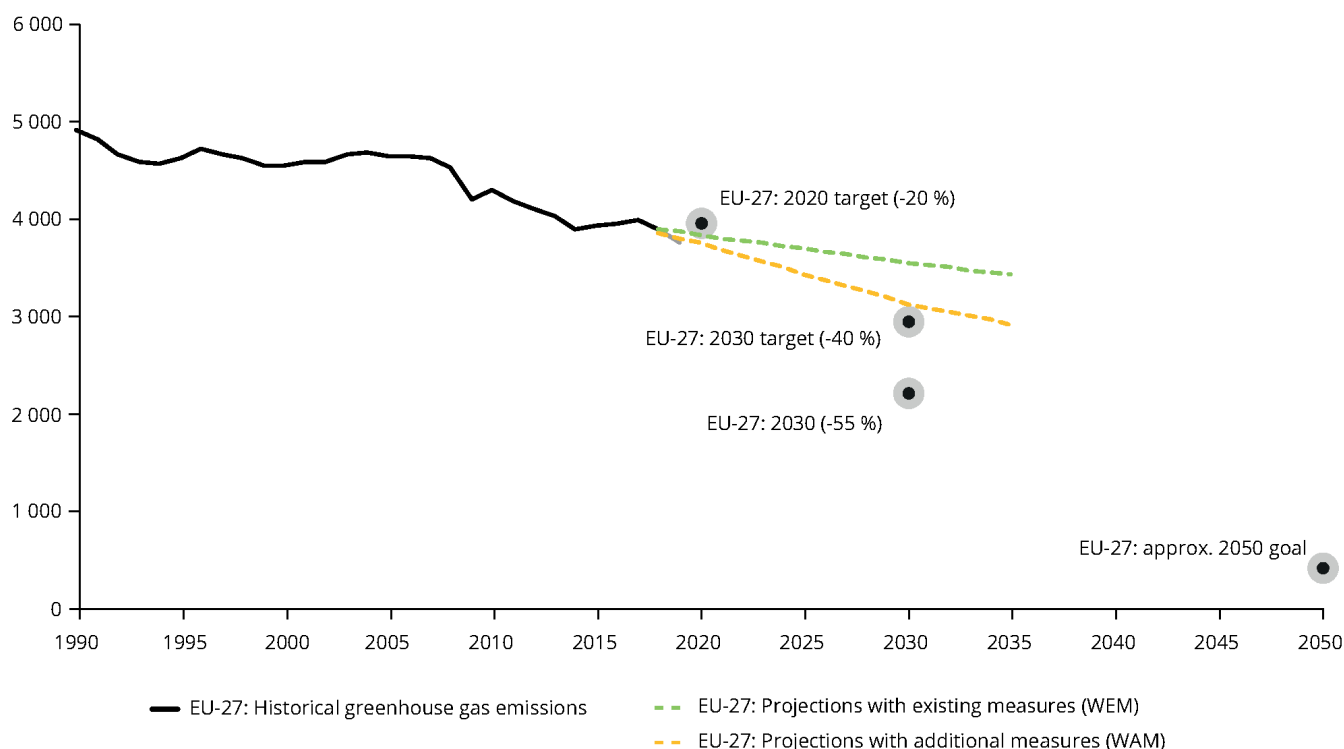
Million tonnes of CO₂ equivalent (Mt CO₂e)

Figure 3.3: EU-27 historical and projected emissions and EU policy targets. Source: EEA.

The EU-27+UK emissions of methane have been decreasing by 38% since 1990. The biggest share of methane emissions come from the agriculture, waste and energy sectors. There have been reductions - as compared to 1990 levels - in methane emissions in all these sectors. For energy, for instance, fugitive methane emissions (i.e. leaks and irregular releases) have been cut back steadily mainly due to lower underground mining activities and there has been a decrease in EU oil and gas production. The EU's Common Agricultural Policy (CAP) made a clear impact on reducing agricultural methane emissions e.g. through the milk quota system. This milk quota system has limited the economic attractiveness of cattle production in the EU and has given incentives for higher milk yield to sustain production levels with less cattle. As regards the waste sector, the amount of municipal waste that is landfilled decreased strongly and this can be at least partly attributed to early implementation of the EU landfill waste directive (EU 2020: 2-3). Methane emissions are also closely linked to the EU clean air policy objectives as methane is a precursor to ground-level ozone, a pollutant regulated under the Ambient Air Quality Directive (2008/50/EC) (see chapter 4).

The EU and its Member States have been able to reduce their black carbon emissions, and these have been declining steadily from 2000 to 2018. Owing to national and EU policy measures as well as technological and infrastructural changes, the EU-27+UK black carbon emissions had declined in 2018 by 46% compared to 2000 and by 25.5% compared to 2010 (based on PM₁₀ measurements). It seems clear that the NEC Directive has contributed to this decline. The revised directive has now entered into its implementation phase and the Commission is currently working on analysing the National Air Pollution Control Programmes (NAPCPs) submitted for the April 2019 deadline. In these NAPCPs, black carbon measures shall be prioritised among the particulate matter reduction measures to further reach the emission reduction commitments (EU 2020: 6). As mentioned, fine particulate matter concentrations in EU Member States are also monitored under the Ambient Air Quality Directive 2008/50/EC. The project "Action on Black Carbon in the Arctic region", mentioned above, catalysed scientific and technical work to support reduction of black carbon emissions from major sources (e.g. gas flaring or domestic heating) by for instance, producing technical reports and enhancing international cooperation on black carbon

policy in the Arctic region, e.g. by organising workshops and dialogue events (AMAP website, EUA-BCA project webpage).

Early outputs of the EU's support and encouragement towards adaptation in the European Arctic can be noted. Initiatives supported by the European Commission serve exchange of information, experience and good practice regarding climate change adaptation in Europe. For instance, the EU climate adaptation platform, Climate-ADAPT, which was initiated in 2012, is intended to support informed decision-making at all governance levels and to include a toolset for adaptation planning. Of interest is that Climate-ADAPT has a specific section on transnational regions, in which the European Arctic countries are represented as the Northern Periphery region. Climate-ADAPT is closely connected to the Copernicus Climate Change Monitoring service delivering climate projections globally and over the Arctic. The EU adaptation strategy also encourages its Member States to prepare national adaptation strategies, and to date they have been adopted by Sweden (Regeringen 2017) and Finland (MMM 2014).

As increased risk of flooding is among key impacts of climate change across the European Arctic (AMAP 2017), the information systems which are part of the Copernicus Emergency Management Service (CEMS) – European Flood Awareness System (EFAS) and Global Flood Awareness System (GloFAS) – are relevant. The other parts of the CEMS, e.g. European and Global Drought Observatory (EDO GDO) can also prove of importance in light of the changing Arctic climate. As the climate change increases the risk of fires in boreal forests, of importance for climate adaptation are EU services dedicated to wildfires including the European Forest Fire Information System (EFFIS, part of CEMS) and the Global Wildfire Information System (GWIS) (see chapter 6 on biodiversity).

The EU is an important provider of funding for Arctic and polar research, also in respect of climate change. Currently, all the polar research projects that have been funded by Horizon 2020 and the 7th Framework Programme have formed a network called the EU Polar Cluster, and all of these are directly or indirectly dealing with climate change in the Arctic. By forming a cluster, the projects can achieve increased knowledge sharing and greater visibility (EU Polar Cluster website).

Examples of Arctic climate change projects (about to be completed or on-going) include:

- *APPLICATE (work to enhance weather and climate prediction capabilities - a focus on the Arctic is important for improved predictions of weather and climate in the mid-latitudes)*
- *BLUE-ACTION (contributes to the improvement of climate models to represent Arctic warming realistically and address its impact on atmospheric and oceanic circulation);*
- *ICE-ARC (better understanding of, and ability to predict, Arctic marine change, focusing on changes in the sea ice).*

3.5. Policy options for the EU's Arctic climate change action

P18. EU common target for black carbon reductions

All policy entities, including the EU, need to elevate their climate ambitions, both in terms of GHG emissions and short-lived climate pollutants. This is even more important now that we know that with the decreased sulphur dioxide emissions, which are cooling the Arctic (as well), we need stronger action in terms of mitigation (AMAP 2021). This is necessary in order to avoid the most dramatic consequences of climate change in the Arctic, even if high levels of Arctic warming may already be locked in. The EU is at the forefront of global climate action, now more so than ever, with its transformative Green Deal. The greatest and quickest impact to Arctic warming is with reductions in black carbon, a policy area where the EU has funded Arctic-specific action (EU action on black carbon in the Arctic). The EU is also participating in the Arctic Council Expert Group on Methane and Black Carbon. This is the only political mechanism whereby voluntary percentage reductions for black carbon are set for the Member States (goal to collectively reduce black carbon emissions by at least 25-33% below 2013 levels by 2025 and

general commitment to lower methane emissions). One possible way for the EU would be to undertake a voluntary BC reduction commitment, similarly and in parallel to what the Arctic states have done under the auspices of the Arctic Council (contributing but not committing to the action under the AC). The EU could lead the way for the non-Arctic states to voluntarily commit to BC reductions. This would likely also prompt AC member states and observer states to pay more attention to BC inventories and monitoring of BC in the Arctic, which would be important as there are significant gaps in both respects, especially in Russia and China. The EU has already adopted national targets for PM2.5 reductions (which partly cover black carbon) and is achieving progress in that regard (see chapter 4) - therefore, a more general common black carbon target is not unimaginable.

P19. Continued inclusion of the development of black carbon inventories and mitigation in dialogues with China and India

The EU could also take up the subject of BC reductions in its established bilateral relations with China and India - the two major BC emitters and observers to the AC - via the EU and China Partnership on Climate Change, and the EU-India initiative on clean development and climate change.

P20. Utilising the Northern Dimension Environmental Partnership towards black carbon work

Projects related to black carbon mitigation are already being discussed under the NDEP. In 2020, a conference was organised targeting black carbon as a topic for the ND. The EU should strongly advance such ideas in its discussions with partner countries within the common policy of the ND. Black carbon-related projects in Russia could be cost effective, introduce best practices and technological solutions, and also establish a strong practical platform for cooperation with Russia as regards this key short-lived climate pollutant.

P21. Supporting work on the understanding of the global impacts of Arctic climate change

The EU has funded several research projects dedicated to the impacts of the warming Arctic on lower latitudes. Moreover, the EEA has looked at the implications of Arctic climate changes for Europe. There are indications that this line of work could also be of interest for the Arctic Council, including impacts of weather patterns and feedback effects related to melting permafrost and ecosystem changes (e.g. for wetlands). The EU should continue to invest in research and assessment activities in that regard and encourage and support together with other observers this line of work within the AC.

4. Long-range pollutants

4.1. Overview of long-range pollution in the Arctic

The chapter deals with persistent organic pollutants (POPs) and heavy metals. Sulphur oxides and nitrogen oxides are not discussed here as their prevalence in the Arctic has decreased in recent decades and currently do not seem to constitute major components of long-range pollution affecting the Arctic (AMAP 2006). However, it is important to note that successful air policies as regards sulphur dioxide, which have brought major benefits for human health and ecosystems, have also affected global climate as sulphur dioxide acts as a cooling agent.

Arctic regions are one of the least polluted areas of our planet. While sources of many pollutants can be found locally in the Arctic, especially where heavy industry or military activities take place, in most regions human activities remain limited. It is to a great extent via pollution from major population centres far south from which pollutants travel to the Arctic and are deposited in its food-chains. Certain pollutants, such as POPs and mercury persist in the Arctic environment for long periods as there are cold temperatures (they do not e.g. evaporate). These pollutants travel to the Arctic from the south through atmospheric, riverine and marine pathways. They are not only harming Arctic wildlife via the food chain of the Arctic ecosystems, but they also affect humans, particularly as these compounds bioaccumulate as they travel up the Arctic food chains. In particular, Arctic Indigenous Peoples still continue to harvest local fish and mammals, which carry POPs and heavy metals.

These pollutants have been monitored for almost three decades. The Arctic Monitoring and Assessment Programme (AMAP) commenced its activities during the 1991 Arctic Environmental Protection Strategy (AEPS) and was merged as one of the working-groups of the Arctic Council. From the beginning, it has conducted monitoring of the extent and effects of various pollutants in the Arctic region, in particular those belonging to POPs and heavy metals (AMAP 2015).

As long-range pollutants, certain POPs and heavy metals are regulated by international instruments, in particular the 2001 Stockholm Convention on POPs and 2013 Minamata Convention on Mercury. Aspects of these pollutants (notably monitoring of emissions and reporting of emission inventories) are also addressed under the UN Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution (UNECE CLRTAP, Air Convention) and its protocols on Heavy Metals and on POPs, respectively. The CLRTAP Cooperation Programme on Evaluation and Monitoring in Europe (EMEP) provides annual reports on the air pollution aspects including transboundary fluxes. These international instruments acknowledge the importance of the reductions for the Arctic ecosystems and people, including indigenous communities. The Arctic is mentioned in the preambles of both the Stockholm Convention on POPs and Minamata Convention on mercury.

As regards those POPs that are regulated by the Stockholm Convention on POPs, assessments (see AMAP 2014, 2015) show generally decreasing trends in air and biota for most pollutants. The levels of POPs in the blood of Arctic residents have gone down over the past 20 to 30 years. AMAP assessments do point out, however, that levels of some POPs, such as PCBs, in human blood remain higher in some Arctic regions than in most general populations in North America and Europe and that others, such as HCB, may be increasing. These are also chemicals of emerging concern, those that have recently been added to the regulated POPs in the Stockholm Convention or are proposed to be added. There is evidence of increasing levels of some of these POPs in some Arctic locations and datasets, which is a cause for concern (e.g. Stockholm Convention 2017; HCB, PCB concentrations increased at several sites, while there was no decrease of some regulated chemicals such as heptachlor, endrin, endosulfan, aldrin, dieldrin, PBDEs).

In terms of heavy metals, the assessments state that levels of mercury in human blood in Arctic populations in Norway and Sweden have now fallen to similar levels to those found in non-Arctic populations in these countries but in some cases remain at elevated levels, such as in parts of Greenland and Canada. The levels of lead in humans have decreased in most Arctic countries, even if they remain higher in some parts of Russia and Arctic Canada. Climate change also causes uncertainty with regard to how contaminants cycle in the Arctic, for instance due to releases of contaminants that are stored in permafrost, sea ice or glaciers. Moreover, the impacts of climate change on Arctic food webs can also affect the concentrations of pollutants in Arctic fauna and humans.

4.2. Impact of the EU's economy and population on pollution in the Arctic

Measuring the relative transport of pollutants into the Arctic from different parts of the world is challenging. Wind patterns do not take pollutants from industrialised regions directly northward as there is much longitudinal transport. Different pollutants behave differently in the air, depending e.g. on their weight. No completely new modelling for the air transport of POPs has been carried out since the Arctic Footprint 2010 report (AFPA 2010) and therefore its results will not be reiterated here. For instance, for PCB-28 and PCB-118 30-40% of Arctic depositions come from Europe, about the same amount from Russia and 15% from the Americas (Gusev and McLeod 2013). Climate change is likely to impact the way pollutants are transported (e.g. AMAP is currently conducting a study on POPs and climate change).

Following the above assessment of relative source regions influence, current models suggest that the reductions of POPs in Europe have the highest impact on the change in their concentrations in the Arctic (see figures 4.1 and 4.2).

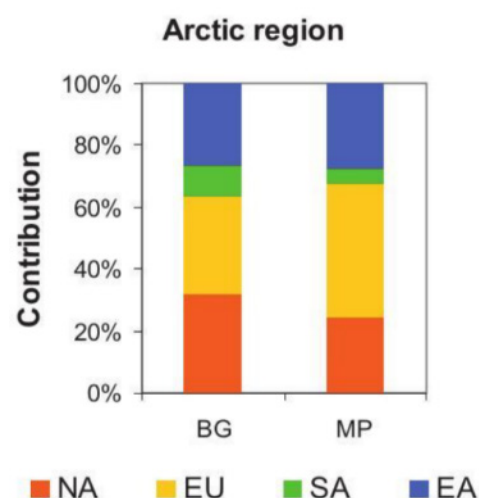
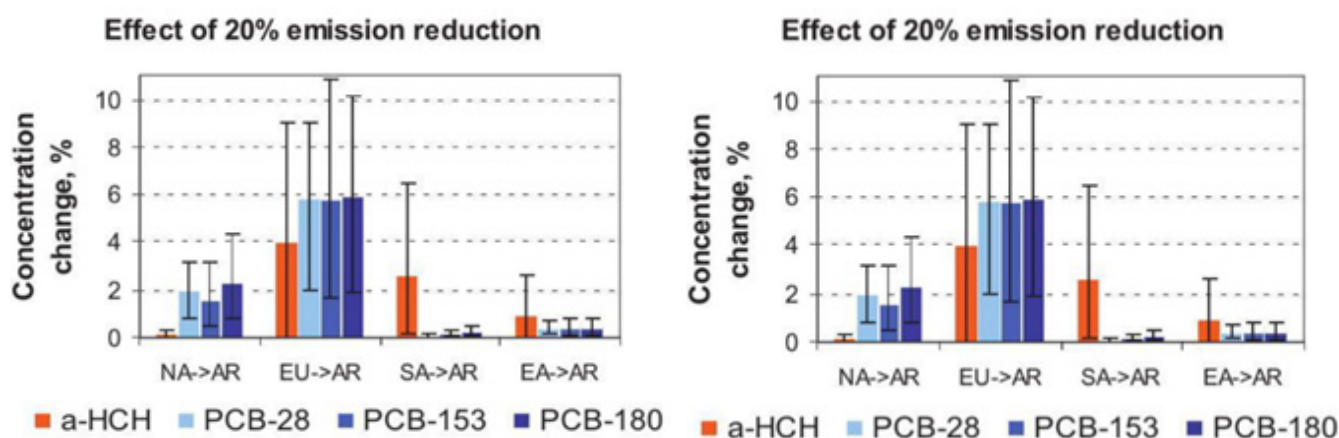


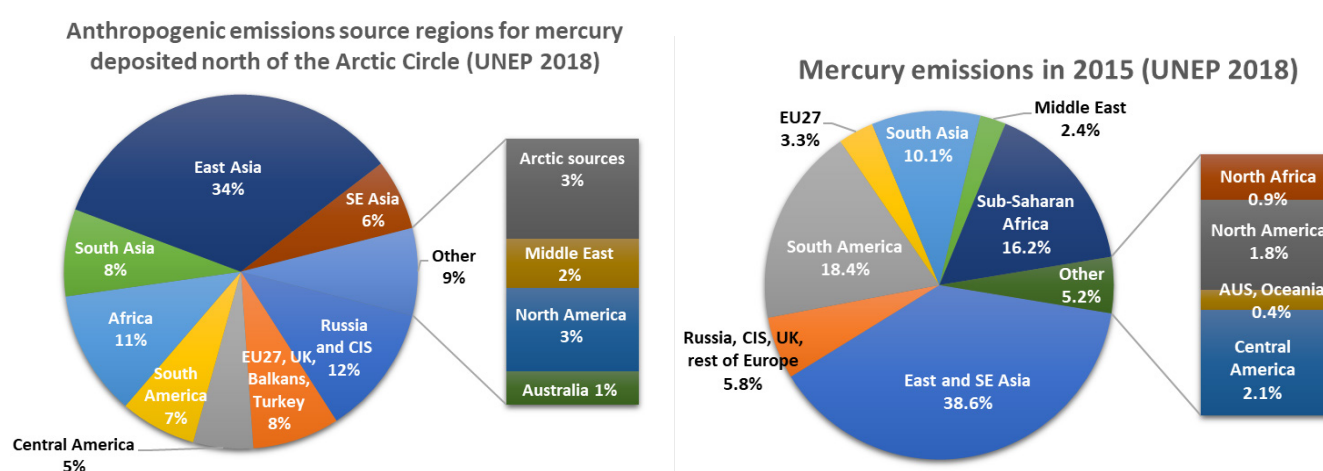
Figure 4.1: Contribution to cumulative air concentration of selected POPs in the Arctic region from different regions (NA-North America, EU-Europe, SA-South Asia; EA-East Asia, between 20°N and 66°N). Based on BETR-Global (BG) and MSCE-POP (MP) models.

Source: Gusev and McLeod 2013: 155.



Figures 4.2 and 4.3: Two models of the effects of reducing annual air concentrations in different source regions by 20% on the concentrations in the Arctic (NA-North America, EU-Europe, SA-South Asia; EA-East Asia, between 20°N and 66°N). The impact of European reductions is the highest, with greater impact for Arctic deposition from reductions of more volatile POPs. Source: Gusev and McLeod 2013, pp. 152, 154.

Various heavy metals have different properties in terms of their ability to travel far from their origin. Particle-bound heavy metals such as lead and cadmium are mostly transported regionally but can also be transported to neighbouring regions. From the global viewpoint, mercury is of special concern as it possesses properties that enable it to travel between continents. The UNEP's Global Mercury Assessment of 2018 concludes that "[e]stimated global anthropogenic emissions of mercury to the atmosphere for 2015 are approximately 20% higher than they were in updated estimates for 2010" (UNEP 2018). Increased economic activity, especially in Asia, is likely to be the main reason for this increase. The majority (63-74%) of mercury in the Arctic comes from natural and secondary sources (EMEP 2020). The EMEP report suggests that about 10% of the remaining anthropogenic emissions can be attributed to Europe, 10% to Russia and the CIS and one third to East Asia. The 2018 UNEP assessment (UNEP 2018) estimates EU-27 emissions are at 3.3% of the global total (adjusted for the UK with EEA data), while the impact on the Arctic from Europe including Turkey and the UK is at 8% (EU-27 is responsible for 80% of emissions from this group) (see figures 4.3 and 4.4). The likely EU-27 Arctic mercury depositions footprint is therefore in the 6-8% range.



Figures 4.4 and 4.5: Anthropogenic emissions source regions for mercury deposited in the Arctic; and overall share of regions in global mercury emissions (global total at 2200 tonnes annually) (based on UNEP 2018).

For transport into the European Arctic, the UNECE CLRTAP European Monitoring and Evaluation Programme (EMEP 2020) compiles and analyses the reports on POPs and heavy metal emissions as submitted by the CLRTAP parties in the EMEP region. Northern European countries, being very close to the region, are attributed with having a significant share of impact but Russia is clearly the biggest emitter (Ibid.) (see figure 4.5).

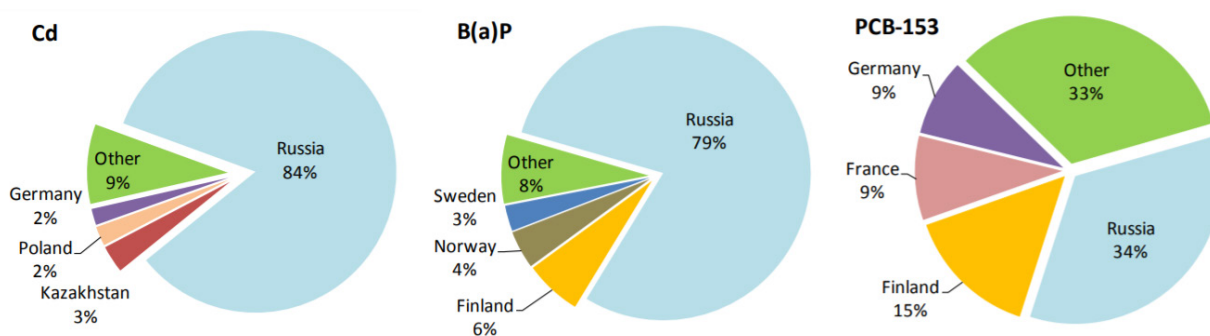


Figure 4.6: Source apportionment of heavy metal and POPs anthropogenic deposition to the Arctic within the EMEP domain (Europe, Western Russia and Central Asia, area between 30°N and 82°N latitude and 30°W 90°E) in 2018. Source: EMEP 2020: 79. Cd - cadmium; B(a)P-Benzo(a)pyrene; PCB-Polychlorinated Biphenol.

4.3. Overview of EU policies and actions affecting long-range pollutants

The EU's environmental footprint in terms of long-range pollutants is directly related to the emissions of these pollutants in the EU and all EU actions aimed at reducing these emissions – also where the main objective is the improvement of air quality within the EU – are in principle also of importance for the Arctic environment. The EU policies over the last decade – being in constant evolution – have already significantly co-shaped the EU economy's environmental footprint in the Arctic. There are many policy areas to be considered when evaluating how the EU has been able to tackle its air emissions. Many of the harmful air pollutants are also contributing to climate change, such as black carbon, but strict climate change measures also have a strong impact on harmful air emissions, as both areas of regulation affect the same industrial plants or pollution sources (e.g. methane). Air emissions tend to cross national borders, and hence the EU needs to tackle e.g. POPs and some heavy metals via international policy but also via its internal air pollution measures (e.g. the NEC Directive (EU) 2016/2284, see below).

The first European Economic Community's air quality directives date back to the 1980s and establish standards for ambient air quality for different substances (sulphur and nitrogen oxides, lead and ozone). The more strategic approach of air policy was manifested via Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management, which then led to directives related to harmful substances. In 2005, the Thematic Strategy on Air Pollution established a long-term objective for air pollution work: “to achieve levels of air quality that do not result in unacceptable impacts on, and risks to, human health and the environment” (EC 2005, COM/2005/0446 final). As part of the 2005 Thematic Strategy, the Commission also proposed consolidation of the Framework Directive and the directives into a single Ambient Air Quality Directive (2008/50/EC), also including limit values for fine particulate matter (PM_{2.5}). The ambient air quality directives set out limits for ground-level ozone, particulate matter, nitrogen oxides, dangerous heavy metals and a number of other pollutants in zones established by Member States, and is of relevance for the Arctic via reducing in general these harmful substances but also setting zonal air quality limits in the European Arctic. These have the effect of reducing these substances overall, and, in addition, establishing a system of monitoring whether the zones exceed limit values in certain localities within the EU.

Due to the diversity of sources of emissions within the EU and the different ways the pollutants can be controlled, the landscape of relevant EU policies is very diverse. The Clear Air Programme for Europe sets new objectives for EU air policy for 2020 and 2030. The directive on the reduction of emissions of certain atmospheric pollutants - the National Emission reduction Commitments (NEC) (Directive (EU) 2016/2284) - was adopted as the main instrument to achieve the 2030 Clean Air Programme goals. The directive sets national emission reduction commitments for five air pollutants for the period 2020-2029 and for 2030 and beyond: sulphur dioxides, nitrogen oxides, ammonia, non-methane volatile organic compounds and particulate matter – all capable of long-range transport. In 2017, the EU ratified an amendment to the 2012 Gothenburg Protocol setting emissions reductions from 2020 onwards. Measures towards the control of emissions from Medium Combustion Plants were adopted via the Directive (EU) 2015/2193. There are also pieces of legislation and policy tackling sources of harmful air emissions, such as from road vehicles, from non-road mobile machinery, from maritime transport, agriculture, energy and industrial sources, and from paints.

The last major remaining use of mercury in the EU is dental amalgam, which is now being reduced by the EU Mercury Regulation (2017/852), while other uses are banned. Other problematic areas are large combustion plants, waste incineration, cement production and the manufacture and smelting of metals, which have been regulated under the Industrial Emissions Directive that requires that best available techniques (BAT) be used by operators and be the basis for emission limit levels set by permit authorities, covering both emissions to air and to water.

In 2006, the Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH, EC 1907/2006) was also adopted, aiming to improve the protection of human health and the environment through the better and earlier identification of the innate properties of

chemical substances. According to the Regulation, this will be done via registration, evaluation, authorisation and restriction of chemicals. REACH not only aims to protect human health and the environment but also to enhance innovation and competitiveness of the EU chemicals industry.

Since many air pollution issues cross national borders, the EU works collaboratively with states and other actors to tackle global and regional air pollution issues. The EU is a party to the UNECE CLRTAP and is a party to seven of its eight protocols. The EU takes active part in the continued Air Convention developments; the EU and its Member States make up more than half of the Convention parties. The Stockholm Convention aims to curb the emissions of POPs, and the EU has been a party since 2004 (together with the Aarhus Protocol on POPs). Domestically, the EU implements POPs and mercury conventions via dedicated legislation on POPs (Regulation (EU) 2019/1021) and mercury (Regulation (EU) 2017/852). As regards POPs, the EU POPs Regulation goes further than the Stockholm convention, emphasising the goal to eliminate the production and use of internationally recognised POPs (EC 2009). As part of the overarching European Green Deal, the EU has now embarked on further enhancing its air quality legislation. The goal is that this would be in line with the Green Deal's zero pollution ambition. As part of this process, the EU will also be revising its ambient Air Quality directives, aiming to align more closely with the World Health Organization's air quality standards.

4.4. Assessment of EU policies affecting long-range pollution

Global and EU levels of POPs are in decline. This was concluded as regards global level as part of the effectiveness evaluation of the Stockholm POPs Convention in 2017. On the basis of monitoring, the POPs listed in 2004 - concentrations measured in air and in human populations - have declined and continue to decline. As regards the newly listed POPs, concentrations are starting to show a decrease with some exceptions (Stockholm Convention 2017). The same applies to the POPs emissions from the EEA region, which covers 33 countries, where emissions of most POPs are in decline (EEA 2019).

The fitness check evaluation of the EU's air quality legislation observed, in general, that even if there are shortcomings, "[t]he overall observation is that exceedances of targets/limits have decreased over time for most pollutants - both when measuring via the number of EU Member States experiencing exceedances and via the share of zones in the EU reporting exceedances" (EC 2019). Yet, it also concluded that the EU's ambition level would need to be raised for several pollutants, especially for fine particulate matter (PM_{2.5}), and the WHO recommendations should be observed in the next stage of revising air quality standards.

The Second Clean Air Outlook observes that "since 2005 (the base year for emissions reductions under the NEC Directive) emissions of air pollutants in the EU have decreased significantly thanks to EU and national legislation". It is also stated that even if the EU's GDP has grown by 30% since 2000, emissions of the main air pollutants have decreased by 10 to 70% (see figure 4.6), depending on the pollutant (EC 2021, COM(2021) 3 final), with the exception of ammonia.

In the international context, the EU in general is very active in the UNECE CLRTAP, the POPs Convention and other international instruments. The EU has been very ambitious in pushing for stronger international standards on POPs and mercury, which are also major pollutants for the Arctic region. The EU is also funding and committing its experts to work on the mapping and gathering of data on long-range pollutants, especially identification of new pollutants.

The EU has laid a lot of emphasis on strengthening the Stockholm POPs Convention. It has proposed most new chemicals for listing, also continuously screening new candidate POPs for potential listing (<http://www.pops.int/>). Screening chemicals with POPs characteristics is linked to assessments under e.g. Plant Protection Products regulations (EC 1107/2009; EU 540/2011; EU 546/2011; EU 283/2013; EU 284/2013), Biocides Regulation (528/2012), and REACH Regulation (1907/2006). However, the long-range transport potential of the chemicals under review is not given the same attention as their persistent, bioaccumulative and toxic properties receive.

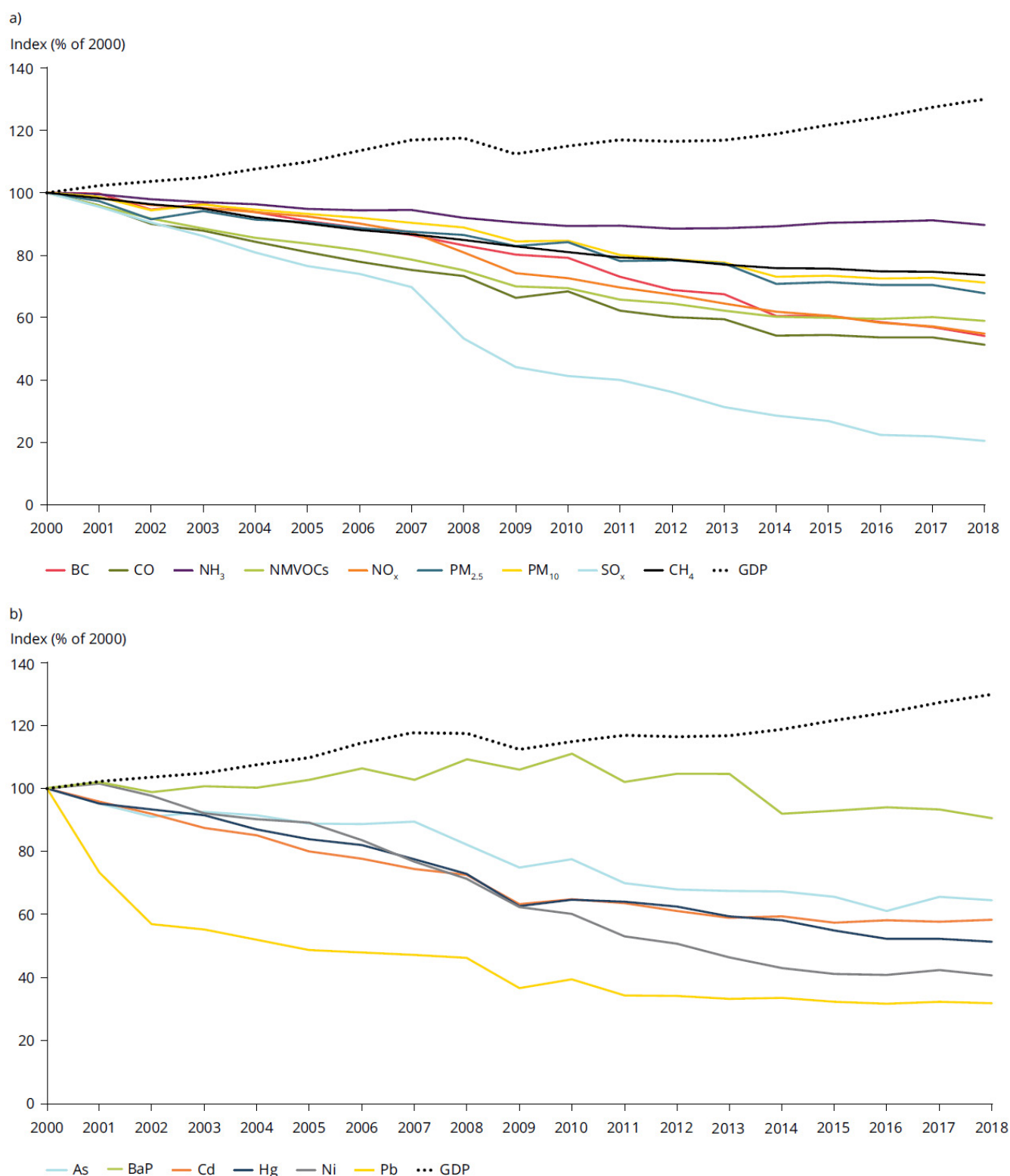


Figure 4.7: Development in EU-28 emissions, 2000-2018 (% of 2000 levels): (a) sulfur oxides (SO_x), nitrogen oxides (NO_x), ammonia (NH₃), PM₁₀, PM_{2.5}, Non-methane volatile organic compounds (NMVOCs), carbon monoxide (CO), methane (CH₄) and black carbon (BC); (b) arsenic (As), cadmium (Cd), nickel (Ni), lead (Pb), mercury (Hg) and 6-Benzylaminopurine / benzyl adenine (BaP). Also shown for comparison is the change in EU-28 GDP (2000 – 100%). Source of data: EEA 2020, Eurostat 2020. Source of figures: European Environment Agency (2020). Air quality in Europe – 2020 report, EEA Report no 09/2020, p. 31.

The European Chemicals Agency (ECHA) is playing a gradually increasing role with regard to the long-range aspect of pollutants emitted in the EU. The Copernicus Atmosphere Monitoring Service is also seen as an important input for providing data on long-range pollutants.

In the negotiations, the EU usually wants to be as restrictive as possible and avoid excessive national exemptions to agreed restrictions. In some cases, the EU is negotiating directly with emitters like China, Iran and others, often successfully, for them to drop or limit their exemption demands. The EU is also engaged in discussing the question of long-range pollutants with Arctic countries; especially Norway and Canada via bilateral dialogue as these are also key players in the POPs Convention. There is coordination to avoid overlap of work between the EU and these partner states. The EU is also one of the biggest donors of the Stockholm Convention Secretariat together with the EU Member States (a voluntary trust fund covering the convention's monitoring, reports, guidance and capacity building). It is supporting the Stockholm, Basel and Rotterdam conventions' secretariats with around EUR 2 million annually. It also provides financial support for the expert work on the review for new chemicals. The links between EU policy-making and its international action to the work of the AC are limited. However, assessment outputs of the AC do contribute to the EU's internal policy considerations, according to the EU officials involved.

The EU is pushing for stronger action under the Minamata Convention on mercury, because it has been able, over the years, to cut pollution from this indestructible and highly toxic substance and also because mercury emissions are globally on the rise.

The EU Member States have generally achieved sustained reductions in the emissions of the main POPs (see figure 4.6). There are, nonetheless, some exceptions to this trend. PCB emissions rose compared to 1990 in Cyprus, the Netherlands, Spain and Sweden. PAH emissions increased in Bulgaria, Denmark, Finland, Malta and Romania, partly due to policy measures encouraging burning of renewable materials (e.g. wood), but emissions from these countries are small. Only Greece and Romania reported an increase in dioxin and furans emissions.

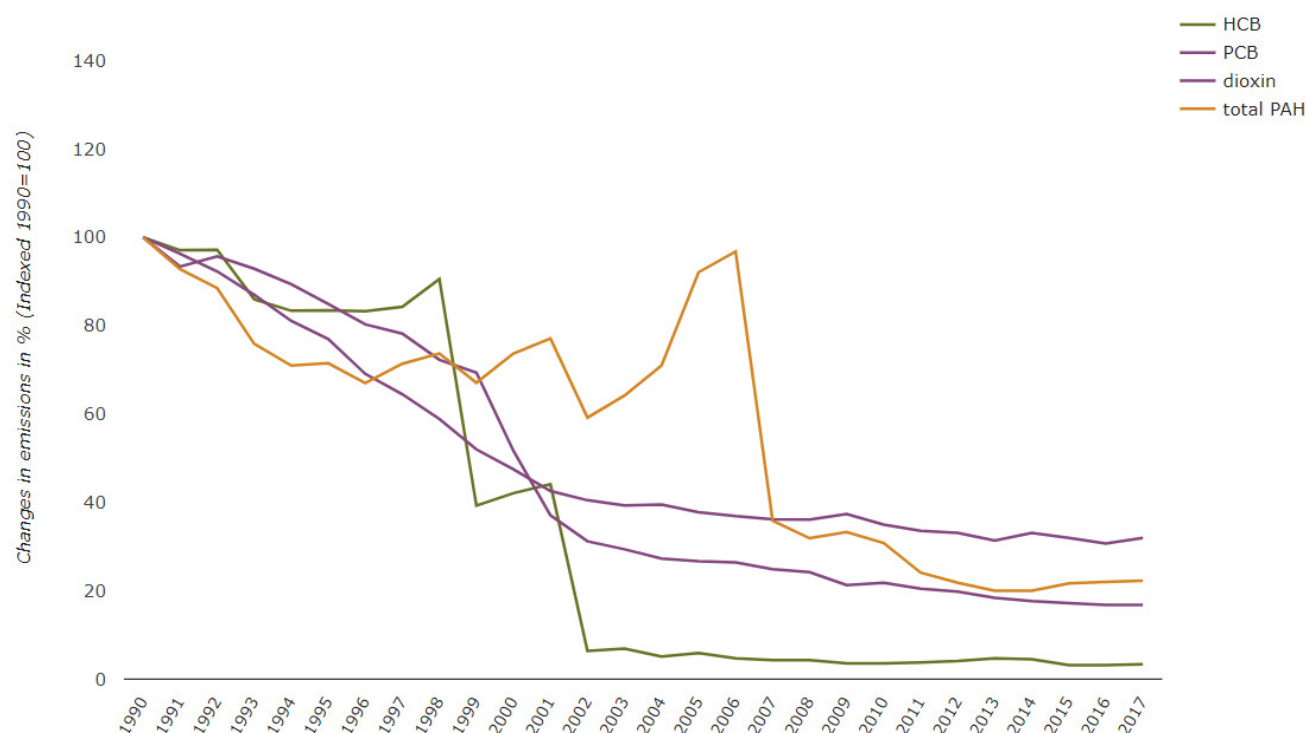


Figure 4.8: Emission reductions of selected POPs in the EU-27+UK/NO/CH/IS between 1990 and 2017. HCB-Hexachlorobenzene; PCB-Polychlorinated biphenyl; PAH-Polycyclic aromatic hydrocarbons. Source: European Environment Agency 2020, at <https://www.eea.europa.eu/data-and-maps/indicators/eea32-persistent-organic-pollutant-pop-emissions-1/assessment-10>

The effects of the global action, including EU policies, are visible in the European Arctic. The levels of PCBs and PCDD/PCDF in human milk in Finland, Sweden and Norway - earlier at one of the highest levels in Western Europe - dropped three- to eleven-fold between the periods 1987-2002 and 2005-2010. The concentrations of PBDEs in human blood in the European Arctic are among the lowest across the circumpolar North, with the highest recorded in Alaska, where Asian and North American emissions may be partly responsible (Stockholm Convention 2017).

Partly owing to EU policy actions, EU mercury emissions to air dropped by around 73% between 1990 and 2014 and to water by 71% between 2007 and 2014. However, EU action alone is not sufficient as global mercury emissions are rising (by 20% between 2010 and 2015). International action becomes therefore a key way for the EU to tackle mercury and it has been at the forefront of mobilising the international community to reduce mercury pollution. This includes prohibiting mining and export of mercury from the EU to discourage its use in artisanal and small-scale gold mining.

4.5. Policy options for long-range pollutants

The policy options referring to black carbon, which are included in the chapter 3 on climate change are also of general relevance for long-range pollution.

P22. Bringing the long-range aspect of pollutants more strongly into the EU regulatory and institutional framework

The majority of EU regulatory instruments and most of the work of the ECHA focus on European emissions and impacts. The existing assessment schemes should pay more attention to assessing long-range transport potential to implement Article 3(3) of the POPs Regulation (EU/1021/2019) calling for the need to prevent the manufacture, placing on the market and use of new substances exhibiting POPs characteristics. This should go on in parallel with other ongoing efforts to identify new POPs for nomination to the Stockholm Convention. Greater consideration for the long-range transport and impacts of pollutants emitted in the EU would also strengthen the Arctic dimension of EU policies, even if the Arctic region is not mentioned or analysed specifically. Some first steps have been taken as regards expanding the role of the ECHA in the long-range transport of pollutants. The Stockholm Convention (2017) underlined the importance of the analysis of long-range transport for the process of identification of new POPs.

5. Macro-and microplastic pollution

5.1. Background: macro- and microplastic pollution in the Arctic

Macro- and microplastic pollution has recently become an area of major environmental concern in the Arctic due to its effects on ecosystems, Arctic species and human health. The amount of plastics and microplastic found in the Arctic environment is significant and modelling studies suggest gradual accumulation of plastic waste in an ocean plastic patch in the Barents Sea within a couple of decades (van Sebille et al. 2012). The fact that plastics are semi-permanent makes the pollution a long-term challenge, even if all emissions were to stop. The Arctic may thus act as a sink for plastics, which are found both in the surface waters and on the seafloor of the Arctic, with a clear increase over the last two decades (Halsband and Herzke 2019). The concern about the plastic pollution in the Arctic has, among others, led the Arctic Council to make it one of the areas of focus. In 2021, the Regional Action Plan on Marine Litter was adopted (PAME 2021).

While local plastic pollution sources exist, especially due to large sub-Arctic fisheries, the human activities and population centres generating plastic waste and microplastic emissions remain limited in the circumpolar North (shipping, tourism, Arctic communities). Lack of infrastructure in some communities, e.g. proper water treatment, increases the amount of plastics released into the environment. An unknown but important part of the pollution arrives into Arctic regions from the distant global sources of plastic pollution, which include the EU. While scientific understanding of macro- and microplastics in the Arctic remains relatively scarce (PAME 2017; Halsband and Herzke 2019), recent research confirmed that part of the marine litter arrives into the Arctic Ocean and sub-Arctic waters via sea currents and in particular via the Gulf Stream from North America and Europe. Currently 56,470 tonnes (data in this chapter is in metric tonnes) of surface plastic is estimated to be polluting the surface waters of the North Atlantic (constituting 21% of surface plastic in the global ocean, Eriksen et al. 2014) – this pollution is located on the pathway of ocean currents heading towards Arctic waters. Plastic influx into the Arctic from non-local sources was estimated at 62,000 to 105,000 tonnes annually. Micro- and nanoplastics are also transported into the Arctic by air, as is visible from snow and ice sampling (Halsband and Herzke 2019).

Globally, over half a billion tonnes of plastics is produced annually and, with current trends, the production is expected to double by 2050. Since the 1950s, over nine billion tonnes of plastics have been produced, of which over half has been discarded into landfills, part of which has polluted the global ocean due to mismanagement. In addition, it is estimated that 2% of total plastic waste is never collected (“littered”) (Jambeck et al. 2015). As a result, between 4.6 and 12.7 million tonnes of plastic waste is globally released into the marine environment annually. That constitutes roughly one-sixth to one-third of all mismanaged plastic waste generated by coastal populations worldwide (data for 2010). Different types of plastics have different properties. For instance, of special concern in the North Atlantic is pollution originating from expanded polystyrene (EPS) packaging. The waste originates from land-based sources both from the coasts and when transported via river systems. Additional pollution comes from marine activities such as shipping and fisheries. In the Northeast Atlantic, this source of marine litter appears to be dominant. This is likely similar in all Arctic waters where fisheries are intensively practised (PAME 2017, Buhl-Mortensen and Buhl-Mortensen, 2017). The relationship between local plastic pollution and that originating from distant sources is at present unknown in the Arctic (Halsband and Herzke 2019; PAME 2017).

Microplastics (less than 5 mm in size) are present across the Arctic. Recent research (Ross et al. 2021) found 40 microplastic particles per m³ of surface seawater on average from studied locations across

the region (compared, e.g. to 40 particles per litre in the highly polluted eastern Mediterranean, Everaert et al. 2020). Higher concentrations were found on the Atlantic side of the region (Ross et al. 2021). Microplastics can originate from the breakdown of microplastic marine litter, but the Arctic samples show that 92% originate from synthetic fibres, including 73% from polyester. This means that three-quarters of microplastic in the Arctic may be coming from polyester fibres washed out during textile manufacturing and household laundry. This number is considerably higher than the global average of 35% of microplastic pollution coming from synthetic textiles. Based on one British study (Kay et al. 2018), it appears that waste water treatment plants have limited effectiveness in filtering out microplastics.

Microplastics can be also transported into the Arctic environment via air. This is particularly the case for particulate matter from tyre and brake wear, originating from road transport. It is estimated that over 30% of these particles (PM_{2.5} and PM₁₀) end up in the world's oceans. The Arctic is seen as a particularly sensitive receptor-region, with these microplastics also contributing to accelerated warming. It is estimated that 3.6% of such globally emitted particles are transported into the Arctic (Evangelidou et al. 2020). Nanoplastic (<1 µm) prevalence in the Arctic has been studied very little (Halsband and Herzke 2019).

Macroplastics are ingested by Arctic marine animals, including fish, birds and mammals, causing e.g. blockage of intestines. Animals can be entangled, impairing limb movements. Animals are also exposed to harmful plastic-related chemicals. However, it is challenging to evaluate the frequency and impacts of interactions between marine plastic and biota in the Arctic, and major knowledge gaps remain (Halsband and Herzke 2019; PAME 2017). There is insufficient understanding of environmental thresholds for the Arctic environment with regard to marine litter, beyond which significant impacts occur.

Nano- and microplastics impact the whole ecosystem as well as animal and human biology, including via affecting enzyme activity in cells, gene expression, metabolism, mortality and growth of organisms, viability of offspring, and even behaviour. Human health is a major concern. The amount of microplastics in the Arctic environment remains lower compared to other regions, but is expected to increase. These pollutants have the capacity to bioaccumulate over time in animals, exacerbating impacts on health. Macro and microplastics are also carriers for POPs (PAME 2017; Halsband and Herzke 2019). At the moment, it appears unlikely that the Arctic waters would be exposed to a major ecotoxicological disruption (an extreme level of plastic pollution impact) by 2050 due to plastic pollution as might be the case for instance for the eastern Mediterranean or the Yellow Sea. However, insufficient data on current pollution and transport of plastics warrants future reassessment of such risks (Everaert et al. 2020).

The impacts of microplastic pollution go beyond direct health and environmental impacts. Fisheries are one of the most important industries across the circumpolar North and remain the primary source of income in many Arctic communities. The widespread and increasing presence of microplastics would affect the perception of Arctic fish as a valuable and safe food source. Marine debris also affects the perception of the region as a destination for nature tourism.

By 2040, macroplastics in global oceans may increase three-fold if the current growth in releases is maintained, two-fold if they stabilise at 2020 levels, and drop by 15% in the purely hypothetical scenario where new releases were to completely stop. Microplastics are expected to increase in global oceans in future, even if all current emissions were to cease (two-fold increase related to the breakdown of existing marine litter), while increasing up to three times if the current growth in emissions continues (Lebreton et al. 2019).

5.2. Arctic plastics footprint of the EU economy

It is at present impossible to assess how much plastic pollution arrives into the Arctic environment from the EU. The EU impact here can be seen as significant considering that the EU economy is responsible for about 1% of mismanaged waste in coastal areas globally, compared e.g. to 0.9% for the US and 27.7% for China (Jambeck et al. 2015).⁶ While that may be a relatively small share in the global context, the EU is close to the Arctic as well as to the primary transport route for plastic waste into the Arctic in the North Atlantic – the Gulf Stream (e.g. Strietman 2017; PAME 2017). Due to its geographical location and the fact that the highest concentrations of microplastics can be found in the Eastern Arctic, the EU is also responsible for a significant part of the microplastic pollution, especially that three-quarters of microplastics result from the manufacturing and washing of polyester fabrics. European rivers constitute only 0.28% of global plastic waste output of the river systems (compared to 86% for Asia) into the global oceans (Lebreton et al. 2017). An area where the EU Arctic microplastics footprint is likely to be higher is microplastics originating from road traffic (wear of tyres and brakes). The EU plastics industry has a significant share of global production and the industry is important for the EU economy, employing 1.6 million people and generating a clear trade surplus.

In 2019, the EU-27+UK+CH produced 57.9 million tonnes of plastics, 17% of global production. The EU is a net exporter of plastics (PlasticsEurope 2020).

The EU+UK+NO+CH produce almost 30 million tonnes of plastic waste annually. Of particular concern is plastic packaging, which constitutes 40% of plastic production but over 60% of plastic waste, and it has the lowest recycling rate in the EU compared to other packaging materials (EDJNet, nd). Plastic constitutes around 85% of marine litter in European waters, with 43% coming from single use plastics and 27% from discarded fishing gear. In addition to plastic pollution, 400 million tonnes of CO₂ are emitted in the EU in the process of plastic production and incineration of plastic waste.

In the EU+UK+NO+CH, around 40% of plastic waste is converted to energy (2016-2019, European Parliament News 2018; PlasticsEurope 2020) and one-fourth ends up in landfill. In 15 years, the recycling rate for plastics has doubled in the EU, reaching 32.5% in 2018 (including 20% outside the EU).

A key issue leading to marine litter is mismanaged plastic waste (uncollected litter as well as collected but inadequately managed waste), which potentially ends up in waterways and oceans. The EU, as most developed states, has relatively low levels of mismanaged plastic waste, lower than 10%, with central-eastern European states performing worse. Among beach litter in the EU, 50% comprises single use plastics and 34% other plastics (Addamo et al. 2017; EC 2018 – Plastics Strategy). Estimates of how much plastic waste from the EU pollutes the marine environment vary significantly. From the perspective of marine pollution, the EU mismanaged plastic waste in coastal areas (50 km from the coast) was estimated at only 0.2-0.4% of the global amount (Jambeck 2015). Other estimates indicated that 150,000 to 500,000 tonnes of plastic waste enter the marine environment in the EU every year, which could constitute between 1 and 8% of global marine litter annual output (EC 2018 – Plastics Strategy). However, the EU impact on the Arctic marine environment is likely to be higher due to proximity to the Arctic and the existence of the key plastic pollution transport link – the Gulf Stream (see figure 5.1). A small part of the EU exports of plastic waste would add to this EU environmental footprint on the global ocean's environment. One study (Bishop et al. 2020) estimated that 1-7% of polyethylene waste exported from the EU+UK+NO+CH formally for recycling abroad may be mismanaged and end up in the oceans (data for 2017). For these reasons, it is not possible to provide a reliable EU Arctic footprint number.

In 2018, the EC estimated that 75,000 to 300,000 tonnes of microplastics were released into the environment every year within the EU (EC 2018 – Plastics Strategy). Other assessments indicate that

⁶ Although, in addition, part of the waste exported from the EU may be mismanaged in import countries, see the discussion further in this chapter.

every year European waters are polluted by 176,000 tonnes of microplastics originating from the wearing and breaking down of larger pieces of plastics, including primarily synthetic textiles and tyres within the EU. Furthermore, Europe (alongside eastern USA and South-East Asia) is one of the global emission hotspots for microplastics originating from road traffic (wear of tyres and brakes). As the EU is also in close proximity to the Arctic, it is very likely that a significantly greater percentage of this airborne particulate matter reaches the region from the EU compared to the average transport from all global sources, modelled at 3.6%. In addition, 42,000 tonnes of microplastics are released into the environment from products that contain these particles by design.

Plastic input into the Arctic Ocean

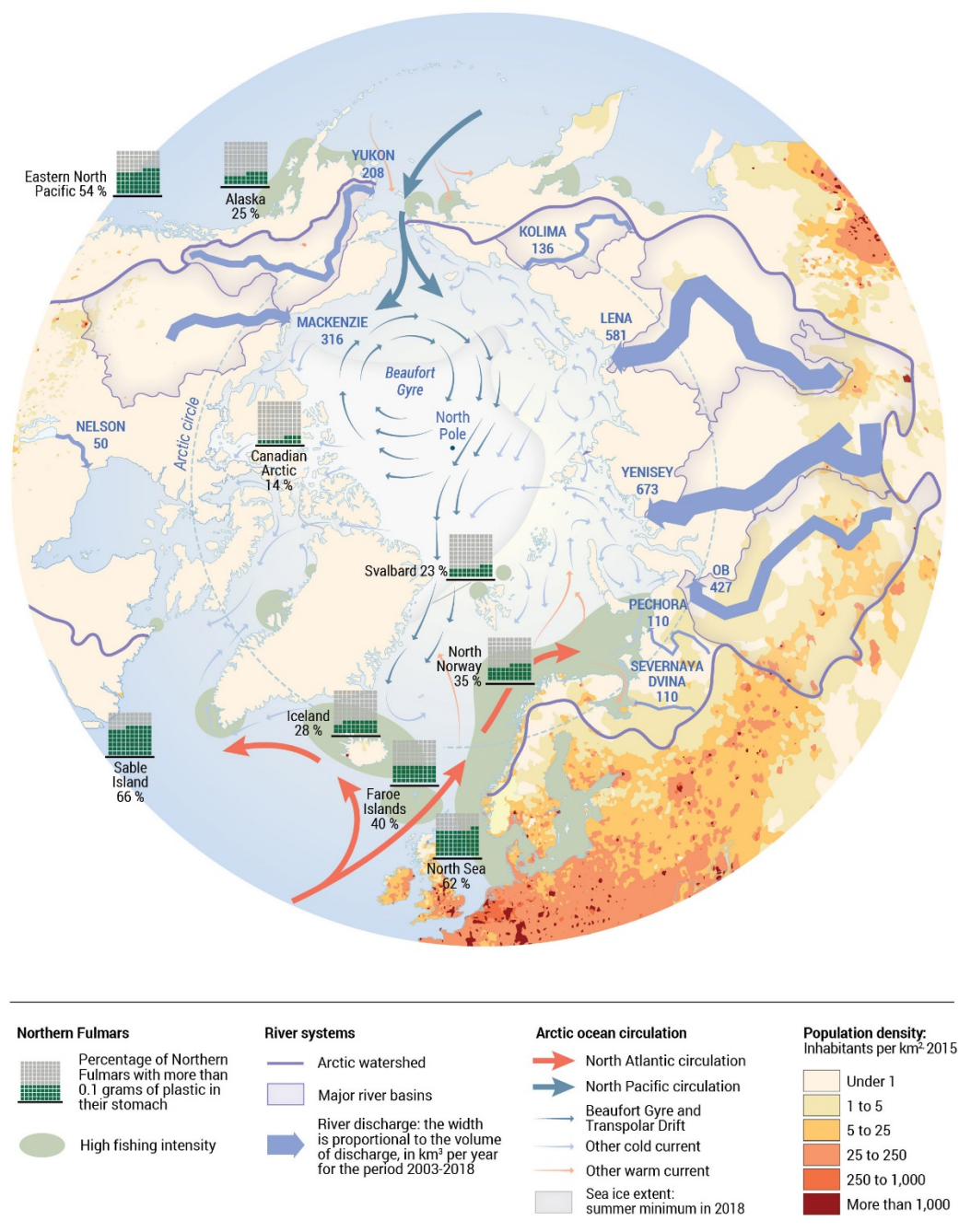


Figure 5.1: Pathways of plastics input into the Arctic Ocean. Cartographers: Philippe Rekacewicz, Riccardo Pravettoni, and Nieves Lopez Izquierdo, GRID-Arendal 2019, from *Global linkages – a graphic look at the changing Arctic*.

5.3. EU policies and their impact

The EU can limit the amounts of plastics transported into the Arctic from European sources by reducing the amount of mismanaged waste and uncollected litter, as well as limiting landfill deposition. The EU had some success in that regard over the last decade. Impact on these measures will be limited at the global level, but significant (although impossible to measure currently) in the Arctic context. Recently, a broad range of EU policies have been developed or updated with relatively ambitious goals. An area of particular relevance for the Arctic is microplastic pollution from the EU, where the scope of EU policies is limited compared to macroplastics, although progress in recent years has been visible, with encouraging developments taking place at the time of writing this report. In general, the EU stands out among large economies as the one taking ambitious and innovative steps in tackling plastic pollution.

In 2018, the EU adopted a European Strategy for Plastics in a Circular Economy (COM/2018/028 final, Plastics Strategy), envisaging a broad range of actions aimed at a variety of sources of macro- and microplastics. Furthermore, in 2015, the EC adopted the Circular Economy Action Plan (COM(2015) 614 final), which resulted in a number of policy changes. A new action plan was adopted in 2020 (EC 2020) and constitutes one of the main components of the EU Green Deal package. It is too early to assess the impact of the plastics strategy and the second action plan. The Marine Strategy Framework Directive (MSFD, 2008/56/EC) required EU Member States to ensure that by 2020 the “properties and quantities of marine litter do not cause harm to the coastal and marine environment”. This ambitious goal has not been achieved as the amount of marine litter remains problematic.

The EU’s Plastics Strategy clearly acknowledged that plastic waste from European sources is transported, among others, into the Arctic Ocean. However, the Arctic is not considered one of the EU’s key regions for international engagement as regards plastic pollution (such as East Asia and the Mediterranean).

A variety of EU actions have been targeting the improvement of plastics recycling, including among others, revision of the Packaging and Packaging Waste Directive (94/62, amended in 2018), better standardisation of waste, initiatives targeting industry and public authorities, as well as awareness-raising campaigns targeting the public. The directive on waste has been amended (2018/851) insofar that specific measures in prevention programmes and waste management plans are to be taken towards preventing waste from being released into the marine environment. For the first time, threshold values for macroplastic litter on the coastlines were adopted (Commission Decision EU/2017/848). The EU is a forerunner in this regard globally. The EU has harmonized and introduced incentives for Extended Producer Responsibility, where the producer also takes account of the end of life and waste management phases of the product life cycle (ECA 2020).

The effects of these recently introduced actions are yet to be seen. So far, for the EU-27, the recycling rate for plastic packaging waste has gone up only slightly since 2014: from 39% in 2014 to 41.5% in 2018. It should be acknowledged, however, that significant progress had, however, occurred earlier, as in 2005 below 20% of such waste was recycled. Clearly, EU legislation prior to the 2018 Strategy resulted in increased recycling rates for plastics in several EU Member States (Ziajahromi et al. 2017). However, at the same time more municipal waste was generated, rising from 478 kg per person in 2014 to 502 kg in 2019 (Eurostat for EU27). The generation of the - most concerning - plastic packaging waste has steadily increased from 28.6 kg per person in 2005 to 30.34 kg in 2014 and 33.47 kg in 2018 (Statista and Eurostat estimates for EU-27+UK). The use of plastics in agriculture is also increasing, while no specific targets for management of this waste source exist. Still, good results have been achieved in some specific sectors. For instance, for construction waste, the 70% waste recovery target established by the Waste Framework Directive (2008/98/EC) was successfully achieved by 2020 (ECA 2020).

Recent EU legislation established more ambitious binding targets for recycling, including currently the target of 50% of plastic packaging waste recycled by 2025 (rising from 22.5% under the Directive 2008/98/EC) and 55% by 2030 (and 90% for bottles by 2029). By 2035, 65% of municipal

waste in the EU should be prepared for reuse and recycling and only up to 10% can be deposited to landfill. The European Court of Auditors (ECA 2020) in its 2020 review warned that there is a high risk of missing these targets for plastic packaging waste recycling. One of the challenges are recently imposed limitations (by China, the EU and under the Basel Convention) on the export of EU plastic waste, on which the EU has been dependent to meet targets.

A major policy development has been the Directive (2019/904) on the reduction of the impact of certain plastics products on the environment (which is EEArea-relevant and thus applicable to Iceland and Norway). It introduced a ban on selected single-use plastics with existing market alternatives, as well as measures reducing consumption of food containers. It also extended producers' responsibility schemes including for fishing gear, thus implementing the 2018 Plastics Strategy. Both single-use plastics and fishing gear are key components of marine litter.

The EU is to also boost its funding and incentives for investment and innovation in circular solutions related to plastics, e.g. recyclability in product design. EU research funding, structural funding and smart specialisation strategies are to be used towards this purpose (COM(2018) 28 final). Strategic Research and Innovation Agenda on plastics have been proposed by a group of European research and industry stakeholders, although the document does not target e.g. microplastic pollution from synthetic textiles and tyres or long-range transport of plastic waste (SusChem 2019). About EUR 350 million - out of EUR 1.4 billion spent on circular economy – were directed towards research projects related to plastics during the Horizon 2020 programme and the focus is to be maintained in Horizon Europe. In addition, a variety of projects under the cohesion policy, the European Fund for Strategic Investments and the LIFE programme were implemented (totalling over EUR 9 billion for all circular economy projects EC 2019, COM(2019) 190 final)

Addressing the European exports of plastic waste is also important as a small part of mismanaged waste in the destination countries can eventually end up in the Arctic (e.g. from West Africa and northern China). Moreover, decreased imports translates to challenges for achieving EU waste management goals (ECA 2020). Prior to the Chinese restrictions on imports of plastic waste, the EU exported almost half of its waste, of which 85% went to China. Recently, the amount of plastic waste exported outside of the EU has been decreasing significantly, from 3.3 billion tonnes in 2014 to 1.72 billion tonnes in 2019. EU operators must receive an attestation that plastic waste processing in third countries meets EU standards as the EC introduced new rules for waste exports in 2020 (Commission Delegated Regulation (EU) 2020/2174). Moreover, from 2021, only pre-sorted and uncontaminated recyclable plastic waste would be considered as non-hazardous under the Basel Convention. However, a significant amount of plastic waste is shipped illegally, being in fact one of the main commodities shipped illegally out of the EU (ECA 2020).

From the perspective of Arctic plastic pollution, of particular relevance could be the envisaged measures to reduce loss and abandonment at sea of fishing gear via targets, recycling funding and deposit schemes. The directive on port reception facilities for the delivery of waste from ships (2019/883, relevant for the EEArea) establishes measures and financial incentives for better waste management in ports, including, importantly, in the fishing industry. A report (2016) identified a number of possible measures within the EU and, among others, North-East Atlantic Fisheries Commission (NEAFC), where the EU is a party, to limit the amount of fishing gear lost or discarded as well as possibilities for developing gear that would not be harmful to the marine environment. Actions towards technological developments and incentives are of great value for the Arctic environment, considering that a big part of Arctic and North Atlantic macroplastic pollution originates from the fisheries sector. EU research and transnational/cross-border programmes have funded projects addressing this need. A good example of such an action is Circular Ocean and its successor Blue Circular Economy, an NPA-funded project, which advances methods of reusing fishing nets. The project includes partners from North Norway, Iceland and Greenland (see at circularocean.eu). Other relevant projects related to fishing equipment involve non-Arctic partners but develop solutions and technologies for reducing fishing gear loss and recycling (e.g. NetTag, BLUENET and OCEANETS projects, all funded by the European Maritime and Fisheries

Fund, EMFF). Under Interreg Atlantic Area Programme, the EU is funding Clean Atlantic and OceanWise project. Clean Atlantic aims at improving the capabilities to monitor, prevent and remove marine litter, and includes awareness-raising component. OceanWise was focused on pollution caused by foamed polystyrene products (EPS and XPS, used broadly e.g. in packaging) in the North-East Atlantic. The goal was to develop long-term measures to tackle this class of pollutants. The EMFF has also a funding line for supporting the collection of waste by fishermen from the sea.

As a result of the Plastics Strategy, the first steps towards actions on curbing the intentional use of microplastics in products have been taken. The microplastics restriction could be added to the existing REACH Regulation (EC 1907/2006). In January 2019, the ECHA commenced this process by proposing wide-ranging restrictions on the use of microplastics in a range of products. A decision from the European Commission and Member States is expected in the near future. The expectation is that half a million tonnes of microplastics would be prevented from entering the environment over the next 20 years or 10,000 to 60,000 tonnes annually (ECHA website).

The EC has also committed, both in the 2018 Plastics Strategy and in the 2020 Circular Economy Action Plan, to exploring options for addressing the microplastics released from textiles and car tyres at all stages of the product life-cycle (especially production, washing and waste water treatment). From the perspective of the Arctic marine environment (where the majority of microplastics appear to currently originate from synthetic textiles), these would be key actions and include e.g. minimum requirements for tyre design and information on abrasion and durability, better and harmonised methods for assessing emissions from textiles, as well as exploring possibilities for labelling, certification and standardisation of microplastics-emitting textiles. Research and development funding is to be channelled specifically for better understanding of the problem and towards technological solutions. Proposals for concrete measures are expected during 2021. Research and other projects have been funded by EU programmes to address unintentional emissions of microplastic. A good example is MERMAIDS (Mitigation of microplastics impact caused by textile washing processes) LIFE project.

The EU can also contribute to addressing plastic waste in the Arctic via support for international cooperation and action. There is EC commitment to work for the development of international responses to combating plastic marine litter and microplastics, as envisaged by the UN Environmental Assembly in 2017. Dialogues with partners could include Arctic nations such as Canada, Iceland, Norway and even Russia, where plastic pollution could be an area of mutual interest despite difficult bilateral relations. As Norway is one of the key promoters of global action on plastic pollution and marine litter, the close cooperation between the EU and Norway in that regard is of particular relevance. There is also an expectation of renewed EU engagement on marine litter via the MARPOL and Basel Conventions (EC website – Descriptor 10: Marine Litter).

The JRC has contributed to the Arctic Council's work on marine litter, including the ongoing development of the Action Plan on Marine Litter within the AC's Protection of the Arctic Marine Environment (PAME) working group. The EU has shared experience with the implementation of pollution action plans and shared experience of the implementation of legislation targeting marine pollution. Arctic-relevant work also takes place under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), where the EU showcases its plastics policy regulatory developments. Already in 2013, OSPAR developed its Regional Action Plan for Prevention and Management of Marine Litter in the North-East Atlantic for the period 2014-2021. The plan deals with both land-based and sea-based sources of plastic pollution as well as removal and awareness-raising. In addition, OSPAR is a partner in the aforementioned Clean Atlantic and OceanWise EU-funded initiatives. These projects resonate with objectives and actions listed in the OSPAR Regional Action Plan.

5.4. Policy options for limiting the EU's Arctic plastic pollution footprint and enhancing its contribution

P23. Improving the understanding of the long-distance transport of plastic waste in the North Atlantic and air transport of microplastics.

There is little scientific data on (and modelling of) the channels for long-distance transport of macro- and microplastics, their sources, amount and type. Another aspect that is not understood are the thresholds of plastic waste and microplastic concentrations for the Arctic environment. Such information would be of value for global policy-making and for the current and future environmental management of the Arctic Ocean. It is also important due to the significance of the Barents Sea for European seafood production. It is understood that a significant amount of the macroplastics enters the Atlantic side of the Arctic together with the Gulf Stream, while part of microplastics travel by air from a variety of European sources. The EU has already funded a variety of relevant projects, and the EU research funding should continue to increase its contributions to such knowledge-generation. The EU could coordinate with other actors and with AMAP and PAME working groups of the Arctic Council, as well as increasingly contribute to their assessment work. The Arctic Council's Regional Action Plan on Marine Litter (PAME 2021) in the Arctic encourages the research and monitoring of sources and pathways for plastic waste arriving from outside the region. The Atlantic Research Alliance (launched by Canada, the EU and the US in 2018 and subsequently expanded) could support such cooperation, as the North America's eastern seaboard and Europe are key contributors to the plastic pollution flows via the North Atlantic into the Arctic.

P24. Developing policy measures for unintentionally released microplastics from synthetic textiles and road traffic

The EU Plastics Strategy and the 2020 EU Circular Economy Action Plan indicate the need to address the unintentional release of microplastics from synthetic textiles and road traffic. These are highly challenging areas for regulators. Synthetic textiles have been found to comprise over 90% of microplastics found in the Arctic environment and the air transport pathways for road traffic microplastics from Europe are likely to be similar to those of other pollutants such as black carbon and POPs. Emissions of these pollutants in the EU are likely to be four times greater than the releases of microplastics included by design in products, on which work is currently being carried out by ECHA towards covering them by the REACH Regulation. The EU should invest in research into better understanding of the pathways and impacts of these pollutants, in technological developments as well as in awareness-raising (moving away from synthetic textiles, public awareness of microplastics impact of road traffic, etc.). A variety of technological developments are at different stages of development including removal of microplastics via ecosystem-based solutions or with the use of chemicals, research on screens and nets for filtering the pollutants, and through the use of bacteria. Regulatory measures could include labelling and certification, as well as incentives for producers where and when appropriate and affordable technologies are available. Measures regarding these pollution sources are of relatively high importance from the perspective of the EU's long-range impacts on the Arctic environment.

6. Biodiversity

6.1. Biodiversity in the Arctic: an overview

Compared to many ecosystems globally, Arctic ecosystems are less affected by pollution, land use change, or ecosystem fragmentation. However, the two-to-three times above global average pace of climate change in the Arctic exerts intense pressures on the northern environment with expectations for dramatic changes in the future as the globe warms. The IPCC (2018) highlighted the Arctic as one of the most exposed regions (see also IPBES 2019). The Arctic Council's Arctic Biodiversity Assessment (CAFF 2013) and recent report on terrestrial biodiversity (CAFF 2021) concluded that global climate change is now the most significant threat to Arctic biodiversity, and it also exacerbates the other threats to Arctic biodiversity. Some species or animal communities have already experienced population declines, key ecosystems – e.g, breeding grounds or migratory routes – are affected, animal behaviour is shifting (Ibid). As the Arctic warms two to three times faster than the global average, it has the effect of changing the Arctic ecosystems fairly intensely, resulting in altered ecosystems, plant and animal species moving northward or becoming extinct. The greening (increased vegetation) and browning (decreased vegetation) phenomena in Arctic tundra have been observed simultaneously (Berner et al. 2020). Climate change opens new areas for economic development, thereby also causing additional challenges to Arctic biodiversity, for instance also increasing the possibilities for invasive species to enter the Arctic.

The increasing development activities in the Arctic - and the disturbance and habitat degradation that they bring with them - have the effect of not only diminishing Arctic biodiversity but also lessening the opportunities for Arctic residents and visitors to enjoy the benefits of ecosystem services. Pollution from distant and local sources also present challenges for Arctic species and ecosystems, as e.g. POPs and heavy metals such as mercury, lead and cadmium bioaccumulate through the Arctic food web and have an effect on animals and humans. In general, even if in the past overharvesting was the primary human effect on Arctic species, this is generally no longer the case, as management systems have been able to address this problem. Yet, many Arctic migratory species are facing problems because of overharvesting and habitat alterations outside of the Arctic. For instance, many of the Arctic bird species require protection measures throughout their migratory range. If harmful overharvesting is done in one outside region, this will also cause problems in protecting Arctic biodiversity. In particular, changes to Arctic biodiversity affect subsistence, nature-based and traditional activities of Arctic inhabitants, including those of the region's Indigenous Peoples. Indigenous and local inhabitants, on the other hand, are also increasingly important sources of information about biodiversity changes and about sustainable nature use and inclusive conservation.

Impacts and risks for selected natural, managed and human systems

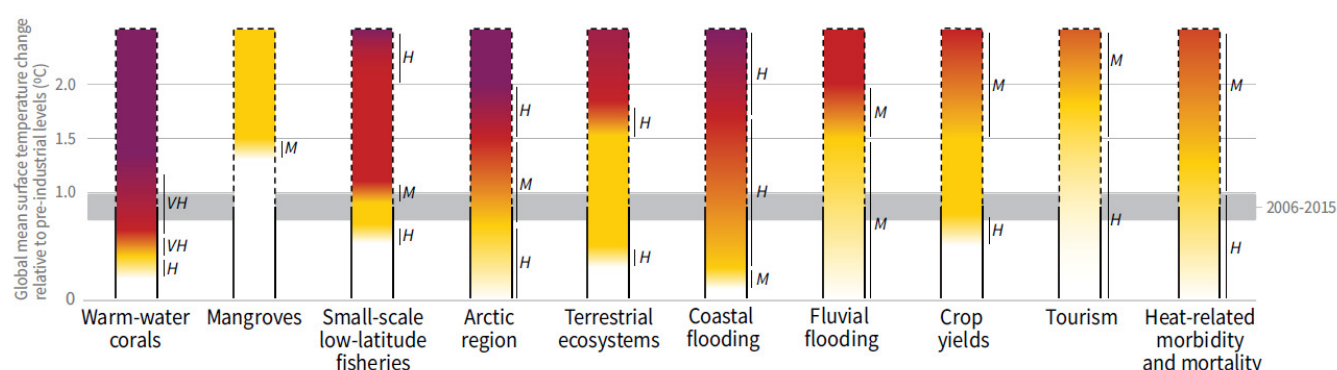


Figure 6.1: Impacts and risks for the Arctic region presently, at 1.5°C and 2°C warming, as compared to other selected natural, managed and human ecosystems. Source: IPCC (2018) Summary for Policymakers. In: Global warming of 1.5°C, p. 13. Confidence level for transition: L=Low, M=Medium, H=High, VH=Very High. Colour reference: Purple indicates very high risks of severe impacts and significant irreversibility or persistence of climate-related hazards. Red indicates severe and widespread impacts/risks. Yellow indicates that impacts/risks are detectable and attributable to climate change with at least medium confidence. White indicates that no impacts are detectable or attributable to climate change.

Even if there are many current and especially future problems, there is still time to protect Arctic biodiversity as the Arctic ecosystems are relatively healthy, compared with various ecosystems in lower latitudes affected by fragmentation, land use change, high levels of pollution and human activities. This will require more effort in terms of obtaining scientific knowledge to inform policy but also integrated solutions with various levels of governance (CAFF 2013). The state of global biodiversity is declining rapidly, as concluded by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in its 2019 assessment (IPBES 2019), stating, for instance, that “Nature across most of the globe has now been significantly altered by multiple human drivers, with the great majority of indicators of ecosystems and biodiversity showing rapid decline”. Currently, there is an urgent need to make a new Arctic Biodiversity Assessment as the previous one is from 2013, and there are clear changes to the biodiversity of the region, especially from climate change (Barry 2021; AMAP 2018).

6.2. The EU economy’s influence on the state of Arctic biodiversity

It is not useful to propose a separate EU footprint for biodiversity because its loss is the result of many pressures, such as climate change or long-range transport of contaminants, which are described in other chapters of this report. It is important to note that all environmental impacts coming from the EU as well as those related to the human activities related to the demand for Arctic resources, to which the EU economy contributes, should be seen as elements of the pressures of the EU’s population and economy on Arctic biodiversity. All EU policies discussed in other chapters are therefore of relevance also for Arctic biodiversity. The EU e.g. influences infrastructure developments, EU citizens travel to northern destinations as tourists, the EU creates demand for resource exploitation in the Arctic.

Even if the EU’s footprint on Arctic biodiversity is not taken up here, it is useful to refer to the EEA’s overall ecological footprint estimates for the EU – “ecological footprint” being understood by EEA more specifically than the broad definition of footprint as applied in this report. The total ecological footprint of the EU-27+UK, as evaluated in 2016, is one of considerable ecological deficit, that is, the total demand for ecological goods and services exceeds that which Europe’s ecosystems can supply (EEA website 2020, Ecological Footprint). With an ecological deficit, the EU must meet its own demand by e.g. importing products, which leads to exploitation of the biocapacity of other nations and regions, including the Arctic. However, it is important to note that the EU’s ecological footprint has considerably decreased between 2006 and 2016.

6.3. Overview of EU policies relevant for Arctic biodiversity and their impact

The EU’s policy actions in many fields, not only in its biodiversity policy, are of relevance for the state of the Arctic’s biodiversity. How the EU is e.g. reducing GHGs, air pollutants or how it is advancing in its fisheries policy are of much importance for how Arctic biodiversity is developing. These are being studied in other chapters, but it is important to point out that the main driver of change as regards Arctic biodiversity, climate change, is being tackled more and more effectively by the EU. This also has a clear policy impact on the state of Arctic biodiversity.

The EU includes within its borders the Arctic regions of Finland and Sweden and many of its environmental policies directly affect Arctic inhabitants in Iceland and Norway via the EEArea Agreement. The EU’s responsibility for European ecosystems is therefore at the same time a responsibility for parts of the Arctic environment. EU ecosystems are also important for Arctic migratory species - birds and marine life.

6.3.1. The evolution of the EU’s overall biodiversity policy

The EU influence Arctic biodiversity primarily via policies affecting pollution, emissions of GHG and land use changes. There are also, however, strategic documents and pieces of legislation directly tackling the protection of habitats and species and biodiversity overall. The current status of EU Arctic

biodiversity has been to some degree influenced by decades of EU policies and actions. The EU became a party to the Convention on Biological Diversity in 1994. By this time, it had already adopted two significant pieces of nature conservation legislative acts, the 1979 Birds Directive and the 1992 Habitats Directive. On 4th February 1998, the European Commission adopted a Communication on a European Biodiversity Strategy, which had goals to anticipate, prevent and attack the causes of significant reduction or loss of biodiversity at source (EC 1998 COM/98/0042 final). The EU has also become a party to the Biodiversity Convention's Cartagena Protocol (2003) and the Nagoya Protocol on Access and Benefit-sharing (2014). In 2006, an EU Biodiversity Action Plan was drawn-up. Its goal was to halt biodiversity loss by 2010 with 150 concrete actions. In the 2010 assessment, however, it was found that the EU had not been able to reach the target, even if some positive progress had taken place (EC 2010).

In March 2010 the Council agreed that “by 2050 EU biodiversity and the ecosystem services it provides – its natural capital – are protected, valued and appropriately restored for biodiversity's intrinsic value...” and the loss of biodiversity and degradation of ecosystem services in the EU were to cease by 2020 (The Council of the EU 2010). At the same time, in October 2010, the global Convention on Biological Diversity (CBD) adopted a ten-year Strategic Plan to tackle biodiversity loss in the world, accompanied by 20 concrete targets (the Aichi targets). These commitments are reflected in the 2011 European biodiversity strategy towards 2020 (EC 2011).

The EU's 2020 biodiversity strategy from 2011 established clear targets for protecting species and habitats. This was to be done via maintaining and restoring ecosystems, establishing green infrastructure, achieving more sustainable agriculture and forestry, making fishing more sustainable and seas healthier, combating invasive alien species and by helping to stop the loss of global biodiversity. Yet, already the mid-term review of 2015 by the Commission found that not much progress in achieving these targets was taking place. Of particular concern from the Arctic perspective was the unfavourable status of wetlands, although those located in Northern Fennoscandia are in relatively better condition (EC 2015). The evaluation of these 2020 targets is now ongoing. As of spring 2021, the EU is organising public consultation in that regard.

The Commission has already adopted a biodiversity strategy for 2030 (EC 2020), which builds on the European Green Deal. The 2030 biodiversity strategy has concrete aims to establish a larger EU-wide network of protected areas of land and sea, launch an EU nature restoration plan (with public consultation concluded in April 2021 on the development of legally binding EU nature restoration targets), introduce measures to enable necessary transformative change and introduce measures to tackle the global biodiversity challenge. Of particular relevance for the Arctic is the focus in the new strategy on nature-based solutions and services – including climate services – provided by the environment. This allows a different perspective on the value of the northern wetlands and the old-growth boreal forests. The strategy also emphasises the need to ensure continuity of the European network of habitats, which is of importance especially for the migratory bird species breeding in the European Arctic.

The new biodiversity strategy does not refer to specific challenges for the European Arctic and - with regard to international action - neither to the environmental problems in the circumpolar North and in the Arctic Ocean. There is also no reference to Indigenous Peoples' concerns and approach towards biodiversity in the European context (while indigenous participation in decision-making and rights to land are mentioned in the context of global action).

The EU attempts to include biodiversity considerations into the projects funded via EU programmes and investments in Europe. For example, the recently adopted taxonomy regulation (EU/2020/852) introduces “the protection and restoration of biodiversity and ecosystems” as one of the environmental objectives with definition specified for what constitutes an activity supporting biodiversity protection. Also strengthening carbon sinks via protection of wetlands – a key European Arctic habitat – has been included line with the concept of climate services provided by ecosystems. It is too early to evaluate the impact of taxonomy regulation on the actual sustainability of investments in the European Arctic. Similarly, the EIB's environmental and social standards emphasise biodiversity protection.

6.3.2. EU policies relevant for the European Arctic and their impact

The EU's nature conservation law dates back to 1979 when the Birds Directive (currently 2009/147/EC) was adopted. This directive was meant to protect all wild bird species naturally occurring in EU Member States' territories. Since habitat loss and degradation are severe threats to the conservation of wild birds, the directive established special protection areas (SPA), in particular for endangered bird species. The Habitats Directive (92/43/EEC) – adopted in 1992 – had as its goal the conservation of natural habitats and wild fauna and flora in order to promote the maintenance of biodiversity. It also established the Natura 2000 ecological network of protected areas, to which the SPAs were also integrated. In 2016, the Commission released a fitness check evaluation of the Birds and Habitats Directives and concluded that the directives “remain highly relevant for the conservation and sustainable use of species and habitats of EU conservation concern, for the environment, people and the economy, and as an essential component of EU Biodiversity Policy” (EC 2016: 96). Some shortcomings were also identified and these are being addressed by an action plan. This is important as there are many Natura 2000 protected areas in Finland and Sweden, especially in their northern regions – e.g., almost a third of the area of the Finnish region of Lapland is covered by Natura 2000 areas. These Natura 2000 areas are also a part of the Barents Euro-Arctic Council's (in which the European Commission is a full member) Barents Protected Area Network (BPAN).

Within the European Arctic, the EU has developed a number of actions and initiatives of relevance to boreal forests (taiga) – their conservation and management and more broadly, land use change. In 2013, the EU adopted Forest Strategy (EC 2013, COM(2013)659 final). As of Spring 2021, the EC is working on a new Forest Strategy which would be better aligned with the European Green Deal and the recently adopted Biodiversity Strategy (EC 2020). Moreover, a Soil Strategy is expected to be adopted in 2021. For the European forests, the Timber regulation (EUTR 995/2010) dealing with the legality of harvesting and the LULUCF regulation (2018/841) are also of relevance. The latter is somewhat controversial in northern Europe due to current forest management practices. The EU (DG Environment and the EEA) are developing a Forest Information System for Europe, which will act as a one-stop shop for a vast amount of forest data. A challenge in this respect is insufficient harmonisation and the voluntary character of reporting on forests and forestry in the EU.

The EU adopted, in 2014 (in force 2015), a Regulation on invasive alien species (IAS Regulation 1143/2014), which builds on the prevention, early detection and management of invasive and alien species that are identified in the Invasive Alien Species of Union concern list.

Across the EU, there is increasing concern about the fragmentation of ecosystems and landscapes related especially to infrastructure investments. Nordic countries are considered to be in a relatively favourable position due to low population density. However, also in the northernmost regions the proposed or implemented developments related to renewable energy or transport infrastructure may be problematic in that regard (EEA 2011).

One of the achievements of the 2011 Biodiversity Strategy was the first assessment of the ecosystems and their services in Europe (Mapping and Assessment of Ecosystems and their Services, MAES, covering also part of the European Arctic), completed in 2020 (JRC 2020). Similar to the circumpolar assessments (esp. CAFF 2013), MAES showed northernmost regions to be comparatively less exposed to pressures but affected by a faster pace of warming.

The EU's LIFE programme provides funding for environment and climate action. Currently, several projects are implemented in the European Arctic, including the “Restoration of Boreal Nordic Rivers” ReBorN LIFE (contributing to the Habitats and Birds directives by bringing the rivers closer to their natural state); “The wild forest reindeer (*Rangifer tarandus fennicus*) of Finland: Conservation and recovery of historic range” WildForestReindeer LIFE, as well as “Restoring the hydrological integrity of wetland habitats in Finland” Hydrology LIFE (See at LIFE CINEA/EASME website).

The EU is also funding Arctic biodiversity research. For instance, the CHARTER Horizon project aims to advance state-of-the-art knowledge on Arctic biodiversity change and social-ecological systems (CORDIS website) and the ECOTIP Horizon project focuses on understanding and predicting changes in Arctic marine biodiversity (ECOTIP website). A major theme related to biodiversity within Horizon 2020 has been nature-based solutions. The Pisuna project, funded under the voluntary scheme for Biodiversity and Ecosystem Services in Territories of European overseas (BEST), engaged Greenlandic fishermen and hunters for monitoring change in natural resources related to environmental transformation. It also attempted to increase Greenlandic participants' capacity to partake in resource governance.

Forest fires in Arctic (sub-Arctic) boreal forests are of increasing concern, with rising occurrence across the Circumpolar North (Witze 2020). The EU has carried out significant work on forest fires, which are a concern for biodiversity, and also for further warming and particulate matter depositions in the Arctic. The European Union's Emergency Response Coordination Centre (ERCC) provides - upon request from any state or a UN body - monitoring and coordination of assistance during emergency response actions in Europe and globally, including across the circumpolar Arctic. For instance, at the beginning of a forest fire season, the centre discusses with Member States the status of prevention and response. The EU can draw emergency response resources from the Member States at the request of a MS or a third country and since 2020 has also its own emergency response capacities. For instance, in 2019 Sweden requested assistance in dealing with forest fires. The EU has established the European Forest Fire Information System (EFFIS) which is a part of the Copernicus Emergency Management Service (CEMS). The system provides early data utilised by the Member States, includes risk assessment, and covers also Norway and the European part of Russia. Based on EFFIS, the EU has also established the Global Wildfire Information System (GWIS), with coverage across the circumpolar North and freely available to users. Both systems also include peatlands fires, although these are challenging to monitor by satellite. A dedicated Expert Group on Forest Fires composed of working states, EC officials and third country representatives, including Norway and Russia, oversees EFFIS and allows the sharing of experience and best practice. In principle, Iceland and Greenland and possibly even Canada could join the working group in the future. The Union Civil Protection Mechanism (UCPM) organised the sharing of best practice by officials and responders from the EU southern nations, who have more experience with seasonal forest fires, with their Nordic counterparts for whom widespread seasonal fires are a phenomenon coming about with climate change. The EU is involved in work on forest fires within the EPPR and CAFF working groups of the Arctic Council. The JRC provides here, e.g., the analysis on the impacts of increasing forest fires on Arctic ecosystems. Cooperation on forest fires is a viable topic for continued selective engagement with Russia, and there has been smooth technical cooperation in that regard so far.

6.3.3. Policies relevant to the circumpolar Arctic and their impact

The EU is a major global player in responding to biodiversity concerns. Much of the biodiversity action of the EU builds on its membership of a number of global and regional biodiversity international treaties, such as the CBD, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Wetlands of International Importance (RAMSAR) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS). It is important to note that the AC's CAFF working group has established a relationship to all these biodiversity treaties.

As part of the global community, the EU has been contributing to achieving the CBD regime's Aichi biodiversity targets to 2020. The IPBES, in its evaluation of 2019, considered that four of the 20 Aichi biodiversity targets can be met; there has been moderate progress in seven targets but for the remaining six targets there is only poor progress (for some targets, there was not enough information). The report states quite plainly that the state of nature continues to decline and most indicators show significantly worsening trends. According to the report "Anthropogenic drivers of biodiversity loss, including habitat loss as a result of land-use and sea-use change (addressed by Aichi Target 5),

unsustainable agriculture, aquaculture and forestry (Aichi Target 7), unsustainable fishing (Aichi Target 6), pollution (Aichi Target 8), and invasive alien species (Aichi Target 9) are increasing globally...” (IPBES 2019: 23). Yet, as was argued above, the state of biodiversity is not as dire at the moment in the Arctic, as was concluded in the 2013 Arctic Biodiversity Assessment (CAFF 2013). On the other hand, this assessment is already quite old, and would need to be done again, especially in view of changes in ecosystems caused by climate change in the region.

A major issue that has arisen during the last 20 years is the threats faced by marine biodiversity, in particular in the high seas areas, which constitute nearly two-thirds of ocean space. The UNCLOS and customary law of the sea guarantee high seas freedoms for all states and their vessels, which have contributed to increasing threats to the biodiversity of the high seas. For this reason, the states and the EU have now been negotiating a legally binding treaty to govern biodiversity in areas beyond national jurisdiction (envisaged international legally binding implementing instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ)). These intergovernmental negotiations will still take some time, and many issues are open, but states and regional institutions are already preparing for the eventuality of the BBNJ. This applies also in the Arctic marine areas, as there is a 2.8 million km² high seas portion in the Central Arctic Ocean (and also other pockets of high seas in Arctic and sub-Arctic marine areas). Issues that are on the table are access to marine genetic resources, area-based management tools (such as MPA’s), environmental impact assessment and capacity-building and transfer of marine technology.

The EU was one of the parties which negotiated the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (2018). Within two years after this Agreement enters into force, parties are obligated to establish the Joint Program of Scientific Research and Monitoring and they have already had some preparatory meetings on this (Art. 4.2.). Of interest is that this Agreement requires not only research on fish but also on improving the understanding of the high sea ecosystems of the Agreement Area. Since the EU is already part of these endeavours to plan research on these vastly changing marine ecosystems, it will have natural interest in how the BBNJ would be implemented in the high seas of the Central Arctic Ocean. The AC is also preparing for the eventuality of the BBNJ. The possibility for the AC to play a role in regionally implementing the BBNJ was discussed in the first Senior Arctic Official (SAO) based Marine Mechanism (Arctic Council 2020: 1.3.). The PAME working group of the AC is at the moment collaborating with the International Council for the Exploration of the Sea (ICES) and the North Pacific Marine Science Organization (PICES) on integrated ecosystem assessment of the waters surrounding the North Pole (Arctic Council website WGICA). This collaboration is meant to contribute to the implementation of ecosystem-based management in the Central Arctic Ocean. In addition to all this, OSPAR (in which the EU plays a role) approached the AC in 2016 about the possible high seas marine protected area designation in the high seas Arctic waters that are under its mandate. Hence, there are many policy developments, which are of interest to the EU, as regards the BBNJ and its regional implementation in the Central Arctic Ocean - and perhaps in particular the future designation of high seas MPA’s in the Central Arctic Ocean.

Furthermore, of relevance to the EU’s global ecological footprint – mentioned in section 6.2. above - is the EU’s Roadmap to a Resource Efficient Europe (COM(2011) 571), which specifies that EU policies need to take account of their direct and indirect impact on land use in Europe and across the globe.

6.4. Policy options for the EU's contribution to Arctic biodiversity

The EU's impact on Arctic biodiversity can be addressed primarily via policies on climate change, pollution and those affecting the demand for the extraction of Arctic resources. These questions are discussed elsewhere in the report. Here, policy options referring specifically to Arctic biodiversity actions are taken up.

P25. Creating stronger institutional presence of the EU in the work of the CAFF to advance the protection of Arctic biodiversity.

The EU is one of the global leaders in protecting biodiversity worldwide. Yet, it is not yet very strongly engaged in Arctic biodiversity work via the CAFF working-group of the AC. Since CAFF has established resolutions of co-operation with global biodiversity treaties, its role is very important in collaborating with all levels of biodiversity governance and with its international partners (CAFF website) in order to advance the protection of Arctic biodiversity. The EU should focus more efforts on working through the CAFF to advance the protection of circumpolar Arctic biodiversity, by e.g. having nominated persons who would have the task of participating more systematically with CAFF activities. The EU would have much to offer for biodiversity work within the Arctic Council. The global database for protected areas, the Digital Observatory for Protected Areas (DOPA), is a service developed by the EC JRC with high potential to support databases and the management of protected areas. There should be coordination with CAFF on this as it used to be working on the Circumpolar Protected Area Network (CPAN) and has continued this work via many CAFF programs and projects including the Arctic Biodiversity Assessment and the Circumpolar Biodiversity Monitoring Program (CBMP) (CAFF 1996, 2013, CAFF CBMP website). There is also a need to carry out a new broad assessment of Arctic biodiversity since the 2013 ABA may be outdated due to the rapid warming in the region. Moreover, knowledge of the impacts of climate change on the Arctic environment has expanded significantly, including through the EU-funded projects. The EU together with other AC actors could encourage as well as support financially and substantially (e.g. via the EEA and JRC contributions in CAFF) such a new overarching biodiversity assessment.

P26. Establishing an internal policy coordination group within the European Commission to follow and, if necessary, take a stance on what should be the EU's role in the governance of biodiversity in the Central Arctic Ocean

The EU has been a strong advocate of the BBNJ (see its original stance, UN n.d.) and it is likely that this implementing agreement to the UNCLOS will enter into force at some time in the future. As argued above, the BBNJ will also apply to the high seas of the Central Arctic Ocean and will likely press the already existing intergovernmental processes to think hard about how to implement this regionally. The EU is already involved in many ways in this. It would be a member of the scientific body of the Arctic fisheries agreement when the latter enters into force. The EU is a *de facto* observer in the AC and an influential party in OSPAR (that has proposed to the AC an MPA in the high seas of the Central Arctic Ocean). It would be therefore natural for the EU to also discuss internally its policies as regards the BBNJ in the Central Arctic Ocean. Currently, many issues are unresolved, but regional actors in the Arctic are now preparing for the eventuality of the BBNJ, hence also requiring the EU to form at least an internal policy coordination group to think and discuss the EU's stance on these developments.

7. Fisheries

7.1. Overview of the sub-Arctic and Arctic fisheries

7.1.1 General

The seafood industry is a significant contributor to the global supply of marine proteins and important nutrients (FAO 2020). Marine capture fisheries yield some 80 million tonnes annually, while marine aquaculture production currently stands at about 30 million tonnes. China is by far the most important fishing nation, followed by Peru and Indonesia (2018 figures) (FAO 2020, p 13). Number four and five are the Russian Federation and USA, both of which have substantial landings in (sub)Arctic fisheries, while Norway is number nine. Globally, the EU ranks about number six with landings of 4.1 million tonnes (2019).⁷

UNCLOS (1982) and subsidiary agreements set out the global framework for fisheries management. A key feature of this framework is coastal states' sovereign rights over the natural resources in their 200 nautical mile (equivalent to 370 kilometres) exclusive economic zones (EEZs) and on/in their continental shelves, including where they extend beyond 200 nautical miles. The coastal states are obliged to manage resources sustainably, utilise them, and – where resources are transboundary – cooperate with neighbouring states in their management (Hoel and VanderZwaag 2014). In the high seas beyond the 200 nautical mile zones states are to cooperate in the management of fisheries in regional fisheries management organisations (RFMOs) or arrangements.

This framework has evolved considerably over recent decades through new legally binding agreements as well as a number of soft law instruments, in particular in the UN Food and Agriculture Organization (FAO). Also, the implementation of the framework has improved significantly over time and where fisheries are actively managed sustainability is improving (Hilborn et al 2020). Globally, about two thirds of fish stocks are at sustainable levels, while one third is overfished (FAO 2020).

The global seafood market has expanded considerably over recent decades, and in 2018, 67 million tonnes were traded internationally (FAO 2020:73) with a total export value of USD 164 billion (FAO 2020:73). International trade in seafood is increasing rapidly, and 78% of fish (including shellfish and molluscs) and fish products are exposed to international competition (FAO 2020:74). China is the top exporter, followed by Norway. Arctic nations are among the world's largest exporters of fish, including the USA, Russia, and Canada in addition to Norway. The EU is the world's largest seafood market. In 2018, the EU had 34% of total global imports of seafood, followed by the US and Japan (FAO 2020: 80).

7.1.2 EU fishing industry

The fishing industry in the EU consists of about 70,000 vessels, of which about 2,500 are over 24 metres in length and can be considered oceangoing (2019 figures, including the UK). Over time, the number of vessels is declining, and economic performance improving (EC website: fisheries facts and figures). About 163,000 people work in the EU fishing industry, including aquaculture (Eurostat).

Fisheries management is one of the exclusive EU competences. The status of fish stocks in the EU (excluding the Mediterranean and the Black Sea) is improving (Jardim et al 2019), reflecting developments in the EU fisheries management regime (see below). Total EU landings amounted to 4.1 million tonnes liveweight in 2019 (EU-27 figures, excluding the UK, Eurostat). More than 20 % of

⁷ The total EU landings from capture fisheries is not reflected in the FAO SOFIA report, as reporting is by FAO member countries.

catches were taken outside EU waters (EC website), and a significant share of this was in sub-Arctic waters in the North Atlantic.

With Brexit and the departure of the UK from the EU, EU landings have been substantially reduced. In 2019, UK landings were about 620,000 tonnes (UK Gov website). Also, with Brexit the EU has lost its coastal state status in the Norwegian Sea.

7.1.3 Arctic

“Arctic” fisheries are in reality mostly sub-Arctic fisheries in the North Atlantic and in the Bering Sea. Some of these fisheries, like the pollock fisheries in the Bering Sea and the cod fisheries in the Barents Sea, are globally significant. Altogether the sub-Arctic fisheries amount to some 6-8% of the global capture fisheries (Hoel 2018), consisting mostly of high value species.

In the North Atlantic the fisheries take place in the sub-Arctic seas of the Northwest Atlantic, in the waters around Greenland and Iceland, in the Norwegian Sea, and in the Barents Sea where the world’s northernmost commercial fisheries take place as far north as 80°N. Most of these sub-Arctic waters are in the maritime zones of Canada, Greenland, Iceland, the Faroes, Norway, and Russia. There are also areas of high seas beyond national jurisdiction in the Northwest Atlantic, in the Norwegian Sea (“Banana Hole”), and in the Barents Sea (“Loop Hole”). In the Norwegian Sea in particular there is a major fishery for pelagic species in international waters. There are virtually no commercial fisheries in the Arctic Ocean proper – the central Arctic Ocean to the north of the continents.

In the middle of the central Arctic Ocean there is an area of high seas of 2.8 million km² – larger than the Mediterranean. Most of it is however ice-covered most of the year, and biological productivity is very low. There are no fisheries in the European wedge of the high seas area.

Total ice cover in the Arctic Ocean is about 15 million km² in March and about 5 million km² in late summer. The continued impact of global warming is likely to continue to reduce ice cover (IPCC 2019) and by mid-century the central Arctic Ocean could be virtually ice-free in late summer. The largest parts of the central Arctic Ocean are the waters of the coastal states, i.e. Greenlandic, Norwegian and Russian waters in the Northeast Atlantic.

The legal framework for fisheries in the Arctic and subarctic is an implementation of the global framework, with coastal state maritime areas, national management regimes, bi- and trilateral arrangements for cooperation on the management of transboundary fish stocks, as well as several regional fisheries management organisations or arrangements (see below). Most major fisheries are at sustainable levels (Hoel 2018).

In the Northeast Atlantic part of the sub-Arctic and Arctic seas the International Council for the Exploration of the Sea (ICES, established 1902) is a unique mechanism for the provision of scientific advice for fisheries management. Based on data and scientific contributions from member countries, ICES develops comprehensive advice on management measures to be taken, such as total quotas and other regulatory measures. It plays a critical role in the management of all major fisheries and all coastal states in the Arctic as well as the EU are ICES clients (the work of ICES is based on a 1964 treaty). Its working group on Arctic Fisheries has existed for more than 50 years. ICES is an independent scientific organisation where work is science-driven and where advice and the underlying science is developed by international teams and subject to peer review. ICES also plays a leading role in developing advisory tools for ecosystem-based management.

7.2. The EU's influence on Arctic fisheries

7.2.1 Resource aspects

Global

The EU has global aspirations as a responsible and sustainability-oriented actor in ocean affairs. This is reflected in its initiatives on ocean governance (EC website: international ocean governance) and positions in international negotiations of global treaties such as the on-going BBNJ discussions. This stance also aligns with the EU green deal initiatives on biodiversity (EC 2020, COM(2020) 380 final). This has implications for fisheries, as these processes and initiatives over time shape the global norms affecting management of fisheries and trade in fish products.

EU

When it comes to fisheries and fisheries management, the EU is somewhat less energetic, with a substantial footprint in terms of subsidies to fisheries operations (Sumaila et al 2019), positions in international fisheries negotiations that are being questioned with regard to their sustainability, for example tuna, as well as bending rules on e.g. bycatch when fishing in Norwegian waters (Agreed record... 2021).

In the sub-Arctic and Arctic

As pointed out above, Arctic fisheries are in practice sub-Arctic fisheries, taking place in the waters of the coastal states in the north and in the high seas areas of the North Atlantic.

The total EU fisheries in sub-Arctic waters is difficult to calculate but EU landings from the Norwegian Sea amount to several hundred thousand tonnes, most of which are pelagic species (herring, mackerel, blue whiting). As a consequence of Brexit, EU quotas in sub-Arctic waters are reduced from 2021 onwards.

7.2.2 Market aspects

The EU-27 is the world's largest market⁸ for seafood with imports of 6.3 million tonnes in 2018. That year trade in seafood into the EU amounted to EUR 32.3 billion (EC website). Norway and China were the largest suppliers, with imports from Norway amounting to EUR 6.9 billion in 2018 – 26.2% of total imports of seafood. In 2019-2020, exports into the EU-27 constituted 60-65% of Greenlandic and Norwegian seafood exports, 50-55% of Icelandic, 27% of Faroese (by value in EUR, data: OEC, EUMOFA, Responsible Fisheries Iceland).

TOTAL FISHERIES AND AQUACULTURE PRODUCTS

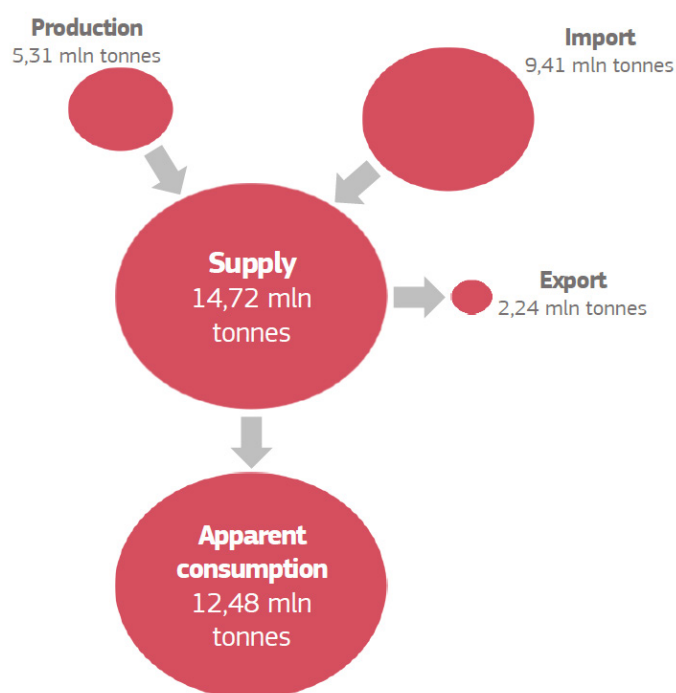


Figure 7.1: EU supply balance 2018.

Source: EUMOFA 2020:26, based on Eurostat

⁸ Where possible, we have relied on sources providing EU-27 figures, i.e. omitting the UK. The main source is Eurostat Fisheries statistics online. We have however in some instances used a report from the European Market Observatory for Fisheries and Aquaculture Products (EUMOFA 2020), which provides more detailed statistics. This is based on figures including the UK and therefore not directly comparable with other figures here (EUMOFA 2020).

The total seafood market of the EU-27 in 2018 – own production (4.1 million tonnes) plus imports from other countries (6.3 million tonnes) - amounted to more than 10 million tonnes. Compared to the landings from its own fisheries at 4.1 million tonnes the EU therefore has a substantial annual deficit of seafood of several million tonnes.

In addition, the EU is also a major exporter of seafood, with about 2.2 million tonnes worth EUR 5.7 million exported. The USA and China were the major markets (EC website). Taking imports and exports together, the EU is the second largest trader of seafood in the world after China (EUMOFA 2020:19) (see figure 7.2).

The total value of EU trade flows of fishery and aquaculture products was over EUR 60 billion in 2019, and the trend is growing rapidly over time.

It is hard to ascertain how much of the imports of seafood originate in sub-Arctic waters, but it can be assumed that most of the imports from Greenland, Iceland, the Faroes and Norway stem from their sub-Arctic seas that make up most of their maritime zones (this includes also aquaculture products, mostly Atlantic salmon). Also, imports from the USA, Russia and Canada may originate in sub-Arctic seas. It is also worth noting that these imports are important to the EU fishing industry, employing a significant number of people in the fish processing industry in the EU. In 2011, Norwegian seafood exports to the EU generated some 21,000 man-years in the EU fish processing industry.⁹

Figure 7.3. below shows that significant amounts of fishery and aquaculture products are imported from all the countries mentioned above in 2019. These are however total imports, and not specifically from the sub-Arctic regions.

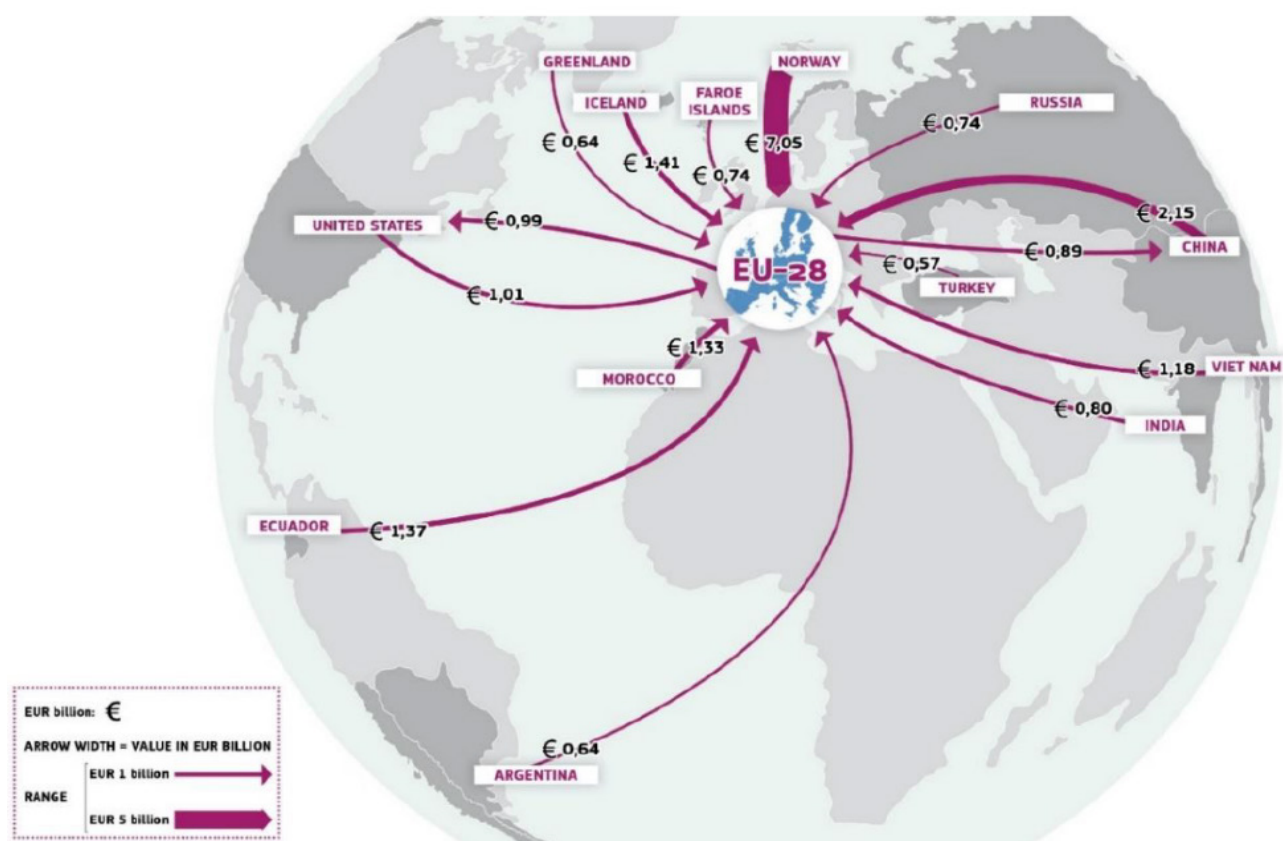


Figure 7.2: Most relevant extra-EU-28 (incl. UK) trade flows of seafood, 2019. Source: EUMOFA 2020: 58, based on Eurostat-COMEXT.

⁹ According to a report prepared by SINTEF for the Norwegian Seafood Federation, pers. comm. 16 March 2021.

It can however be assumed that a large share of the total stems from the sub-Arctic, also in the case of Russia and the US as Alaska pollock is the major species traded.

Altogether imports of seafood from non-EU Arctic countries amount to some EUR 11-12 billion. A large share of this is high value species such as whitefish and salmon. Also, since large amounts of fish are shipped from *inter alia* USA and Norway to China for processing, part of the imports from China of, for example, Alaska pollock could also originate in the sub-Arctic (more than half of EU imports of Alaska pollock come from China. EUMOFA 2020:66).

While the supplies of fishery and aquaculture products from non-EU Arctic countries is very important to the EU – Norway alone supplies one quarter of the imports of fish to the EU (EUMOFA 2020:61), the EU market is also very important to these countries. This applies to Norway, Iceland, and Greenland in particular. About 60 % of Norwegian seafood exports go to the EU (EUMOFA 2020:20).

Overall, the role and footprint of the EU as a seafood market for Arctic countries seem to be much more important than its role as an actor in sub-Arctic fisheries.

7.3. Overview of relevant EU policies

The Common Fisheries Policy (CFP) of the EU has limited application in sub-Arctic and Arctic waters since these areas are outside the EU. The only sub-Arctic waters where the CFP applies to fishing operations is in the Gulf of Bothnia in the Baltic, and fisheries here are very limited. The EU is however party to a number of fisheries agreements, obtaining fishing rights as well as influencing policy developments. This section therefore starts with a brief overview of the CFP, before discussing the relevant international agreements.

7.3.1 The Common Fisheries Policy - fisheries management

The CFP has evolved since the early 1970s, with its first formal adoption in 1980. Upon becoming a member of the EU, a country essentially transfers the authority to manage its fisheries to the community. The European Commission becomes the *de facto* manager, preparing and acting on legislation adopted by the Council and the European Parliament.

In relations with other countries and in international fora dealing with fisheries it is therefore the European Commission that represents the EU. This is of particular relevance in the sub-Arctic fisheries where the Commission is the EU representative in negotiations with other countries.

A fundamental principle of the CFP is equal access to waters (except within 12 nautical miles from shore), allowing vessels from all Member States to fish in EU waters. This principle is however tempered by quota arrangements whereby total quotas for different fish stocks are allocated among Member States. The allocation of total allowable catch (TACs) among countries for each fish stock is set according to a specific formula – the “relative stability” that was negotiated in the early years of the CFP (EC website: TACs).

For most fisheries multi-annual plans for their management have been adopted (EC website: Multi-Annual Plans), aiming at achieving a maximum sustainable yield from fish stocks. Altogether the EU sets annual total quotas for about 75 fish stocks in EU waters. When a TAC is set, the allocation to Member States follows automatically from the “relative stability”. In addition to quota regulations a number of other regulatory measures, relating to fishing gear, fishing areas, and fishing seasons are adopted (EC website: technical measures).

Where fish stocks are shared with other countries or international waters, quotas are set under cooperative bilateral agreements such as the one with Norway or in regional mechanisms such as NEAFC. In EU-internal cases as well as in its cooperation with other countries, scientific advice from ICES is an important basis for decisions on management measures (EC website: Scientific advice).

The CFP is subject to decadal reviews which results in developments in how the EU manages its fisheries and therefore also relations with other countries. The latest version of the CFP was adopted in 2013 (Regulation (EU) No 1380/2013). A significant new measure is a landing obligation aiming to reduce and eventually eliminate waste of fish through discards (EC website: Discarding). The landing obligation has been implemented since 2015 and requires all catch to be retained on board and landed and counted against the quota of the member country in question.

Other aspects of the CFP are policies for capacity development of the EU fishing fleet (EC website: Fishing fleet) and market arrangements (see below). In addition, fisheries are increasingly affected by other measures such as a marine strategy framework directive (MSFD, Directive 2008/56/EC) and biodiversity-related programmes (EC 2020, COM(2020) 380 final). This development is likely to accelerate in the future (Garcia et al 2014).

The control of fisheries, ensuring compliance with regulations, is the responsibility of Member States. Mixed success in this respect has brought a number of adjustments to policy, among other things the establishment of a European Fisheries Control Agency in 2005, which seeks to enhance cooperation among Member States in enforcement of fisheries regulations (EFCA website). In 2008 the EU adopted legislation to prevent, deter, and eliminate illegal fishing (in force since 2010). The Commission can, among other things, take action against states that undermine efforts to combat IUU activities. In this regard there are linkages between fisheries management policy and market policy (see below).

7.3.2 Market policies

General

An important principle underlying the entire EU project is the enhancing of market functioning, through competition rules to ensure the maintenance of the four freedoms of labour, capital, services, and goods. This applies also in the market for fisheries and aquaculture products, currently managed by a 2013 regulation (Regulation (EU) No 1379/2013). The market aspects of the CFP traditionally dealt with organisation of the internal market for fish products, giving producer organisations a central role. Other important elements include marketing standards and rules regarding consumer information (EC website: Market organisation). Over time, environmental aspects and the use of market mechanisms to encourage sustainable practices have been strengthened.

In relation to imports from third countries and the efforts to combat IUU fishing, a policy establishing requirements for catch documentation schemes was adopted in 2008 (in force 2010). This requires flag states to validate the products to be exported to the EU and ensure that they are legal. The EU is now in the process of transitioning this system to an electronic format (EC website: Catch IT System).

The European Economic Area agreement

In relation to Iceland and Norway the 1994 EEA Agreement is important in ensuring access to the EU market for seafood products from these countries. The EEA Agreement allows Iceland, Liechtenstein and Norway (the EFTA states) to participate in the internal market of the EU by incorporating EU EEA-related legislation in their domestic legislation. Fisheries and aquaculture are not part of the agreement, but a protocol to the agreement provides for free access to the EU market for a number of fish products (in the case of Norway several bilateral agreements are also relevant in this context). For other fish products, such as salmon, customs duties increase with the level of processing before entry into the EU market (Melchior 2020). A number of seafood processors have therefore established processing facilities in the EU – Poland is therefore now the largest international market for Norwegian fish.

Another important aspect of the EEA agreement in relation to fisheries and aquaculture is that technical regulations pertaining to veterinary standards are part of the agreement. This is very important for the exports of perishable goods such as fish, as border checks are eliminated (Elvestad 2020).

Marine Mammals

Hunting of marine mammals takes place in most Arctic countries, including Canada (whales and seals), Greenland (whales and seals), Iceland (whales) and Norway (whales and seals). The hunt in Canada and Greenland is considered indigenous, while that in Iceland and Norway is commercial. In the EU there are no commercial interests in hunting marine mammals, but there is a strong lobby opposing the hunting of marine mammals.

A market issue of particular relevance to non-EU Arctic countries is the EU policy towards the import of marine mammal products. Following political pressure from NGOs and initiatives in the European Parliament, the EU in 2009 adopted a regulation banning the import of seal products into the EU market (EC website: Seal hunting). The measure caused markets to collapse and was very unpopular with the Arctic countries and with indigenous communities in Canada and Greenland in particular. The legislation was subsequently modified following a WTO panel ruling.

Greenland

More than 90% of the exports from Greenland are seafood and almost the entire export volume is destined for the EU market. Preferential trade arrangements make Greenlandic products competitive in the EU market (Macfadyen and Cappell 2019).

7.3.3 Fisheries agreements relevant to the sub-Arctic

The engagement of the EU in international fisheries cooperation is part of the CFP, and mandates and implementation of agreements are carried out in the context of the CFP. We can distinguish between bilateral and regional agreements.

Bilateral

The bilateral fisheries agreements of the EU fall into one of two categories: Sustainable Partnership Agreements and Northern agreements (EC website: International Agreements). In an Arctic context the former category applies to Greenland, while those with Norway, Iceland and the Faroes Islands are Northern agreements. While dealing with bilateral relations in fisheries, these agreements are also related to regional agreements or arrangements on the management of fisheries of pelagic species as well as cooperation in the NEAFC (see below). The entire framework of fisheries agreements in the Northeast Atlantic as it pertains to sub-Arctic fisheries is therefore complex.

Norway

The most complicated arrangements and most important agreements are with Norway. Based on a 1980 agreement Norway and the EU meet annually to manage shared fish stocks in the North Sea. With Brexit these talks have become more complex, with three-party talks regarding fish stocks where the UK is involved, and bilateral talks where it is not. Agreement for 2021 was reached in March 2021 (Agreed record... 2021). The agreement also contains an exchange of fish quotas outside the North Sea, providing the EU with access to cod fisheries in the north (10,274 tonnes in 2021), and Norway with access to fisheries in EU waters and to shrimp fisheries in Greenland (which the EU has purchased from Greenland). These exchanges are supposed to be balanced in value. Fisheries around Svalbard have been a subject of disagreements between the EU and Norway.¹⁰

Iceland

The EU Commission website states that the "... agreement with Iceland is "dormant"", meaning that no EU fisheries take place in Icelandic waters under a bilateral agreement (EC website: Agreements).

¹⁰ EU: Note Verbale to Norway of 26 February 2021, URL: <https://data.consilium.europa.eu/doc/document/ST-6714-2021-INIT/en/pdf>; Norway: see three pdf documents in English attached to the Press Release of 12 February 2021, URL: <https://www.regjeringen.no/no/aktuelt/uakseptabel-opptreden-av-eu-i-fiskevernsonen/id2834544/>.

The relationship between the EU and Iceland as regards fisheries management therefore takes place in the various regional contexts addressed below.

Faroe Islands

The EU and the Faroes Islands have annual fisheries consultations on the basis of an Agreement on Fisheries between the European Community and the Government of Denmark and the Home Government of the Faroe Islands (1997). The agreement for 2020 concerned the three pelagic species in the Norwegian Sea and reciprocal access to each other's zones, exchange of information, technical matters, and issues related to control, but no setting of quotas. This agreement is therefore closely related to the regional agreements for pelagic species in the Norwegian Sea.

Greenland

The EU – Greenland Sustainable Partnership Agreement dates back to an initial agreement in 1985 giving the EU access to fisheries in Greenlandic waters, with the EU providing economic support. The 2016-2020 agreement provided for an annual EU contribution of EUR 16 million to Greenland, and access to almost 43,000 tonnes of fish by the EU over the five-year period (EC website: Agreements: Greenland). About half of the quantity was capelin (a low value species), the remainder demersal fish species and prawns (part of which is traded to Norway by the EU). A new Sustainable Fisheries Partnership Agreement (SFPA) was agreed in January 2021 for the coming 4-year period (with another two-year extension possible). The new agreement pertains to the same species as the former, and the annual contribution from the EU will be EUR 16.5 million of which about EUR 3 million is earmarked for development of the fisheries sector in Greenland. In addition, EU fishing vessels will pay access fees. The agreement also addresses monitoring, control and surveillance (TheFishingDaily 2021).

Regional

The North Atlantic has one of the most crowded regional fisheries management landscapes globally, with a number of regional fisheries-management organisations (RFMOs) or arrangements.

The Northeast Atlantic Fisheries Commission

The most important is the NEAFC whose mandate extends from the North Pole southwards to the Mediterranean, delimited to the east by Novaya Zemlya and to the west by Greenland. It has three regulatory areas in the Arctic and sub-Arctic, the northernmost is the European sector of the high seas portion of the central Arctic Ocean. The other two are the Loop Hole in the Barents Sea and the Banana Hole in the Norwegian Sea. NEAFC has adopted a wide range of regulations that apply in all regulatory areas, including the scheme on control and enforcement, protection of vulnerable marine ecosystems, deep sea fisheries, and annual regulations on a series of fish stocks. Members of the NEAFC are the EU, Denmark in respect of the Faroes and Greenland, Norway, Iceland, and – with Brexit – the UK.

The pelagic species in the Norwegian Sea

The management of the three pelagic species of mackerel, herring and blue whiting is complex, as all species straddle the waters of several coastal states, as well as the high seas area that is a NEAFC Regulatory Area. The distribution of these species also varies and changes over time, so not all NEAFC members are coastal states. And with Brexit the role and coastal state status of the EU in the pelagic complex is diminished. Generally, there has not been agreement among all coastal states on the management of all of these pelagic species since the early 2000s. The main reason for this is failure to agree on allocations of total quotas, with several states setting unilateral quotas. Total landings therefore often exceed scientific advice on catch levels. The temptation to free ride on the conservation efforts of others is strong as the short-term economic benefits are substantial, and the fish stocks in question appear to be able to sustain the harvest levels.

The Northwest Atlantic Fisheries Organization

In addition to NEAFC and the pelagic conundrums, there are also several other regional bodies in the North Atlantic with mandates in the sub-Arctic or Arctic. In the Northwest Atlantic, the Northwest Atlantic Fisheries Organization (NAFO) manages fisheries in that region and the EU has significant fisheries there. NAFO has 13 parties, and its regulatory area is surrounded by four coastal states: the US, Canada, Greenland and France (St Pierre and Miquelon).

The central Arctic Ocean Agreement

In the central Arctic Ocean proper, an Agreement to Prevent Unregulated Fishing in its high seas portion was signed in 2018. The process towards the agreement was initiated by the US in 2008, and a first meeting of the five coastal states of the central Arctic Ocean (Russia, USA, Canada, Denmark/Greenland and Norway) was held in Oslo in 2010. The meeting concluded that an understanding of the scientific knowledge of the central Arctic Ocean was needed and this triggered a series of scientific meetings. In 2015 a declaration among the five was signed, stating their intent to refrain from fishing in the high seas area in the absence of a management mechanism, to establish formal scientific research cooperation, and initiate talks with potential distant water fishing nations to include them in the cooperation (NAFO website). Later that year new talks were initiated, now also including Iceland, the EU, Japan, Korea, and China. An agreement was arrived at in late 2017 and the agreement was signed in October 2018. It is not yet in force. The European sector of the high seas portion of the central Arctic Ocean is a NEAFC regulatory area where its regulations apply.

The key elements of the agreement draw on the 2015 declaration: the establishment of a joint program of scientific research and a commitment to abstain from fishing in the absence of a regulatory mechanism. The latter is a *de facto* 16-year moratorium, to be extended in five-year increments as long as no one opposes it. The scientific cooperation initiated by the coastal states in 2010 has continued in a series of meetings since, and in 2017 a science plan and an implementation plan were adopted, setting out a program for addressing questions relating to the potential for future commercial fisheries in the high seas in an ecosystem context. With the vast distances and difficult operational conditions in the central Arctic Ocean this is a very costly program. With no fishing in the decades to come, scientific research is likely to remain the main activity under the agreement for the foreseeable future. The EU hosted a meeting of the provisional scientific coordination mechanism in 2020. An important aspect in this regard is the key role ICES plays in organising marine science and developing scientific advice in the Northeast Atlantic. ICES has participated actively in the scientific meetings mentioned above.

Other

A number of other RFMOs or arrangements exist in the North Atlantic, such as the North Atlantic Salmon Conservation Organization (NASCO), the North Atlantic Marine Mammal Commission (NAMMCO), the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS). The EU is a member of a number of other RFMOs in other ocean areas, such as the North Pacific Fisheries Commission (NPFC).

7.4. Impacts of EU policies and actions on Arctic fisheries

7.4.1. A mutually beneficial situation

The broad picture emerging from this assessment is that the impact of EU policies and actions is much larger in the market for seafood products from the sub-Arctic than it is in relation to management of fisheries and aquaculture there. The Arctic countries with small populations and large maritime areas have a huge surplus of resources, while the EU, with a population of almost 500 million and small ocean areas, has a significant deficit of seafood.

This is a mutually beneficial situation, as most of the seafood produced in the non-EU European Arctic is destined for the EU market. Mostly due to the EEArea Agreement, seafood products from Iceland and Norway enjoy relatively favourable terms of trade on the EU market, even though fisheries and aquaculture is not part of the EEArea Agreement itself. Greenland has preferential trade arrangements also providing favourable terms of market access. At the same time, EU vessels gain access to sub-Arctic waters through a number of arrangements: bilateral agreements, NEAFC, and the annual agreements on pelagic species in the Norwegian Sea, parts of which are in the sub-Arctic. The latter is by far the most important to the EU.

7.4.2. Brexit diminishes the EU's presence in sub-Arctic fisheries

Brexit has reduced the EU share of fisheries in the sub-Arctic. The EU is no longer a coastal state in the Norwegian Sea and its role in relation to the pelagic complexes there is reduced. At the same time, the UK is becoming party to agreements such as the Northeast Atlantic Fisheries Commission. This is consistent with the international legal framework for the oceans, which defines the roles of states relative to the oceans and the resources therein.

7.4.3. The central Arctic Ocean Agreement

While not yet in force, the implementation of the agreement to prevent unregulated fishing in the central Arctic Ocean occurs only in the fisheries management context where the EU is a fully-fledged member on a par with Arctic countries. The EU was an active participant in the negotiation of the agreement and has contributed substantively to the development of its research agenda, thereby having significant impact on the scientific program. That impact has been reinforced by the funding of relevant research projects. As marine scientific research is likely to remain a key issue for the activity under this agreement, this is an area where EU impact can remain strong. It is however not likely to result in fishing opportunities, as the oceanographic conditions are not favourable for fish and the agreement entails a 16-year *de facto* moratorium on fishing which continues in five-year intervals as long as no party objects.

7.4.4. Marine mammals

The EU policy regarding trade in products of marine mammals has had significant impacts on indigenous communities in the Arctic by affecting the access to markets and the reputation of products of marine mammals.

7.5. Policy options

P27. Contributing to the scientific work and cooperation of the central Arctic Ocean fisheries

As the Agreement to prevent unregulated fishing in the central Arctic Ocean brings a *de facto* “moratorium” on fishing for the foreseeable future, marine scientific research will be the most important activity under the agreement. The EU could contribute substantially to sustaining and strengthening ongoing scientific cooperation by a number of actions: first of all, it is important to support continued engagement of ICES in the implementation of the science plan, as ICES has the scientific framework in place for *inter alia* data management, maintenance of scientific integrity and provision of scientific advice. Second, it is important that the EU contributes expertise in fisheries research to the work of the Provisional Scientific Coordinating Group (PSCG), and third that it continues to provide economic support for fisheries science.

8. Maritime transport and its environmental impacts

8.1. Arctic maritime transport: overview

Maritime transport throughout the Arctic region has undergone sustained, and in some parts, significant growth over the past decade.¹¹ The continued decline of sea ice, the resulting improved access to natural resources and major investments in the sector, and new developments in ship technology are the primary catalysts of increased shipping activity throughout the Arctic Ocean. In addition, geopolitical interests, improved infrastructure, and evolving regulatory frameworks continue to influence maritime activity and its environmental impact in the region, and the EU's participation in and contribution to the sector. The development of natural resources, primarily natural gas and crude oil, along Russia's Arctic coastline and their export to Europe and Asia is the primary driver of increasing Arctic shipping activity. Arctic traffic volumes have undergone rapid growth, especially along Russia's Northern Sea Route, but increasingly also throughout Norway's Arctic coastal waterways. The vast majority of traffic comes from destination shipping, not from transit shipping. Marine transport is the Arctic's fastest-growing economic sector as most activities in the region – such as oil and gas development and related large-scale infrastructure projects, cruise-based tourism, fisheries, and transit shipping – all rely on seaborne transport.

As such, Arctic shipping sits at the nexus of a host of economic activities in the Arctic. Despite ongoing and rapid ice melt, conditions for Arctic shipping remain challenging, especially outside the short summer season. Obstacles range from poor weather and ice conditions, incomplete or inaccurate marine charts which in the past have led to accidents, to challenging satellite-based communication and navigation, and limited rescue capabilities. These factors can enhance the risk for environmental impact from maritime transport in the Arctic. Over the past decade substantial investments have been made into Arctic shipping infrastructure including new or expanded ports, search and rescue assets and facilities, and improved collection and distribution of sea ice information. In addition, advances in ship technology have significantly expanded the operational envelope of Arctic shipping. In total more than 6,000 vessels are estimated to operate in the Arctic each year, of which 1,600 are fishing vessels (AMSA 2009). The vast majority of these vessels are below 300 tonnes gross weight (GT) and their environmental impact is less significant than that of the 1,700 (approximately) large vessels, which can be tracked via the satellite-based automatic identification system (AIS), travelling in the region that this chapter focuses on. The potential environmental impacts from the sector in the Arctic are manifold and growing. They range from airborne pollutants such as carbon dioxide (CO₂), black carbon (BC), nitrogen oxide (NO_x) and sulphur oxide (SO_x), emitted by ships' engines to water-based pollutants, including sewage, greywater, bilge and ballast waters. This chapter focuses on the impacts of CO₂ and BC. However, NO_x and SO_x from shipping remain a concern, even if stricter limits were introduced for the former under the IMO 2020 global sulphur cap. Environmental harm also includes impacts not arising from pollution such as increasing levels of shipping noise. Noise from shipping traffic can affect the ability of marine animals to effectively use sound waves to, among other things, communicate, forage, and navigate. Additional environmental impacts arise from artificial light sources, such as high-powered searchlights employed by icebreakers during the polar night, which disrupts Arctic fish and zooplankton behaviour to a depth of 200 metres (Berge et al. 2020). In addition to environmental impacts arising from standard operation of vessels, the region also faces increasing risk of environmental harm from accidents and spills. Over the past decade the region has witnessed a number of near-misses with respect to oil spills, including vessels colliding with each other and vessels running aground. Marine transport and the resulting environmental impact, represents a significant linkage between the EU and the Arctic. Hundreds of EU MS-flagged or EU-based entities-owned vessels travel to, from, and within the region. Many more carry

¹¹ For the purpose of this chapter on marine transport the Arctic region is defined as the Polar Code area.

European products and passengers across the region or others call at EU ports at the beginning or end of Arctic voyages. Up to now, no comprehensive collection of data on the EU's contributions to emissions from marine transport in the Arctic region has been assembled (see, e.g. AFPA 2010). This report represents, to the authors' knowledge, the first comprehensive quantitative assessment of the EU's share of select pollutants – CO₂ and BC – emitted by EU MS-flagged or owned vessels. It furthermore aims to provide a guiding estimate of indirect EU contributions to these emissions e.g. from vessels carrying European cargo or passengers or travelling to or from EU ports via the Arctic. Data on shipping activity include all vessels above 300 GT that navigated in or passed through these waters in 2019. Data were collected from satellite-based AIS, which is mandated for vessels above 300 GT under the Convention on the Safety of Life at Sea (SOLAS). The data include a number of vessel types, including LNG carriers, oil and product tankers, cruise and passenger ships, general cargo and supply vessels, and research and government vessels.

In 2019, a total of 1,718 unique vessels, above 300 GT, were identified in the Arctic region. Of these at least 269 vessels sailed under a flag of an EU Member State or were owned or operated by a company based in the EU.¹² Over the past decade shipping volumes, and correspondingly the environmental impact, have grown substantially. On Russia's Northern Sea Route, for which the most accurate and timely data is available compared to other less frequented parts of the Arctic Ocean such as Canada's Northwest Passage, cargo volumes have grown ten-fold over the past decade to more than 32 million tonnes in 2020 (Saul 2020). The vast majority of this increase in activity comes from the development of Arctic oil and gas reserves, both onshore and offshore, in the waters of or territory adjacent to the Barents and Kara Seas. The primary projects are Russia's Yamal LNG, Arctic LNG II, Kara Gate oil terminal and Prirazlomnoye oil platform as well as Norway's Melkøya LNG plant and Goliat oil platform. Together these installations account for more than 80% of Arctic maritime transport by cargo volume.

Maritime transport related to the development of hydrocarbon resources in the Arctic is two-fold. First, oil and gas projects mandate massive infrastructure development requiring hundreds of voyages to deliver construction materials, prefabricated structures, and supplies. Second, once in production the facilities rely on seaborne transport to deliver resources to markets in Europe and Asia. In 2019 the EU imported 15.07 million tonnes of Russian Arctic LNG produced by Novatek, representing 86% of LNG shipments from the Russian Arctic. The remaining 14%, equal to 2.41 million tonnes, were delivered to Asia.¹³ In addition the region has witnessed an increase in other types of shipping. Arctic expedition cruise ship tourism has experienced a three-fold growth in passenger numbers between 2009 and 2019 with a number of larger traditional cruise vessels now also carrying passengers into the region. General cargo voyages have also increased substantially to deliver construction materials and re-supply civilian and military installations. In addition to the rapid increase of vessel traffic into and out of the Arctic Ocean the region sees a small number of transit voyages from Europe to Asia or vice-versa. This number has remained relatively stable accounting for less than 100 voyages per year and traditionally consisting of bulk and general cargo being ferried between ports in East and Southeast Asia and Western Europe. Chinese shipping company COSCO is the largest single operator of these transit shipments having conducted more than 50 trips over the past five years. Arctic shipping routes allow for distance savings of up to 40% between certain pairs of ports in Northern Europe and North-East Asia. Despite these shorter distances transit shipping will remain limited due to economic and logistical factors. The bulk of shipping in the region will continue to come as a result of the transport of hydrocarbon resources from the Arctic to markets in Europe and Asia.

¹² The data set does not contain vessels below 300 GT, which includes the majority of fishing vessels and small private pleasure craft, which are traditionally not equipped with AIS.

¹³ The EU also receives LNG and crude oil shipments from the Norwegian Arctic, *see* section 9. However, as the areas of productions are outside the Polar Code area of the Arctic, which is used as geographic definition for this chapter, they are not included in the assessment of environmental impacts from maritime transport.

Decreasing and thinner ice coverage has resulted in a longer navigable season during which vessels with low ice-class hulls or even no ice classification can navigate across large parts of the Arctic Ocean. Generally, summer navigation in the Arctic Ocean lasts around four months, from the end of July until the end of October. However, the seasonal navigational window will likely continue to expand. Outside this period maritime transport in the region often requires icebreaker escort although specially designed and ice-capable oil and LNG carriers can often navigate independently i.e. without icebreaker escort in late spring and early winter. Arctic sea ice extent has now declined to the point where some specialised vessels no longer require icebreaker escorts even during the heart of winter. In fact, these types of unassisted voyages are now feasible as late as January and as early as May leaving a period of just 4-5 months where nuclear icebreaker assistance is needed. This trend is likely to continue allowing a growing number of polar-class vessels as well as ships that were not originally designed for travel in ice-covered waters, to navigate in the Arctic. These factors increase the environmental impacts of maritime transport from air- and waterborne emissions as well as from accidents and spills.

8.2. Arctic footprint of the EU's maritime transport sector

Assembling a comprehensive data set to accurately describe and quantify the EU's contribution to the environmental impact arising from maritime transport in the Arctic is challenging. Even with sufficient data, quantifying the EU's impact is highly complex due to differing ship specifications, such as type of fuel or engine, and total distance travelled. Furthermore, specifying the EU's contribution from a particular source of emissions, such as a cruise ship that carries EU passengers, is an inherently imprecise exercise. This report uses data from satellite-based AIS of vessels above 300 GT travelling in the Arctic during 2019 to calculate CO₂ and BC emissions of EU MS-flagged as well as EU-owned and operated vessels.¹⁴ In addition the data are used to infer the EU's indirect emissions, e.g. from vessels delivering LNG to the EU market, carrying EU goods or passengers, or arriving at or departing from EU ports *en route* from or to the Arctic.

For 2019, the data set identifies 1,718 unique vessels above 300 GT emitting 2.8 million tonnes of CO₂ and 355 tonnes of BC. Out of this total, 259 or 15.1% of all vessels travelled under a flag of an EU MS accounting for around 688,000 tonnes of CO₂ emissions and 53.5 tonnes of BC emissions. As a result, EU-flagged ships account for 24.5% of CO₂ emissions and 15% of BC emissions. In addition, at least 10 vessels, representing 0.6% of all ships, fly flags of non-EU states but are owned and operated by companies based in EU Member States. This data may not include all vessels that fall into this category present in the Arctic during 2019 due to complex ownership structures. At a minimum this category accounts for around 40,000 tonnes of CO₂ emissions and 3 tonnes of BC representing 1.4% and 0.8% of the total respectively. This constitutes the EU's direct contributions to combined emissions of around 730,000 tonnes of CO₂ and 56.5 tonnes of BC representing 26% and 16% of the total CO₂ and BC emissions in the Arctic from maritime transport in 2019.

The EU's share of emissions from maritime transport, however, is not solely limited to direct contributions. One must also consider a number of indirect contributions not arising from EU MS-flagged or EU companies' vessels. Indirect emissions include e.g. emissions from the maritime transport of Arctic LNG bound for the European market and emissions from cruise ships carrying European passengers.

| | CO ₂ | BC |
|---------------------------|-----------------|------|
| EU Flagged Vessels | 688,499 | 53.5 |
| EU Operated/Owned Vessels | 38,896 | 3.0 |
| All EU Vessels | 727,395 | 56.5 |
| All Vessels in Arctic | 2,800,985 | 355 |

Table 8.1: Direct Emissions from Maritime Transport in the Arctic, in tonnes (2019), The data are based on complex calculations to ascertain the individual emissions of more than 1,700 ships based on distance travelled, ship and engine type, average speed, and ice conditions the vessel travelled in.

¹⁴ The raw AIS data were provided by the International Council on Clean Transportation, an independent nonprofit organization.

Calculating these types of indirect contributions is challenging and inherently imprecise. However, rough estimates can be inferred for the transport of LNG and cruise tourism by looking at the overall data.

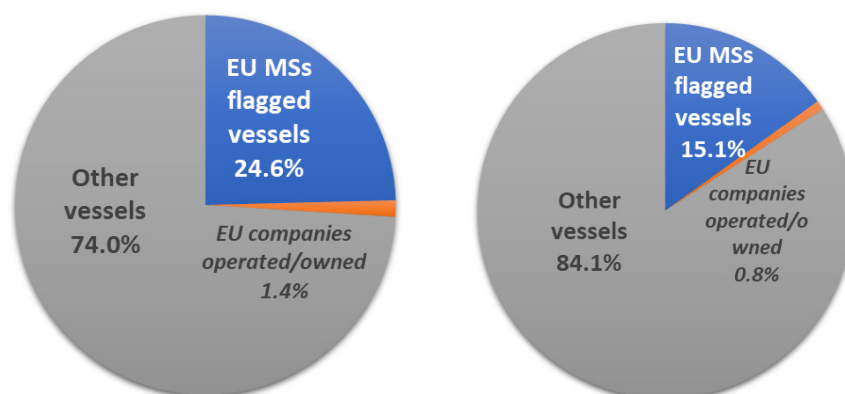


Figure 8.1: Direct EU share of CO₂ (left) and BC emissions (right) from maritime transport in the Arctic (2019).

In addition to direct EU emissions from LNG and cruise ships, there are indirect emissions from the transport of crude oil and oil products to European ports, the carrying of European goods via the Arctic, and emissions from vessels arriving at or departing from EU ports *en route* from or to the Arctic. With the existing data set it is not possible to accurately calculate or estimate the volume of these indirect emissions. However, due to the small scale of these types of Arctic shipping, their impact on EU emissions is limited. The EU indirectly accounts for at least 153,000 tonnes of CO₂ and 3 tonnes of BC emissions from maritime transport in the Arctic. Indirect EU emissions represent 5.5% of all maritime transport-related CO₂ emitted in the region and 0.8% of BC. The EU's total CO₂ and BC emissions (direct and indirect) arising from maritime transport in the Arctic are substantial. The EU accounts for at least 880,000 tonnes of CO₂ and 59 tonnes of BC representing more than 31% and 16% of these types of pollutants respectively.

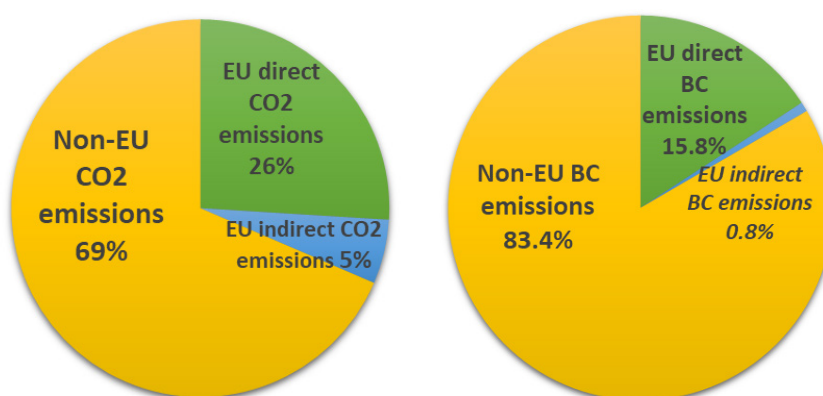


Figure 8.2: EU Share of total CO₂ (left) and BC (right) emissions from maritime transport in the Arctic (2019)

Emissions from the transport of LNG in the Arctic account for more than half of the EU's total CO₂ emissions related to maritime transport in the region. Based on the categories set forth in the Inception Report which aims to describe the level of EU pressure or contribution as low, medium or high, the EU's total contributions to emissions from maritime transport falls into the high category for CO₂ and the medium category for BC. For some subcategories, such as LNG shipping and cruise ships, the EU's impact can be described as very high as it far exceeds a share of 50%.

The overall environmental impact from cruise ships is substantial. In addition to the airborne emissions described above the average cruise ship produces around 30 litres of sewage per passenger per day and generates more than 95,000 litres of bilge water. Almost 90% of cruise ships travelling in

the Arctic use heavy fuel oil (HFO), the dirtiest and cheapest type of fuel. With this type of fuel, BC emissions are of particular concern as backed up by the data.

| | CO ₂ percent | EU CO ₂ Footprint | BC percent | EU BC Footprint |
|----------------------------------|-------------------------|------------------------------|-------------------|-------------------|
| EU Share of All Emissions | 31.44 | High | 16.62 | Medium |
| LNG | 72.36 | Very High | 75.69 | Very High |
| Cruise Oil and Oil Products | insufficient data | insufficient data | insufficient data | insufficient data |
| Cruise Ships | 60.53 | Very High | 61.90 | Very High |
| General Cargo and Bulk | insufficient data | insufficient data | insufficient data | insufficient data |
| Other | 13.75 | Medium | 11.83 | Medium |

Table 8.2: EU Footprint of CO₂ and BC Emissions from Maritime Transport 2019.

8.2.1 EU footprint in 2030 or 2040

Maritime transport and the resulting environmental impacts in the Arctic are expected to continue to experience rapid growth. According to most Arctic shipping forecasts, e.g. by AMAP, airborne emissions could double by 2030 and quadruple by 2050 under some projections of Arctic vessel traffic (WWF 2016). How will growing traffic increase the EU's footprint from maritime transport? While the EU's absolute emissions from maritime transport will experience continued growth, the EU's share of all maritime transport emissions in the region will likely decrease, as non-EU related shipping volume will expand more rapidly than EU-related volume. In 2019 the EU accounted for around 31% of CO₂ emissions from maritime transport in the Arctic. This share is estimated to decrease substantially to around 14% primarily due to the fact that the EU will be importing a decreasing share of Russian Arctic LNG. Nonetheless, emissions from LNG transport will continue to represent around half of all EU CO₂ emissions from maritime transport in the Arctic.

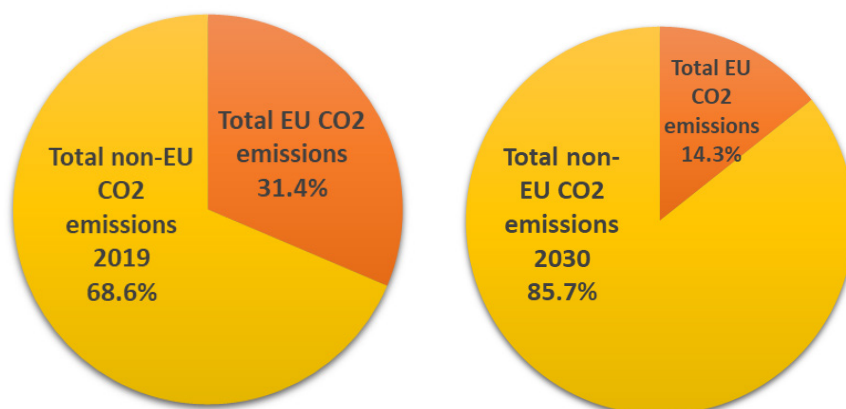


Figure 8.3: EU share of total CO₂ emissions 2019 (left) and estimate for 2030 (right).

Similarly, the EU's share of BC emissions, which was around 16% in 2019 is estimated to decrease by more than 50% to around 7%. The majority of BC emissions continue to arise from cruise ships as well as other types of shipping.

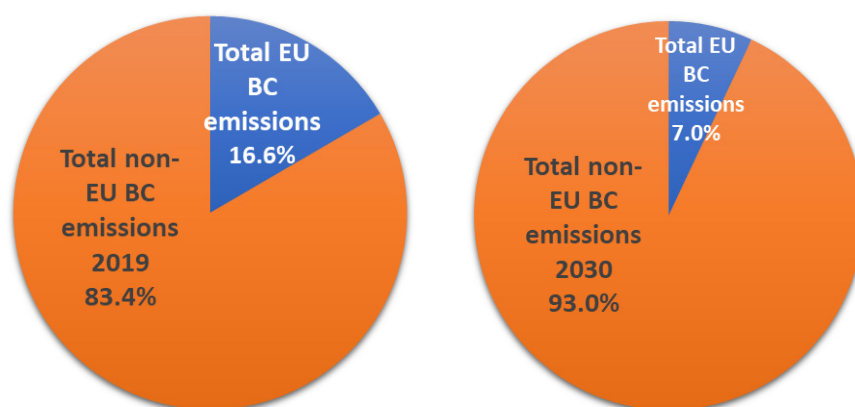


Figure 8.4: EU share of total BC emissions 2019 and estimated share 2030.

It is important to note that estimates for emissions from LNG and cruise ships are based on conservative forecasts. If the EU were to increase the amount of LNG it imports from the Russian Arctic or if EU companies make further investments in ice-capable LNG carriers, the EU's share could potentially remain close to current levels. Similarly, the EU's share of emissions from cruise ships could increase well above the forecast range if European cruise companies order and operate additional Arctic-capable vessels. By 2030 it is highly likely that LNG carriers continue to constitute the EU's largest category in absolute CO₂ emissions from maritime transport. The EU's impact as a share of all emissions will be greatest in the cruise ship subsector, where the EU will account for more than 60% of all cruise ship emissions in the Arctic.

| | CO ₂ percent | EU CO ₂ Footprint | BC percent | EU BC Footprint |
|----------------------------------|-------------------------|------------------------------|-------------------|-------------------|
| EU Share of All Emissions | 14.26 | Medium | 7.03 | Medium |
| LNG | 11.31 | Medium | 11.10 | Medium |
| Cruise Oil and Oil Products | insufficient data | insufficient data | insufficient data | insufficient data |
| Cruise Ships | 60.53 | Very High | 61.90 | Very High |
| General Cargo and Bulk | insufficient data | insufficient data | insufficient data | insufficient data |
| Other | 14.10 | Medium | 12.12 | Medium |

Table 8.3: Estimated EU Footprint of CO₂ and BC Emissions from Maritime Transport, 2030.

8.3 Overview of relevant EU policies

The Arctic states and the broader international community, including the EU, have recognised and begun working towards addressing the environmental impacts of increased maritime transport in the region. A number of international agreements relating to shipping in the Arctic, primarily under the auspices of the IMO and the AC, have been passed and implemented over the past decade. The EU is a primary destination for raw materials and natural resources produced in and exported from the region via maritime transport. As examples, more than 80% of LNG produced in the Arctic was delivered to Europe in 2019, with similar numbers expected until at least 2024 (GIIGNL 2020). Despite this close economic interconnectedness between the Arctic Ocean and the EU as a marketplace and destination for Arctic products transported via the sea, the EU's influence over and ability to shape Arctic shipping policy has been very limited. While several EU members are Arctic states, none of them are Arctic coastal states, hampering the EU's ability to pursue and implement regulatory or legislative actions applicable to the Arctic Ocean under the law of the sea. Furthermore, the EU often shares competences for issues such as

maritime transport with its Member States or is not a member of international organisations such as the IMO or the AC. Thus, the impact of the EU's policies and actions on Arctic maritime transport is constrained due to jurisdictional and geographical factors. Despite this fact the EU has long expressed an interest in maritime matters and pollution, and has developed its maritime and Arctic policies accordingly. The EU, and its Member States, have for long striven for an active role in tackling maritime emissions (EC 2005) and have been instrumental in brokering and securing recent regulations for the sector, including the IMO's recent commitment to reduce emissions from shipping by at least 50% by 2050. In general, among other pathways, the EU can exert influence via flag state control, port state jurisdiction, knowledge generation, connectivity and surveillance enhancement, and inputs into the development of international standards for Arctic shipping.

Importantly, the EU is already active in the international law of the sea, for example through the coordination of efforts of Member States in international fora such as the IMO and the AC, giving the EU the potential to influence policy-making with regard to the Arctic Ocean. Through participation in the creation of policy the EU can ensure that increases in shipping activities are accompanied by appropriate maritime environmental regulations and standards. In recent years, the EU has significantly expanded its maritime policy activities, with a view to facilitating a rules-based order at sea. As part of its Arctic policy the EU has emphasised the "importance of respecting international law principles, including the freedom of navigation and the right for innocent passage" (Ringbom 2017) and has favoured an international approach to rule-making through the relevant bodies of the IMO or the AC. Examples of such actions are the Polar Code, the Arctic Search and Rescue Agreement, and the Arctic Marine Oil Pollution Preparedness and Response (MOPPR) Agreement. While the EU Member States control, either through flag or ownership, a significant share of vessels operating in the Arctic today, and could use this position to create, implement, and enforce regulations aimed at reducing the environmental impacts from EU MS-flagged vessels, it has shied away from this approach in the past.

During the recent past the EU has supported and coordinated a number of international regulatory efforts between Member States. The most noteworthy are the IMO's Polar Code, the pending IMO HFO ban, and the AC's Arctic Search and Rescue Agreement, and the MOPPR Agreement. The EU has supported and encouraged IMO action towards expanding existing and developing new guidelines for ships operating in polar waters culminating in the passing of the Polar Code which took effect at the beginning of 2017. The EU Commission, which is an observer to the IMO, coordinated EU Member States' positions and thus, within the limits of its institutional role in the IMO, contributed to the development of the Polar Code to address safety and environmental concerns related to increased Arctic shipping. The Polar Code addresses the safety and environmental concerns arising from navigation in polar waters. The Code applies to all vessels above 500 GT, but exempts state ships, pleasure craft and, noteworthily, fishing vessels. The new rules were implemented as amendments to existing IMO conventions such as MARPOL (73/78) and SOLAS (1974). Among a host of mandatory rules, the Polar Code specifies requirements for ship construction and design, crew manning and training, and pollutants such as bilgewater discharge.

EU institutions have continually supported an HFO ban for the Arctic and encouraged Member States to take a vocal stance in support of the phasing-out of this type of fuel in the region (e.g. the European Parliament, see EP 2016). Furthermore, the EU Parliament, with broad support by most political groups, also called for a ban on the use and carriage of this type of fuel. The use of HFO results in high emissions of air pollutants, including black carbon, with significant impact on regional climate, forcing serious health effects on local populations. Furthermore, in the event of an accidental spill, the fuel represents a significant hazard to the marine environment and clean-up is complicated by Arctic climate and geography. The adoption of an HFO ban has been under discussion for much of the past decade. At the end of 2020 the IMO's Marine Environment Protection Committee moved to ban the use and carriage of HFO and the ban is expected to be formally adopted by the full IMO assembly during 2021. The proposed ban, however, has been criticised by environmental advocates and industry experts as insufficient as it allows for a number of exemptions for vessels operating under the flags of Arctic

coastal states to continue using HFO, *de facto* delaying the entry into force of the ban until 2029. According to some studies in its currently proposed form, the ban would allow three quarters of vessels operating in the Arctic to continue using HFO until close to the end of the decade and reduce BC emissions by only 5% (Reuters 2020). An example of close cooperation between the EU and international organisations to address the harmful environmental impacts from maritime transport, in this case the IMO, can be found in the 2020 sulphur cap. The cap reduces the maximum sulphur content of marine fuels. From 1 January 2020, the maximum sulphur content of marine fuels is reduced to 0.5% (down from 3.5%) globally – reducing air pollution and protecting health and the environment (Antidormi n.d.). Sulphur oxide (SOx) emissions from ships' combustion engines cause acid rain and generate fine dust that can lead to respiratory and cardiovascular diseases. This effort comes after a concerted effort by the EU to reduce the sulphur content as part of its Sulphur Directive in 2012 (Directive 2012/33/EU) and 2016 (Directive (EU) 2016/802). Even more stringent limits were set in the Sulphur Oxides Emission Control Areas (SECAs) of the North Sea and the Baltic Sea, which have limited sulphur content to 0.1% since 2015. This EU legislation on sulphur content in marine fuel implemented the most recent MARPOL limits and extended them to Finland and Estonia, which had not originally endorsed MARPOL amendments.

The EU has supported and advocated implementation of the Gothenburg Protocol aimed at reducing black carbon emissions (Council Decision (EU) 2017/1757). This effort is especially relevant to maritime transport in the Arctic as the impact of BC emissions in the Arctic has a higher climate forcing component than in other parts of the world. In order to further assess and study the impact of black carbon on the region and to develop a collective response to reducing this type of emission, the EU has funded a 3.5-year project on black carbon in the Arctic (EC FPI 2019). The Action on Black Carbon in the Arctic (EUA-BCA) is funded through an EU Partnership Instrument from January 2018 until June 2021 and focuses on improving the knowledge base, increasing awareness and developing technical knowledge. The scope of the EUA-BCA project also includes black carbon emissions from shipping. The EU is a major investor in scientific research and contributes significantly to Arctic research and cooperates with international partners to study the impact of climate change and pollution, including from maritime transport, on the region. Especially noteworthy are the EU's spaceborne marine monitoring capabilities which can assist in measuring pollution and verifying compliance with existing maritime rules in the region. In this respect, the Copernicus program, which is an EU Earth observation program, delivers space-based products from a number of dedicated Sentinel satellites. Through this program the EU aims to provide the Arctic region with safe and reliable maritime navigation technology (Boniface et al. 2020).

The EU's satellite-based radionavigation system Galileo also contributes to navigation and communication needs in the region. Together these efforts enhance the safety of navigation across the Arctic. The SafeSeaNet, a vessel traffic monitoring and information system, operated by EMSA enables Member States, Norway and Iceland to provide and receive information on ships, ship movements and hazardous cargoes. Apart from providing monitoring services, the EU has recently developed capacities to respond to emergencies both within and outside the waters of EU Member States (in fact 45% of responses take place outside the EEZs of EU Member States). EMSA manages a network of oil recovery vessels and stockpiles of specialised equipment that can be mobilised via the EU's Emergency Response Coordination Centre (ERCC) to respond to maritime emergencies. The Agency can also assist in responding to maritime incidents involving chemicals or hazardous and noxious substances (HNS) by rapid provision of expert information and advice on chemical substances to support the decision-making process.

Observations from the Copernicus program are provided by both mission-specific Sentinel satellites as well as existing national or international missions. Among Copernicus' many services of particular relevance to maritime transport in the Arctic are the Copernicus Maritime Surveillance Service (CMS), for which the EMSA is responsible, the Copernicus marine service for environmental monitoring of ocean and sea-ice (CMEMS), and the Copernicus Atmosphere Monitoring Service (CAMS). CMS

provides maritime safety and security including ice and iceberg monitoring, prevention of accidents and collisions, vessel routing and search and rescue. The directive on vessel traffic monitoring and information system (2002/59/EC) directly refers to sea-ice requiring that Member States provide information on ice conditions, recommend routes and icebreaking services, and request certification documents commensurate with the ice conditions. This is based on arctic ocean and sea-ice forecasting from CMEMS. CMS further contributes to pollution monitoring through rapid detection and early warning of marine oil spills, including detection and tracking of illegal ship-source pollution, identification of possible polluters, and monitoring and drift calculation of oil over time following a large-scale accident. CAMS provides tracking of GHG emissions, including those resulting from shipping. With respect to the Arctic it uses actual ship characteristics and tracks to estimate GHG emissions, reactive gases and aerosols from shipping traffic (Copernicus website). Future missions may contain dedicated Arctic components discussed as part of EU Arctic policy and include up to six new Sentinel satellites. Of particular relevance to maritime transport are improved sea ice monitoring and iceberg detection and efforts may include the ability to detect bilge water, sulphur and CO₂ emissions, including identification of anthropogenic CO₂ hot spots such as maritime traffic.

Via Horizon 2020, the EU has also been investing in research and technological development towards low-carbon shipping. A good example is a recently launched EUR-10-million project “deCarbonising sHipping by Enabling Key technology” (CHECK), which investigates low carbon energy sources and systems for long-distance shipping, including hydrogen fuel, wind power, electric batteries, heat recovery, air lubrication, and anti-fouling technology.

8.4 Policy options

It is important to note that any potential EU efforts to work towards a reduction of the environmental impacts from maritime transport in the Arctic occur against the backdrop of substantial economic development and interest in the region. While the EU’s role in the Arctic generally, and in maritime transport in the region specifically remains vague and its ability to unilaterally create rules directly applicable to the region is constrained due to jurisdictional and geographical limitations, it can nonetheless aim to positively influence the drafting of regional or global rules, especially in conjunction and in coordination with its 27 Member States. The EU’s previous efforts and work towards the strengthening of environmental rules in maritime shipping, such as IMO 2020 (sulphur cap), the IMO Polar Code, and the upcoming IMO HFO ban for the Arctic, show that working through international organisations to achieve broad and universally applicable global regulatory schemes can be an effective tool, though processes can be lengthy and lead to “lowest-common denominator” outcomes. Yet, this least controversial approach has been the EU’s favoured policy approach to rulemaking (Ringbom 2017).

P28. Strengthening the Polar Code

Currently the IMO Polar Code only applies to merchant ships and passenger vessels, but notably exempts fishing vessels and ships under 500 GT. The EU and its Member States could support efforts to incorporate Arctic fishing vessels and vessels under 500 GT, such as private craft or small cargo ships, into the existing international regulation of the Polar Code. Such new provisions would not only enhance the safety of fishing vessels and private water craft, but would offer further protection of the marine environment with respect to water based pollutants from discharges and spills. The risk of loss of life and pollution from discharges or spills from these non-SOLAS vessels is substantially higher than for vessels currently covered by the Polar Code. The so-called “Phase 2” of the Polar Code, which would expand regulations to these types of vessels, has been deferred by the IMO several times (IMO 2020).

P29. Strengthening Port State Control

The primary options for the EU, working through its Member States, to unilaterally regulate emissions from shipping in the Arctic come from the jurisdictional mechanisms available under coastal state, flag state, or port state control. The EU has in the past shied away from using flag state control to impose regulations on international shipping (Ringbom 2017). It would have to work directly with Member States to design and implement such new rules, almost certainly encountering resistance due to a number of factors. Requiring stricter environmental standards only from EU-flagged vessels would place these ships at a competitive disadvantage to non-EU-flagged ships and would likely result in operators changing the flag state to circumvent new environmental regulations. In light of the above, which limits the EU's ability to exert regulatory influence over Arctic shipping based on coastal state jurisdiction and flag state control, port state control offers a feasible pathway to strictly enforce existing regulations for maritime transport in the Arctic (Ryngaert and Ringbom 2016). While PSC is limited to implementing international rules rather than shaping or creating new ones, the EU has long utilized the port state capacity of its Member States under the Paris MoU to regulate the safety and environmental impact of shipping within Europe (Directive 2009/16/EC, Commission Implementing Decision EU/2015/253). Currently Europe is a key destination for Arctic shipping traffic with more than a third of all vessels travelling to and from the Arctic calling at EU ports. Port state control allows for the inspection of vessels, including foreign-flagged ones, in national ports to ensure that a ship, its equipment and crew are in compliance with international regulations, such as the Polar Code amendments to SOLAS and MARPOL. With a substantial share of Arctic shipping traffic bound for or originating in European waters, PSC offers a direct pathway for the EU to implement and enforce existing as well as future rules related to Arctic shipping. In addition to regulations related to vessel specifications and crew training, PSC also allows states to audit and enforce pollution practices. However, it is important to note that the ability to assert jurisdiction over violations of international pollution regulations is often limited to those violations that occur in the jurisdictional zone of the port state, i.e. internal waters, territorial sea, or exclusive economic zone (Bardin 2002). Since the EU has no jurisdiction in Arctic waters, its influence for enforcing maritime pollution regulation is more limited. Nonetheless, in certain cases, e.g. violations of the 0.5% sulphur limit, port states can also take action against ships that violate marine pollution laws on the high seas (Commission Implementing Decision EU/2015/253).

9. Energy, including renewables and offshore hydrocarbons

9.1 Background: Energy and the European Union

As highlighted in section 2.7, the EU has strong economic ties with all Arctic states. For Norway and Russia, these trade ties also have a pronounced Arctic dimension, particularly with regard to energy aspects, including offshore hydrocarbons extraction and renewables. This becomes obvious when discussing the EU's very own production and import of energy products. Generally, the production of energy in the EU is spread across a range of different energy sources: solid fossil fuels, natural gas, crude oil, nuclear energy and renewable energy (such as hydro, wind and solar energy). In 2018, the production of primary energy in the EU (excluding the UK) totalled 635 million tonnes of oil equivalent (Mtoe). Renewable energy (34.2% of total EU energy production) was the largest contributing source, followed by nuclear energy (30.8%), solid fossil fuels (18.3%, largely coal), natural gas (9.3%) and crude oil (3.4%) (Eurostat, 2020b, p. 2). The production (and consumption) of energy is – naturally – very different from one MS to another. The EU's gross electricity production, for example, amounted to 2.941 terawatt-hours (TWh) in 2018, with 32.9% produced in power plants using renewable energy sources, followed by nuclear power plants (25.9%), coal-fired power plants (20.2%) and gas fired plants (17.8%). Overall imports of electricity only amounted to 0.3%. Electricity consumption was 956 TWh in the industry sector, 737 TWh in the service sector, 706 TWh in the residential sector and 59 TWh in the transport sector - numbers that stabilised over the past decade (Eurostat 2020a).

9.1.1 Oil and Gas

The EU is (and has always been) highly dependent on the import of energy products, in particular oil and gas. Over the last three decades, EU dependency on energy imports – primarily due to a downturn in the primary production of coal, crude oil, natural gas and nuclear energy – has increased from 40% in the 1980s to 58.2% of the EU's gross available energy in 2018; in other words, net imports accounted for more than half of gross inland energy consumption (Eurostat 2020b).¹⁵ Over the period from 2014 to 2019 domestic gas production, for example, in the EU fell significantly, from 153 billion cubic metres (bcm) to 109 bcm, whereas total consumption rose from 419 bcm to 482 bcm. This underlines the increasing import needs of the EU (European Commission 2020a, p. 14).

The highest need (gross inland consumption + international maritime bunkers) was for oil and petroleum products, 547.3 Mtoe, of which 94.6% (512.5 Mtoe) were imported. The major imports in 2018 came from Russia (151.6 Mtoe), Iraq (44 Mtoe), Saudi Arabia (37.8 Mtoe) and Norway (36.7 Mtoe), with some imports also from the United States (12.2 Mtoe) and Canada (2.9 Mtoe) (Eurostat 2020d, data for EU-27). In 2019, the total net imports of gas amounted to 398 bcm, which is about 358 Mtoe (European Commission 2020a, p. 11).¹⁶ Russia accounted for almost 46% of natural gas imports, followed by Norway with 29% and Algeria with 7%, all including both pipeline and liquified natural gas (LNG) imports (European Commission 2020a, p. 13). A similar analysis for the same period shows that 26.4% of crude oil imports came from Russia, 9.2% from the United States and 8% from Norway (Eurostat 2020c).¹⁷

In 2006 (and 2009), when Russian supplies to EU Member States were interrupted as a consequence of disputes over gas trade with Ukraine, the question of security of supply became one of

¹⁵ The dependency rate shows the extent to which an economy relies upon imports in order to meet its energy needs. It is measured by the share of net imports (imports - exports) in gross inland energy consumption (meaning the sum of energy produced and net imports).

¹⁶ In 2019, the total amount of LNG imported to the EU was more than 108 bcm, up by 48 bcm or by 75% compared to 2018. LNG imports made up 25% of total extra EU gas imports in this year (European Commission 2020b).

¹⁷ In addition to being the leading supplier of crude oil and natural gas, Russia has also been the largest supplier of coal in the last decade. In 2018, 42.4% of the EU's imports of hard coal were from Russia (Eurostat 2020b).

the key themes in the EU's energy policy (Airoidi 2020, p. 344). In 2014, the EU (and other countries) imposed sanctions on Russia, targeting the financial, energy and defence sectors. The sanctions prohibit the sale, supply, transfer, export, and financing of equipment for oil exploration and production in Arctic offshore, deep water and shale formations. However, they do not affect Russian gas exports.

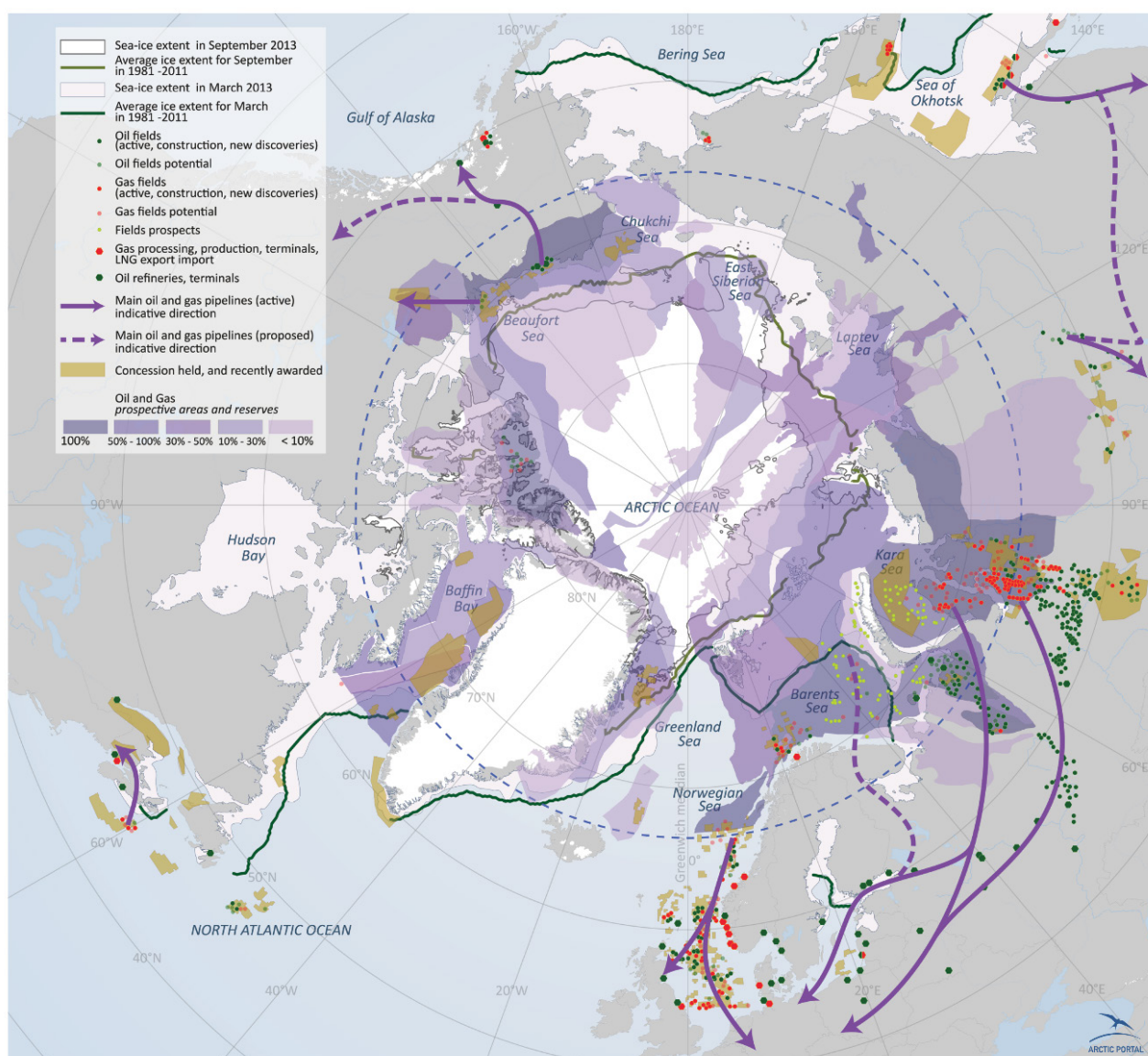


Figure 9.1: Arctic hydrocarbon resources including prospective areas and existing and proposed energy infrastructure. Source: Strategic Assessment of Development of the Arctic (Stepien, Koivurova and Kankaanpää 2014), map by Arctic Portal.

9.1.2 Renewable Energy

The share of renewables in gross final energy consumption doubled from 9.6% in 2004 to 19.7% in 2019 (for the EU-27) with the two Arctic EU Member States Sweden and Finland using the most renewable energy sources for their energy mix: 56.4% and 43.1%, respectively (Eurostat 2020e).¹⁸ For both countries, the share of renewable energy increased by between 10 and 12% since 2005 (European Topic Centre on Climate Change Mitigation and Energy 2020, pp. 14–15). The share of renewables in the final

¹⁸ Renewable energy sources include wind power, solar power (thermal, photovoltaic and concentrated), hydro power, tidal power, geothermal energy, ambient heat captured by heat pumps, biofuels and the renewable part of waste.

energy consumption is considerably higher for the two EFTA States, Iceland (78.2%) and Norway (73.7%) (Eurostat 2020e).¹⁹ For all five Nordic countries the overall renewable share increased from 31% in 2008 to 40% in 2018. Although the contribution from wind power has increased significantly in recent years, biomass and hydropower remain by far the most important sources of renewable energy in the Nordic countries (Nordic Energy Research 2020).

By 2030, Finland aims to increase the share of renewable energy to at least 51% of final energy use and to 30% of final energy use in road transport (Ministry of Economic Affairs and Employment 2019). Generally, the Finnish total primary energy supply is dominated by domestic biofuels, nuclear power, and oil imported mainly from Russia (Kilpeläinen, 2020, p. 47). Finland is furthermore a net importer of electricity, mainly from Sweden, Russia, and Norway (Hildén and Kivimaa 2020, p. 6). Sweden already reached the government's 2020 target of a renewable share of 50% in 2012 and now targets 100% renewable electricity production by 2040 (Swedish Energy Agency 2020, p. 13). The Swedish energy mix is characterised by hydropower, nuclear power, and bioenergy (Kilpeläinen 2020, p. 48). Generally, wind power has grown rapidly in Sweden, making the country a net exporter of electricity. This trend is expected to continue (Kilpeläinen 2020, p. 48). For some 25 years now, the Nordic region has successfully developed a common electricity market, where hydro, nuclear and wind power are the main generation sources (Nordic Energy Research 2018). The energy grid in Norway, Sweden and Finland is integrated and includes also parts of the Danish energy grid. Through the 1,400 MW NordLink cable, which connects the energy grid in Norway with the one in Germany, the combined Nordic energy grid is further connected with the continental European energy grid. A test of NordLink in December 2020 has been successful and full operations are planned to commence in 2021. In the future, this will allow for better energy distribution as well as for buffering in case of energy supply fluctuations. Today, Nordic electricity generation is already close to being decarbonised (87% carbon-free) and the Nord Pool area is well suited for integrating wind as well (Nordic Energy Research 2020).

9.2 Arctic Energy and the European Union

9.2.1 Oil and Gas

Over the last two decades the Arctic's (presumed) onshore and offshore energy resources have often been discussed as one essential source to ensure future EU energy security. Especially in the early 2000s, and due to a then higher anticipated need for energy imports, both the EU and Russia recognised the importance of giving political impetus towards a strategic EU-Russia energy partnership. Central to Arctic considerations then was the development of the Shtokman natural gas field in the Russian part of the Barents Sea and efforts on the Yamal Peninsula. Shtokman in particular was seen as a major source for the Northern (Trans-)European gas pipeline, today better known as Nord Stream (COM(2003) 262 final/2).

In 2010, the EU Arctic Footprint and Policy Assessment calculated that the then EU-27 already received 24% of Arctic oil and gas outputs (Cavalieri et al. 2010, pp. 41–42).²⁰ However, and despite the high dependency on hydrocarbon resources from Norway and Russia, “the Arctic” barely made a public appearance as a distinct energy region (Neumann 2012, p. 629). Oil and gas coming from (mainly offshore) Norway and (predominantly onshore) Russia is never differentiated in terms of regional place

¹⁹ Iceland's own calculation amounts to even 83.8% in 2019 (National Energy Authority 2020). Denmark (without Greenland) has a share of 37.2%, with Greenland itself aiming to achieve a 100% renewable heat and power supply by 2024, primarily by tapping its significant hydropower potential (Eurostat 2020e; Nordic Energy Research 2018).

²⁰ The Assessment, however, indicated that the accounted percentage of 24% of the EU-27's final demand for products from the Arctic oil and gas industry comes with some inaccuracy (Cavalieri et al., 2010, p. 42). The Assessment further highlighted the regional environmental impact of hydrocarbon exploration and exploitation activities and infrastructure development efforts as they increase land fragmentation, threaten biodiversity, and heighten the risk of polluting land and water ecosystems (Cavalieri et al. 2010, pp. 42–44).

of origin in EU energy analyses and outlooks. In other words, there are no numbers or estimates of how much of the imported oil and gas from Norway and Russia actually comes from their respective Arctic territories.

And yet the only Norwegian Arctic gas field Snøhvit, and its oil equivalent Goliat currently produce about 6 bcm gas and about 1.8 Mtoe respectively. In 2019 practically all the LNG from Snøhvit was exported to the EU (including the UK) (BP, 2020, p. 42). For Goliat, almost all the produced oil is acquired by refineries within the EU as well. In Russia, and for 2017, 96.2 Mtoe and 568.9 bcm gas came from the nine regions that make up the Arctic zone of the Russian Federation.²¹ The volumes of gas production in the Arctic zone have stabilised over past years and amounted to 83% of total Russian production at the end of 2017. The share of oil production in the Arctic increased from 11.8% to 17.6% from 2007 to 2017 (CDU TEK 2019). In 2019, Russia's overall volume of national crude oil production amounted to 561.2 million tonnes (in absolute terms) with an (pandemic-conditioned) 8% decrease to 514 million tonnes in 2020 (Ministry of Energy of Russian Federation 2020a; TASS 2020). The total gas production (natural and associated petroleum) reached 737.8 bcm in 2019, but again decreased by 4-6% to about 700 bcm in 2020 (Ministry of Energy of Russian Federation, 2020b; TASS, 2020). Today, almost all the gas imported from Russia stems from fields in West Siberia, and is delivered to the EU via the existing pipeline system (Ulchenko 2020, p. 2). Moreover, the Russian government wants LNG production in the Arctic to grow almost ten-fold between 2018 and 2035 with the Yamalo-Nenets Autonomous district in northwest Siberia being the focus of related developments. In 2019 the EU imported 15.07 million tonnes of Russian Arctic LNG, representing 86% of LNG shipments from the Russian Arctic (approximately 18 million tonnes per year).

9.2.2 Renewable Energy

The Arctic and in particular the European Arctic, also holds significant output and export opportunities for renewable energy sources (Middleton et al. 2019). Today and by virtue of its rivers and hydroelectric power, the two Swedish Arctic regions Norrbotten and Västerbotten account for about 21% of Sweden's total electricity production (Statistics Sweden 2018). This percentage and country-wide impact is also similar for Norway (and its Arctic regions Nordland, and Troms and Finnmark), Finland (Kainuu, Lapland and North Ostrobothnia), as well as North-West Russia (Nenets, Arkhangelsk and Murmansk), with 85% of all the regionally produced electricity originating from renewable energy sources (Middleton et al. 2019, p. 45).

The presence of numerous hydroelectric power plants makes northern regions important energy producers and give regional companies competitive advantages in being able to produce products with a much smaller carbon dioxide footprint than global competitors with a more fossil-based energy mix. As such, hydropower can be utilised to encourage the development of energy-intensive industries in Arctic regions. This is the case with existing or planned aluminium smelters in Iceland and Greenland, as well as Facebook's data centres in Luleå, and Northvolt's battery factory in Skellefteå, two examples of major locations in Sweden which international companies have chosen, partly on account of favourable Arctic/Northern conditions (Ministry for Foreign Affairs of Sweden 2020, p. 51; Nordic Energy Research 2020). Similarly, Freyr Battery will build Norway's first lithium-ion battery factory in Mo i Rana by 2024/2025, with production also being powered by hydropower. In Finland, however, hydropower offers little potential for further development as most capacities have already been exploited, with the remaining potential being protected from utilisation (Kilpeläinen 2020, p. 47). Yet, the production of wind power is anticipated to increase in the European Arctic (Nordic Energy Research 2020).

²¹ Those regions are Chukotka Autonomous Okrug, Yamalo-Nenets Autonomous Okrug, Nenets Autonomous Okrug, Murmansk Region, Republic of Karelia, Komi Republic, Arkhangelsk Region, Krasnoyarsk Territory, Sakha Republic (Yakutia).

9.3 Overview of EU policies

Identifying Arctic-relevant EU policies that largely affect Arctic development as well as assessing the impact of those policies comes with methodological difficulties as the EU predominantly exercises its influence in an indirect manner. As such the EU acts as consumer and market power with a large and mature oil/gas market where consumers are increasingly adding their energy preferences and quality demands. From a policy/legal perspective, the EU – as a regulator – generally shapes the demand for Arctic energy resources by its climate and energy frameworks and specifically by measures to safeguard the security of natural gas supply or efforts to increase the share of renewable energy sources within the EU. The only legal mechanism that has a direct effect on Arctic oil and gas developments, specifically by affecting EU companies' operations in the region, is the directive on the safety of offshore oil and gas operations (Directive 2013/30/EU).²² The directive advances a more active role for industry in guaranteeing the safety of offshore platforms, in particular by better monitoring of the construction and operation of the installations. It also encourages a certain extra-territorial application of the primary responsibility of EU economic actors (Dobson and Trevisanut 2018, pp. 400–401). Most importantly in the context of this study, the directive calls on the Member States to require reports on major accidents occurring outside the EU, e.g. in Arctic waters, which involve companies registered in their territory. Moreover, while Member States are not able to enforce rules outside the EU, adequate means for the confidential reporting of safety concerns should be made possible for persons involved in offshore oil and gas operations outside the EU.²³

In order to share best practice and improve standards of operation, the European Union Offshore Oil and Gas Authorities Group, chaired by DG Energy, was established in 2012, and also includes representatives from the Norwegian Petroleum Safety Authority (EUOAG and JRC-EUOAG websites). Additionally, since 2002 the EU has maintained a regular high-level energy dialogue with Norway, held between the Commissioner of Energy and the Norwegian Minister for Petroleum and Energy. This is further supplemented by an EU-Norway Energy conference. A similar Energy Dialogue was established in 2000 with the Russian Federation but has been put on hold since 2014. Only the technical work-stream on internal market issues under the previous EU-Russia Gas Advisory Council (GAC WS2) remains operational. The EU also holds regular energy dialogues with Canada and the United States but Arctic energy has not yet been on the agenda.

9.3.1 From Energy to Climate

Energy became a recognised EU policy area after the oil crises of the 1970s and early 1980s. Yet European primary law did not explicitly provide EU competence in the field of energy until the Treaty of Lisbon entered into force, stipulating shared competence between the EU and its Member States (Koivurova et al. 2010, p. 29). In particular article 194 of the Treaty on the Functioning of the European Union (TFEU) defines EU policy on energy issues in the context of the internal market and the protection of the environment, as well as the (remaining) right of each Member State to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply (TFEU, article 194). Moreover, resource policy can also affect the common market and concern the policy area of industry, policy fields with exclusive competence for the EU (TFEU, articles 3 and 6) (Neumann 2012, p.625).

²²In principle any mechanisms related to energy policy do not extend to the EEArea and therefore restrict the EU's legal influence on the Icelandic or Norwegian continental shelf (Koivurova et al. 2012, p. 366). Norway, which as an EEArea state and therefore in principle applying EU environmental legislation has chosen not to apply the directive on safety of offshore oil and gas operations in its territory (Raspotnik 2018, p. 156)

²³ The directive is complemented by a report (COM(2015) 422 final) and staff working document (SWD(2015) 167 final) on liability, compensation and financial security for offshore oil and gas operations in Europe. The Commission has assessed experiences with current legislation on the safety of offshore oil and gas operations and just recently published a first report, COM(2020) 732 final. Furthermore since 2016 three annual reports on the safety of EU offshore oil and gas operations have been published (COM/2018/595 final; COM/2019/358 final and COM/2020/263 final).

Today, the EU's energy policy is based on its 2015 Energy Union Strategy, and its basic document: *A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy* (COM(2015) 80 final). The Energy Union Strategy is designed to bring greater energy security, sustainability and competitiveness, and builds on five mutually reinforcing and interrelated dimensions:

- Energy security, solidarity and trust;
- A fully integrated European energy market;
- Energy efficiency contributing to moderation of demand;
- Decarbonising the economy, and
- Research, Innovation and Competitiveness.

This strategy was followed by Commission proposals for new rules on EU gas supply security (COM(2016) 52 final) and energy agreements between the EU and non-EU countries (COM(2016) 53 final). Each year the State of the Energy Union reports take stock of the progress made towards building the Energy Union and highlight issues where further attention is needed. To date five reports have been issued, with the latest issued on 14 October 2020 (EC website, Energy Union).

The Energy Union Strategy essentially builds on the Energy Security Strategy (COM(2014) 330 final), which aimed to ensure a stable and abundant supply of energy and was a response to continuing concerns about the EU's dependency on energy imports. Previous energy strategies included the Energy 2020 Strategy (COM(2010) 639 final), a policy framework for climate and energy in the period from 2020 to 2030 (COM(2014) 15 final), and a 2050 energy roadmap (COM(2011) 885 final) which set a long-term goal of reducing the EU's GHG emissions by between 80 and 95% by 2050. The 2011 Communication "On security of energy supply and international cooperation" (COM(2011) 539 final) took up the external dimension priority of the 2020 Strategy and specifically highlighted Norway and Russia as the EU's main hydrocarbon suppliers. The reference legal text on measures to safeguard the security of gas supply is regulation (EU) 2017/1938. It lays down the framework for EU emergency preparedness and resilience to gas disruptions. On the security of gas supply, Member States have prepared further preventive actions and emergency plans (those from the EU's Arctic Member States Denmark, Finland and Sweden can be found at EC website, Secure Gas Supplies). These contain measures for mitigating the impact of gas supply disruption, and risks identified at national and regional level. A standing advisory group, the Gas Coordination Group, assists the Commission and supports the coordination of security of supply measures, especially during crises.

Given the relevance of natural gas for the European energy system and previous tensions between the EU and the Russian Federation, one key objective of the EU is to diversify its supply sources and supply routes. As a consequence, the EU supports the financing of infrastructure projects like LNG import terminals or import pipelines such as the Southern Gas Corridor or the Mediterranean hub to provide an incentive for potential new suppliers to enter the market. Furthermore, the EU supports infrastructure projects within Europe that promote the integration of an EU internal gas market and hence an exchange of natural gas between EU Member States. LNG plays an essential role in related considerations and the objectives of the EU's Energy Union Strategy is exemplified in the EU strategy for liquefied natural gas and gas storage (COM(2016) 49 final). The EU's overall LNG import capacity is significant, enough to meet around 45% of total current gas demand.

At its core the Energy Union aims to develop a sustainable, low-carbon and climate-friendly EU-economy by fundamentally transforming the EU's energy system. Thus, the EU's energy policy always needs to be put in context to climate policy efforts, dating back to the early 1990s. Yet, until 2007, climate, energy and innovation policies developed largely in isolation, based on different concerns: climate change, energy security, and economic growth. It was only in 2008 when climate and energy policies were linked by adopting the EU's 2020 framework for achieving the 2020 targets: a 20% cut in GHG emissions (from 1990 levels); 20% of EU energy from renewables (via its Renewable Energy Directive (2009/28/EC)); and a 20% improvement in energy efficiency (Skjærseth 2021). For the period 2021-2030, the 2030 framework aims to cut GHG emissions by at least 40%, increase the share of renewable energy to 32% (Directive 2018/2001) and improve energy efficiency by at least 32.5% by

2030 (Directive 2018/2002). These targets are legislatively implemented through the revised directive on the ETS (Directive 2018/410) and an effort-sharing regulation covering non-ETS sectors (Regulation 2018/842).

The very nexus of energy and climate policies has recently, and most prominently, been conceptualised in the European Green Deal (COM(2019) 640 final), an ambitious roadmap of key policies for the EU's climate agenda, and related legislative proposals and strategies from 2020 onwards. As such, the Green Deal is designed to have a substantial impact on both medium-term goals for 2030, and long-term targets for 2050. With the European Green Deal, the EU has set itself the objective of becoming the first climate-neutral continent by 2050. In the short-term and with the 2030 Climate Target Plan (COM(2020) 562 final) and an amended proposal on the European Climate Law (COM(2020) 563), the Commission proposes to (again) raise the EU's ambition of reducing GHG emissions to at least 55% below 1990 levels by 2030.

The EU's increased climate ambition requires unprecedented growth of renewable energy production. In 2012 the Commission outlined various options for a renewable energy policy beyond 2020 in its Communication on Renewable energy, a major player in the European energy market (COM(2012) 271 final). To facilitate the process of developing offshore renewables, the Commission adopted its strategic vision for offshore energy produced from natural and clean sources such as wind, solar, wave and tidal in an EU Strategy to harness the potential of offshore renewable energy for a climate neutral future (COM (2020) 741 final). A new regulation further integrates GHG emissions and removals from land use, land use change and forestry (Regulation 2018/841) in the 2030 Framework. Finally, a new Governance Regulation (Regulation 2018/1999) establishes a framework for planning, reporting, and review. In particular, it requires each MS to submit an integrated National Energy and Climate Plan every ten years (starting in 2019, with an update every five years), including national contributions to the EU-wide renewable energy and energy efficiency targets (Siddi 2020b).

In July 2020, the Commission also adopted a hydrogen strategy for a climate-neutral Europe (COM(2020) 301 final), setting out its vision to significantly increase the role of clean hydrogen as an energy carrier, ranging from storing renewable energy to fuelling heavy transport, and as energy and feedstock in energy-intensive industry, such as in the steel or chemical sectors. To accelerate the decarbonisation of its industry and maintain industrial leadership in Europe, the Commission also launched the European Clean Hydrogen Alliance, a collaboration between public authorities, industry and civil society. The Alliance aims at an ambitious deployment of hydrogen technologies by 2030, bringing together renewable and low-carbon hydrogen production, demand in industry, mobility and other sectors, and hydrogen transmission and distribution.

9.4 Policy Assessment and Outlook

Globally the energy situation has changed significantly over the past decade(s). The energy sector is generally characterised by intense competition (for markets and end users), a high degree of uncertainty and the high speed of development of new technologies, and a global orientation towards green growth (Carayannis et al. 2021). In addition, the Covid-19 pandemic has caused more disruption than any other event in recent history, leaving impacts that will be felt for years to come. The World Energy Outlook 2020 predicts the end of growth in global oil demand within the next ten years, a very first, yet slight, decline of gas demand in advanced economies by 2040 and a rapid growth of renewable energy sources. While hydropower remains the largest renewable source of electricity, solar power will be the main driver of growth, followed by onshore and offshore wind (International Energy Agency, 2020). For the past decade, global discussion on energy transition and green energy solutions, in addition to fluctuating energy markets, have also had a profound impact on Arctic energy considerations, not only within Arctic countries but also within the EU. Compared to the 2008 and 2012 (Joint) Communication, the 2016 Joint Communication only mentioned Arctic hydrocarbon resources with regard to the adoption of "the highest standards of major accident prevention and environmental control". Unlike the two earlier policy

statements, there was no reference to regulation of the production and consumption of oil and gas from the Arctic region.

9.4.1 EU policy impact on Arctic energy production

As the EU's climate ambitions have increased over the past decades, climate-energy policy mixes have expanded in scope to fulfil more transition functions related to the EU's energy mix, energy efficiency efforts, security of supply activities, low-carbon innovation or green industrial growth (Skjærseth 2021). In addition to external factors, from shifting global demand to the Fridays for Future movement, these policy developments have undoubtedly impacted EU Arctic energy considerations. While identifying EU energy (and climate) policies that potentially or to varying degrees affect Arctic energy developments is possible, assessing a causal relationship between a certain policy and specific socio-economic developments is difficult or even impossible. Therefore, while some kind of Arctic (energy) relevance can be derived from all the above outlined policies, frameworks and instruments, their overall effect on energy imports from the EU's main (Arctic) energy partners, Russia and Norway, as well as their regulatory impact, is impossible to assess. For example, while the assessment of Directive 2013/30/EU (safety of offshore oil and gas operation) concluded largely positively on the implementation of the directive (COM(2020) 732 final), the "Arctic" is hardly affected by this measure as the directive does not ensure effective accident prevention outside the EU.

Moreover, and from an energy dependency perspective, while imports of crude oil from Russia have remained relatively stable over the past decade, those from Norway have more than halved over the period 2000-2018. By contrast imports substantially increased from other regions and countries such as Kazakhstan and Iraq (Eurostat 2020d).²⁴ Similarly while the EU's imports of natural gas from Russia slightly increased between 2008 and 2018, those from Norway slightly decreased in the same period (Eurostat 2020b). Overall, however, EU dependency on energy imports did not change much over the past decade, from 58.4% in 2008 to 58.2% in 2018. Yet in detail, the EU's dependency on supplies of natural gas grew by 13.1%, much faster than the 2.1% growth in dependency on solid fossil fuels. The dependency on crude oil during the same period remained quite stable (Eurostat 2020b).

Generally, Arctic hydrocarbon exploration and exploitation is driven by global demand (the price of energy commodities), political alterations, shifting market conditions, infrastructure-related considerations and physical access to other resource capacities. Especially growing energy resource competition (e.g., shale gas revolution, renewable energy) has placed on long-term hold many of the Arctic projects, such as the Shtokman gas field which was also an essential part of EU energy considerations at the turn of the century (and during the early years of the Arctic energy hype). Therefore, assessing the role of the Arctic for current and future energy markets provides a very ambiguous picture (Morgunova and Westphal 2016, p. 7).

By aiming to increase reliance on renewable energy or maximising energy efficiency, the EU's broad climate and energy frameworks of the past two decades had a determining influence on Arctic energy considerations.²⁵ However, and as shown above, the EU's dependency on energy imports has increased over the past decade with most of the energy imports (oil and natural gas) being from Norway and (Arctic) Russia. Thus, while strong arguments could be brought forward that the policy efforts x and y directly impacted Arctic energy considerations, methodologically sound conclusions cannot be drawn. While energy exploration and exploitation in the Norwegian Barents Sea is considerably less than initially anticipated (Claes and Harsem 2010), the Russian Arctic (e.g. developments on the Yamal

²⁴ It should be noted that the imposed sanctions against Russia and the sanction regime on deep-water and Arctic oil exploration did not, at least in the short-term, negatively affect the Russian oil sector. Huge past investments, numerous tax breaks, as well as a Rouble devaluation allowed avoidance of reduction in production. However, future prospects for Russian oil output are not that clear due to relatively low global oil price conditions and sectoral sanctions (Mitrova et al. 2018, p. 4).

²⁵ Generally, the EU plays a key role as energy regulator, shaping energy relations both within and outside its borders. For example the Third Energy Package, which aimed to unbundle energy suppliers from network operators, also had an effect on Russia and its South Stream Gas project (Stang 2016, p. 25).

Peninsula) will continue to be essential for oil and natural gas resource exploitation in Russia, predominantly due to domestic political will and strategic considerations (Morgunova 2020). Similarly, and as evidenced by Norway's response to the 2013 offshore oil safety directive, the EU's influence as Arctic energy regulator is still rather limited.

A similar picture might also be drawn with regard to renewable energy sources. For example, in the case of Norway the EU has clearly and increasingly contributed to Norwegian climate and energy policy via the EEArea Agreement, but its policies have not triggered significant transition in Norway so far (Boasson and Jevnaker 2019). Generally, the Nordic countries have a rather successful history of improving the diversification of their energy supply with a core focus on the utilisation of renewable energy resources and a steadily increasing share of renewables in the respective energy mixes (Aslani et al. 2013; Eurostat 2020e; Nordic Energy Research 2020). As such, the Nordic countries already decarbonised aspects of their energy systems and decoupled CO₂ emissions from GDP growth more than two decades ago, and are currently striving for carbon neutrality and the electrification of inter-connected sectors with renewable electricity (International Energy Agency and Nordic Energy Research 2016; Norden 2019).

9.4.2 Outlook

The EU's objective of becoming the first climate-neutral continent by 2050, with renewable energy being at the core of the European Green Deal will further impact (EU-)Arctic energy considerations. The European Green Deal will not only overhaul the European energy system but also change the (energy) relationship with the EU's present main energy partners, and in the long-run lead to a possible surge in trade in green electricity and green hydrogen (Leonard et al. 2021). As such, the Green Deal will have two main implications for Arctic energy considerations, particularly for the Russian Federation. The first concerns the import of Russian fossil fuels which will progressively decrease over the next decade, initially affecting coal demand, then oil and after 2030 also natural gas. The second main implication concerns Russia's energy-intensive exports, such as metals, chemicals and fertilizers. The planned introduction of a carbon border adjustment mechanism, namely a tax related to the volume of emissions caused by the production of the imported goods, can have a significant (negative) impact on the price of Russia's metallurgical and chemical exports to Europe (Lassila and Siddi 2021, p. 6).

And yet, while the EU's climate neutrality concept will have a long-term impact on (Norwegian and Russian) Arctic hydrocarbon resource development, Russian natural gas and its considerable Arctic share will remain a key pillar of the EU's immediate and near-future energy mix. In the 2030 timeframe, Russia could potentially profit from the European Green Deal as more gas will initially be needed (Leonard et al., 2021). Renewable energy sources do not yet play a role in EU-Russia energy relations, despite considerable potential for the production of renewable energy and the production of hydrogen. Northwest Russia, especially, boasts a large renewable energy resource base in geographic proximity to the EU. Developing this could offer win-win prospects for both Russia and the EU as Russia could develop its renewable energy industry with Western technology at a lower cost, whereas EU Member States could achieve their 2030 renewable energy targets by importing electricity produced from these sources in Russia. EU companies have already become involved in the development of Russian wind power. Notably the Italian energy company Enel is building Russia's largest wind park in the Murmansk region and developing two more in the Stavropol and Rostov regions (Siddi 2020a, p. 20).

The European Green Deal might also bring substantial changes for Norway, although in principle the Nordic country aligns with the EU's green objectives. Competition on the global gas market will only increase in the near future with commodity facing more environmental pressure in the years to come. Additionally, regional expansions of renewables will require further investment in domestic and transboundary power grids, both between the Nordic countries and between the Nordics and the rest of Europe (International Energy Agency and Nordic Energy Research 2016, p. 27). At present Norway exports power through the Nordic market and the NorNed link to the Netherlands, with a new link (the above mentioned NordLink) currently under construction taking Norwegian supplies to Germany.

However, the EU's future aim is to further develop local resources and create more links across borders within the EU, thus reducing the need for balancing supplies from outside the EU-27 (Butler 2020).

Generally, the entire Nordic region including its Arctic sub-regions, has a substantial amount of renewable energy resources. Hydropower and wind have the potential to export electricity, and thus balance EU variable renewables, as well as further developing the electrification of (Nordic) transport means (both for electric vehicles and ferries) (Middleton et al. 2019; Nordic Energy Research 2020). Firstly, clean power can be exported to displace more emission-intensive generation. In 2017, net Nordic exports were at 11 TWh, with Norway exporting 15 TWh and Sweden 20 TWh. This is set to increase with the deployment of wind power in the Nordics, especially Norway and Sweden, and a number of transmission cables are under construction and being planned. Additionally, an EU-funded project (Haeolus) is currently looking into the opportunities to sell hydrogen instead of electricity (Haeolus Project - Hydrogen-Aeolic Energy with Optimised Electrolysers Upstream of Substation.). Secondly, dispatchable hydropower in the Nordics can provide balancing services to help integrate variable renewables (Nordic Energy Research 2018). Hydropower can serve as regulator of energy demand and supply balance for the EU, especially in future scenarios of a bigger share of renewables and related considerations of high energy fluctuations, and almost non-existent energy storage capacities.²⁶

9.5 Policy options

Discussing the complex matter of Arctic energy from an EU-perspective comes with one essential paradoxical premise: while the EU's demand for the import of Arctic and non-Arctic fossil fuel has been gradually increasing, the EU has also made ambitious emission reduction commitments over the past decades. Thus, the key question lies in finding a convincing policy balance between fighting global climate change in the Arctic on the one hand and importing Arctic energy resources on the other hand. How can the EU perform as a global leader in tackling climate change, while simultaneously being dependent on mainly Russian Arctic energy resources? (Chuffart and Rasputnik 2019) Keeping this paradoxical complexity in mind, while also taking into account the different energy needs of the Member States, the following policy recommendation might provide some food for thought.

P30. Rethinking Arctic Energy: a comprehensive Arctic energy policy

With the long-term perspectives of the European Green Deal in mind, EU policymakers should promote a comprehensive 'Arctic Energy Policy' that moves away from exploiting Arctic hydrocarbons towards not absorbing these resources. In other words, as the European Green Deal will restructure the relationship with the EU's main energy suppliers, such as Norway and Russia, the Arctic is directly and immediately affected by related considerations. Convincingly articulating such developments, while simultaneously highlighting the opportunities for the trade of green electricity and hydrogen might provide impetus for future Arctic energy discussions.

P31. Actively engage in BEAC's Joint Working Group on Energy

Building on the renewable energy capacities and potential of the Barents Euro-Arctic region, the EU should actively engage in the BEAC's Joint Working Group on Energy (JEWG) to further improve the efficiency, distribution and consumption of energy in the Barents Region. Cooperation efforts with regard to green electricity and green hydrogen, and the very promotion of those efforts could lead further to confidence building in the (regional) relationship with the Russian Federation. Additionally, this might provide impetus for increased development of renewable energy capacities in Russia.

²⁶ Coordinated by the Norwegian University of Science and Technology, HydroFlex – a Horizon2020 project – is currently doing research on the development of new technology that facilitates highly flexible operation of hydropower stations, see HydroFlex website.

10. Raw materials

10.1 Overview of the Arctic mining sector

The economies of Arctic regions are traditionally characterised by a relatively high share of extractive industries. Non-energy raw materials are an integral part of this economic landscape.

Several areas around the Circumpolar Arctic are particularly rich in mineral resources. The Canadian shield and Greenland, parts of Siberia, as well as the Fennoscandian Shield, which includes the EU Member States, Finland and Sweden, as well as Norway, contain base metals, ferrous metals, high-tech metals, and industrial minerals. In the Fennoscandian Shield alone, there are over 160 significant industrial mineral deposits and between 2015 and 2020 there were 30 to 35 operational mines. It is an important region for the EU's own mineral production, including critical minerals. Northern Sweden and Finland account for a substantial share of the EU's production of gold, silver, zinc, and copper. Almost 90% of EU-27 production of iron ore comes from Northern Sweden (Smed Olsen et al. 2016; van Dam et al. 2016). Northern Sweden hosts nine out of twelve mines currently operating in the country. In Finland, four out of ten operating mines are located in the three northernmost regions of the country, including Europe's only chromium mine and its largest gold mine, while half of the 12 projects that are currently under development are located in these northernmost regions (see figure 10.1).



Figure 10.1: Mining activities in the European Arctic and Greenland. Riccardo Pravettoni, GRID Arendal 2014, for the Strategic Assessment of Development of the Arctic report, 2014.

Geological mapping and geochemical analyses suggest that Alaska and parts of Arctic Canada have high potential for strategic and critical elements such as thorium, niobium, tantalum, indium, gallium, germanium, platinum-group metals, tin, manganese, titanium, and vanadium (USGS website). Recently, a large deposit of phosphates, vanadium and titanium has been discovered in southwestern Norway. Arctic rare earth elements potential is assessed at 126.76 million metric tonnes (Mt) with possible Russian deposits standing at 72.26 Mt (compared to China's 161.13 Mt) followed by Greenland, Canada, Sweden and Alaska. In the coming years, several Arctic REE projects may be developed: Kvanefjeld (Greenland), Tomtorskoye (Russia, Yakutia), and Nachalcho (Northwest Territories, Canada) (Mered 2020).

Contribution of Finland, Norway and Sweden to the total mineral production of the EU-36 (EEArea, UK, and EU candidate countries including Turkey, data for 2014, BGS 2016; European Commission 2020a, 2020b):

- 72.6% of cobalt (in global context: EU-36 as a whole 24.3% of world production);
- 12.1% of mined copper and 17.1% of smelter production (EU-36 5.5% globally);
- 25.5% of gold (EU-36 1.9% globally, over half in Turkey);
- 22% of graphite (only Norway, EU-36 1.8% globally, three quarters in Turkey);
- 20.4% of lead (only Sweden, EU-36 6.4% globally);
- 31.5% of mica (only Finland, EU-36 11.1% globally);
- 34% of nickel (only Finland, EU-36 11.3% globally);
- 100% of phosphate rock (Finland);
- 17.3% of silver (only Sweden, EU-36 8.1% globally);
- 100% of titanium (only Norway, 6.6% globally);
- 26.9% of zinc (EU-36 7.3% globally);
- 81.4% of iron ore (EU-36 1.7% globally).

The Arctic's cold climate, vulnerable environment, long distances, sparse population and lack of infrastructure result in specific challenges and risk, as well as high costs of exploration and activities; but the Arctic regions have certain advantages as suppliers compared to other parts of the world in terms of minerals conflicts, regulation, human capital, business environment and environmental performance, although these differ across the North. Many Arctic regions have a centuries-long history of exploration and extraction of minerals, resulting in extensive regulatory frameworks, developed extractive services sectors, good knowledge and human capital (van Dam et al. 2016; Boyd et al. 2016). Environmental and social standards and administrative capacity are high when compared to developing countries. However, Arctic countries and regions vary in their performance. The environmental performance of the Russian mineral industry is of concern in this context (Levchenko et al. 2019). Some parts of the Arctic, like Greenland and parts of Arctic Canada, remain resource frontiers characterised e.g. by limited administrative capacities and availability of human resources.

Mineral extraction has brought and can contribute to wealth, economic growth and jobs in Arctic regions and communities. However, extractive activities have a range of environmental and social impacts, the scope of which depends on project design and management. These impacts are related not only to extraction itself, but also exploration, construction, transportation of mined products, and mine closure. The environmental impacts may range from emissions, noise, landscape fragmentation, pollution of land and waters, especially if accidents occur. Management of mining waste is always a challenge for project developers, as well as the mitigation of impacts following the closure of mines, including the question of company liability for such impacts. Adverse impacts on other livelihoods and economic sectors, not least on crucial Indigenous Peoples' livelihoods such as reindeer herding, tourism, fishing or hunting follow from changes in the environment and landscapes, especially that these impacts need to be considered in the light of other activities and developments taking place in the same area. The often-unresolved question of indigenous land rights in Nordic countries makes various mining projects difficult or even impossible to implement across Sápmi. The extraction of minerals has also global environmental consequences. According to the Global Resource Outlook (2019), pre-consumption extraction and processing of metals and non-metallic mineral resources contribute to about 17% of climate change (emissions and land use change) and more than one fifth of particulate matter health impacts globally.

The socio-economic implications and interactions of the mining industry are complex. In some cases, mining can complement key northern sectors such as tourism, bringing economic and employment diversity to smaller communities. At the same time, mining activities compete with these sectors and can be disruptive. Mining companies are also important tax payers and can contribute to northern infrastructure. However, too much dependence on mining revenues exposes Arctic regions to the volatile nature of mineral markets, where prices fluctuate constantly. This can result in production cuts, suspension or in some cases mine closure, leaving small communities with existential challenges. It has also been shown that social and economic impacts appear at the moment the project is announced, even if eventually no mine becomes operational (van Dam et al. 2016). Exploration activities, conducted often by smaller companies, can be problematic due to weaker regulatory oversight and limited involvement of stakeholders compared to the later extraction planning stages. Often, general local resistance to mining projects is already activated at the exploration stage.

With the development of renewable energy, and gradual and planned transition to a green economy, the global demand for a number of minerals is expected to rise significantly (Carrara et al. 2020). Critical minerals are needed for wind energy installations, batteries, catalysts, fuel cells, semiconductors, photovoltaics, fertilizers, magnets, new power grids, modern technologies including medical applications. The European Commission maintains and regularly updates a list of the minerals critical for the EU economy, the supply of which is highly concentrated or not fully secure (EC 2020). The EU is dependent on a few or single source-countries for many of the critical minerals on a few or single source-countries, with Turkey providing 98% of borate, Chile 78% of lithium, South Africa 71% of platinum and 92% of iridium, the US 88% of beryllium and China 98% of REEs and 93% of magnesium (EC 2020). While part of the future demand can be met by recovery and recycling, there are increasing market pressures towards new exploration and primary extraction. Arctic deposits (and more broadly, deposits in Arctic states) of critical minerals would diversify EU supply (see table 10.1). In the North, this raises both the hope of increased interest followed by projects and revenues, as well as concern that there would be increased pressures on sacrificing local environmental and social values for the sake of global sustainability (Heffron 2020).

The interest in the Arctic as a source-region for non-energy minerals in the last two decades is related to: national projects on mineral potential and exploration, continuing discovery of major deposits, concerns related to other source-regions, expected or perceived improved access related to climate

| | Production (2019) | Significant reserves (2020) |
|--|--------------------|-----------------------------|
| EU Critical minerals – 2020 list (Arctic-relevant examples) | | |
| Antimony Sb | CA, RU | RU |
| Heavy & Light REEs | RU | CA, GL, RU |
| Silicon metal Si | CA, NO, RU | |
| Indium In | CA, RU | |
| Tantalum Ta | CA, RU | GL |
| Borate | CA, RU | RU |
| Magnesium Mg | RU | RU |
| Tungsten W | CA, RU | RU |
| Cobalt Co | CA, FI, RU | CA, RU |
| Natural Graphite | CA, FI, RU, SE | NO |
| Vanadium V | RU | NO, RU |
| Bauxite | RU | RU |
| Fluorspar CaF ₂ | RU | RU |
| Niobium Nb | CA, RU | CA, GL |
| Lithium Li | | CA |
| Platinum Group Metals Pt Ru Rh Pd Os Ir | CA, FI, RU | |
| Titanium Ti | NO, RU | CA, NO |
| Germanium Ge | FI, RU | |
| Phosphates | FI, NO, RU | NO |
| Other important minerals (examples) | | |
| Iron Fe | CA, NO, RU, SE | |
| Nickel Ni | CA, FI, NO, RU | GL |
| Chromium | FI, RU | CA, RU |
| Molybdenum Mo | CA, RU | CA, GL, RU |
| Copper Cu | CA, FI, NO, RU, SE | |
| Gold Au | AK, CA, FI, RU, SE | AK, CA, RU |
| Zinc Zn | AK, FI, NO, RU, SE | AK, RU, SE |
| Lead Pb | AK, CA, RU, SE | AK, RU, SE |

Table 10.1: Examples of mines and known reserves in the Arctic states for selected critical minerals and some important minerals. For the US, only Alaska is considered (AK-Alaska, CA-Canada, FI- Finland, GL-Greenland, IS-Iceland, NO-Norway, RU-Russia, SE-Sweden, IS-Iceland). Based on OECD, compareyourcountry.org database; EC 2020a, EC 2020b; Boyd et al. 2016).

change and opening of Arctic maritime routes, as well as a general political focus on the Arctic as a region of strategic significance.

10.2. Footprint of the EU's economy and population on Arctic mining

The EU's demand for minerals affects the prices of Arctic raw materials in proportion to the EU's share in the global trade in and consumption of minerals. The EU is among the largest importers of metals and minerals globally, with imports totalling over EUR 220 billion in 2016. EU consumption constituted: 11% of global cobalt consumption (annual average data for 2012-2016), 6% of global iron ore consumption, 13% of global nickel consumption, 25% of titanium oxide, 7% of chromium (EC 2020a, 2020b; Statista, 2021). The EU+UK consume overall 20% of the world's mineral products while producing only 3% of them. The EU's economy is therefore dependent on imports of minerals, including from the Arctic states.

While the current production in Arctic regions meets only a small part of the overall EU demand for raw materials, the eight Arctic states are suppliers of critical and other raw materials, many of which are produced in their Arctic regions. For instance, Finland provides 51% of germanium, 16% of phosphate rock and 14% of cobalt for the EU market, Norway 30% of silicon metal and 8% of natural graphite, and Russia 40% of palladium, 20% of phosphate rock, 19% of vanadium and 4% of lithium (many of these resources are produced outside of these countries' Arctic regions) (EC 2020 Raw Materials Communication). Apart from critical minerals, Arctic regions provide EU industry with such important raw materials as gold, iron, nickel and chromium.

Data for mineral imports into the EU are not disaggregated by subnational regions. It is therefore challenging to calculate the EU imports of minerals extracted in Arctic regions. Import data for Arctic states are presented in figure 10.2. A significant part of EU imports of many minerals is satisfied by the Arctic states and for some minerals the EU is an important, or even main, destination.

The future demand for new minerals is difficult to assess due to the fluctuating nature of resource markets, changing technological requirements and recycling rates. OECD (2019) predicts a 38% increase in global extraction of metals by 2030 (compared to 2017 volumes) and 27% for non-metallic minerals. While overall material intensity in the EU is low compared to the global average, the overall EU demand for raw materials is predicted to rise in the next decades. This is expected especially for minerals used in modern technologies, renewable energy generation and low-carbon transport. The EU annual demand for rare earth elements (REEs, e.g. dysprosium, neodymium, praseodymium and terbium) used in wind turbines is predicted by the JRC to increase up to six times by 2030 and 15 times by 2050 compared to 2018 values. For solar power generation, up to fourfold increases in demand are predicted for silver and 12-fold for silicon (Carrara et al. 2020). The EU demand for lithium may increase as much as 18-fold by 2030. The EU's overall demand for nickel for electric car batteries is expected to rise by 543 thousand tonnes by 2030, compared to 17 thousand tonnes in 2020, which would translate to an increase of over 30-fold (Fraser et al. 2021).

Arctic regions can be seen as prospective source regions for meeting future EU demand and the Arctic will likely be part of the expected increased global mineral supply. However, predicting the exact growth in Arctic extraction by 2030 would be too speculative due to small volumes of extraction and thus high dependence on particular projects and mineral groups and the fluctuations in their price levels.

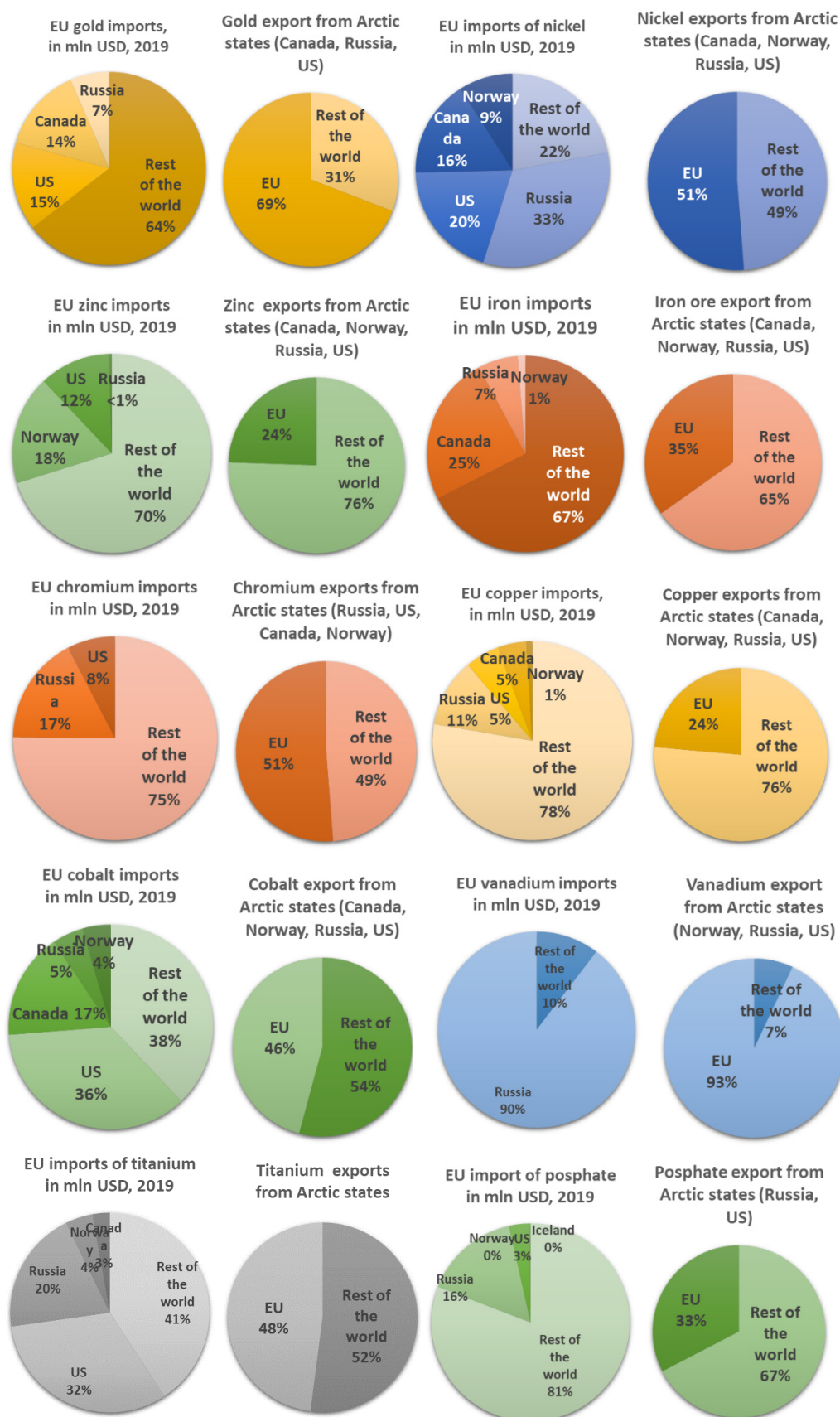


Figure 10.2: EU imports of chosen minerals from Arctic states (including non-Arctic regions) and the EU's position as an importer of resources from Arctic states. Data: OECD, compareyourcountry.org; EC 2020a, 2020b. Data for 2019 is based on the monetary value of trade in USD. A small part of the resources is re-exported. Data for imports specifically from Arctic extraction are not available (no disaggregation).

It is important to consider the spectrum of the impacts on the environment arising from the extraction of metals and other non-energy minerals coming into the EU from the Arctic states, just as in the case of imports from the Global South. A prominent example of the EU dilemma is the import of minerals from Russia. Some 33% of EU nickel imports come from Russian sources, mostly extracted in the Arctic regions. The powerful Nornickel company, with nickel, copper and cobalt operations in the Kola Peninsula and Taimyr Peninsula, has for years caused various environmental problems. Very high air pollution levels related to refining are of concern and a recent diesel leak into the water system resulted in a USD 2 billion fine. Nornickel cooperates with major European companies such as BASF, as the minerals produced are key for modern technologies, including those needed for green transition. However, evaluating the overall environmental impacts of minerals coming into the EU is very challenging as these are different for each mine and with imports into the EU varying on an annual basis.

The need for raw materials to achieve transition to a low-carbon economy and the risk of local environmental and social impacts related to any extraction may create dissonance between global and local dimensions of sustainability. Representatives of Indigenous Peoples have already expressed their concern with what some of them see as a risk of “green colonialism”. The debate on raw materials resembles the discussions with regard to e.g. wind power and hydropower projects.

10.3. EU policies and their impact on mining developments in the Arctic

The EU plays different roles with regard to shaping Arctic mineral extraction: a limited regulator for various aspects of mining activities within the EU and partly in the EEArea; supporting the European security of supply and its environmental and social sustainability; encouraging certain types of investments; supporting research and development; as well as encouraging networking among pan-European industry and authorities. In 2008 the EU adopted a first overarching minerals policy, the Raw Materials Initiative (EC 2008; EC 2011). In 2020 a new Critical Raw Materials Resilience communication (EC 2020) has been adopted with an action plan. The EU has a three-tier approach to raw materials: diversifying and securing sustainable and responsible imports; increasing domestic, European production, especially of critical minerals; and improving recycling of minerals. The first objective is relevant for the EU's relations with Arctic states and the second aim is of importance for European Arctic mineral production and is related to the EU's internal regulatory framework. Supplementing these goals, the 2020 communication specified the need for developing resilient value chains for EU industrial ecosystems, introducing more holistic thinking, facilitating sustainable products and innovation, as well as rule-based open trade in raw materials, and removing distortions to international trade. The policy is in line with the objective of the EU to achieve a degree of strategic autonomy, as it would become less dependent on a limited number of external sources for raw materials critical for its industry.

10.3.1. European Arctic extraction and relevant EU domestic legislation

The EU does not have direct competence as regards its Member States' mineral policies or permitting decisions, although some directives set minimum standards for permitting or the EC may potentially become involved if e.g. Natura 2000 areas are impacted. Various pieces of EU legislation, in particular environment-related ones, have a bearing on how mineral extraction is carried out in the EU (and partly in Norway and Iceland via the EEArea Agreement). Examples of such regulatory instruments are numerous. Waste originating from mining is one of the largest sources of waste in the EU and Directive 2006/21/EC on the management of waste from extractive industry, supplemented by the Best Available Techniques Reference (BAT) document, was adopted to prevent or minimise water and soil pollution. It requires mines located in the EU to have a permit based on the best available techniques approach, including a waste management plan and a financial guarantee, while dangerous waste facilities in mines need to have an accident prevention policy. A decade ago the Commission (COM(2013)442) encouraged Member States to develop national minerals policies, set up comprehensive land-use planning policies for minerals, and streamline permitting processes. REACH Regulation 1907/2006/EC (Registration,

Evaluation, Authorisation and Restriction of Chemicals) 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). An important framework is created by the Habitats and Birds Directives and the Natura 2000 network of protected areas. The European Commission (2011) issued guidance dedicated to reconciling the environmental objectives with the desire to promote mineral extraction (in 2019 this guidance was supplemented by a collection of case studies and best practices). The guidelines remain relevant. At the time of writing this report, there are a few projects in Northern Fennoscandia where proposed mining affects Natura sites (e.g. Sakatti in Finland). Through funded projects and commissioned studies, the EU compiles best practices, including on social issues, stakeholder engagement and transparency, as well as consideration of the societal benefits of minerals extraction. The EU's focus is on efforts to improve the awareness, acceptance and trust of society in sustainable raw materials production in the EU. The concept of a social license to operate has been considered in some EU-funded projects. The Water Framework Directive (2000/60/EC), groundwater directive (2006/118/EC) and the Integrated Pollution Prevention and Control Directive (2008/1/EC) are relevant for mining. Since environmental impact assessment (EIA) is critically important for mining projects, the minimum requirements established by the recently revised EIA Directive (2014/52/EU, 2011/92/EU, EEA relevant) – as well as the Strategic Environmental Assessment Directive (Directive 2001/42/EC) are of major significance for how mining projects are developed. The EIA Directive includes an obligation for evaluation of certain social impacts and requires giving local and regional authorities an opportunity to participate in consultations, while EIA-related information must be electronically accessible. The implementation of the EU's Biodiversity Strategy for 2030 (2020) and upcoming Soil Strategy will be relevant as the EU aims at both facilitating extractive activities and safeguarding the status of the environment.

Apart from direct relevant regulations, the EU can facilitate extraction in the European and circumpolar Arctic by supporting innovation in mining and networking among mining stakeholders. A Raw Materials Information System (RMIS) of the EU has been established to facilitate better data availability. An important EU instrument is the European Innovation Partnership (EIP) on Raw Materials, which brings together industry, public services, academia and NGOs. Its objective is high-quality performance of the European mining industry. One of the interesting initiatives under the EIP is the Raw Materials Scoreboard (EIP 2018), which provides an overview of the mining sector in the EU and the position of the EU in global raw materials production and trade landscape (a 2020 version is to be published in 2021). Nordic states have a strong position in this EIP, with the Finnish Green Mining programme being a good example. The EIP for Raw Materials has also moved from a focus on extraction to covering the whole value chain. In parallel, the European Raw Material Alliance (ERMA) was established in 2020 as a network of public and private sectors covering the entire raw materials value chain, with strong participation from Finland, Sweden, Canada, Greenland and Norway. It focuses on material resilience of the EU industries. A similar role as regards specific minerals is played by the European Battery Alliance, launched in 2017 and bringing together the European Commission, national authorities, the EIB regions, industry research institutes and other stakeholders, with particularly strong presence of Finnish and Swedish companies and institutions, as well as Canadian actors. The European Institute of Innovation and Technology (EIT) – Raw Materials, in turn, groups leading higher education institutions, research labs and companies. The EIT established a North Hub based in Luleå, Sweden, which offers infrastructure for validation and acceleration including a network of excellence for sustainable mineral exploration and extraction in the Arctic, in order to further promote the environmentally and socially sustainable extraction of resources.

After many years of avoiding providing financing for extractive projects, the EIB from 2020 may be more active in supporting investments in responsible resource extraction, including projects outside the EU that can contribute to the security of a sustainable supply of critical minerals to the EU. The EIB sustainability criteria will apply to such support. The EU has also established the Invest EU Programme, a new tool which may provide funding for raw materials investments, which also follows the EU's sustainable finance taxonomy (Regulation 2020/852).

The EU has dedicated significant resources for research and innovation projects related to raw materials. In the Horizon 2020 programme around EUR 600 million was reserved for the sector, covering the entire value chain including exploration, extraction, mineral and metal processing and recycling – a more than threefold increase compared to the 7th Framework Programme.

Examples of relevant projects with strong involvement of European Arctic partners include:

- Sustainable Intelligent Mining System (SIMS) - improving testing and demonstration of new technology and solutions for the mining industry;
- Sustainable Mining (SUSMINE);
- Tools for sustainable gold mining in the EU (SUSMIN) addressing challenges of eco-efficiency and extraction methods, processing, water treatment and management of environmental and social impacts;
- Mining and Metallurgy Regions of the EU (MIREU) - establishing a network of mining and metallurgy regions across Europe and investigating the social license to operate;
- Sustainable Management of the Extractive Industries (SUMEX);
- The Innovative, Non-invasive and Fully Acceptable Exploration Technologies (INFACT);
- Mineral Intelligence for Europe (Mintell4EU) - improving the European knowledge-base for raw materials primarily through cooperation of geological surveys;
- MINETRAIN - creating training programmes for mining professionals;
- Sustainable Low Impact Mining (SLIM) - solution for exploitation of small mineral deposits based on advanced rock blasting and environmental technologies.

Via many of the projects mentioned above and via other channels, the EC has been working with Member States, regions, industry, civil society organisations and social partners to ensure that mining and extractive activities within the EU are resource-efficient and adhere to the highest environmental and social standards. For instance, a set of non-mandatory, voluntary EU principles for sustainable raw materials were developed by the multiple stakeholders in the Raw Materials Supply Group and the EC. They address social, economic/governance and environmental aspects of sustainability and are expected to be published in 2021.

It is difficult to assess the quantitative impact of EU policies on the volume and sustainability of performance of mining activities in the European Arctic. However, the spectrum of actions taken by the EU in the sector is very broad and the companies, institutions and stakeholders from northernmost European regions are significant beneficiaries of EU research and innovation funding, and active participants in the networks facilitated by EU programmes.

The 2020 Action Plan on Raw Materials envisages further investments in research on extraction technologies, applying EU remote sensing and earth-observation for resource exploration, operations and environment management, as well as further enhancing European skills and mining expertise.

10.3.2. Circumpolar raw materials supply meeting EU demand

In principle EU actions towards stronger recovery of minerals and metals via recycling decrease the demand for primary sourcing, while the policies encouraging low-carbon transformation and technological change increase demand for specific critical minerals. A variety of EU policies on energy, waste, industrial policy, environmental action, climate policy, etc. influence the demand for minerals in the EU economy and this should be taken into account in policy-making. Nonetheless, discussion on these sectors from this perspective is beyond the scope of this chapter.

While mineral extraction in the Arctic has not been specifically discussed in EU strategic documents, the imports from Arctic states could meet several EU objectives. Increased imports from Arctic states could therefore contribute to the diversification of EU supply. As source-regions, Arctic

areas can be considered to have advantages compared to parts of the world where conflicts or low environmental standards are problematic (for comparison, see ICLG 2019).

The EU's trade agreements and framework may influence mineral imports from Arctic states. The EEArea Agreement fully opens the EU market to the resources produced in Norway. The EU's interest in the recent phosphates, vanadium and titanium discovery in Norway, while not located within the Arctic Circle, is a case in point.

Canada is a key mining country and for instance in 2015, 7.3% of the EU's global imports were coming from there (Eurostat, 2016). CETA - which is implemented on a provisional basis while awaiting full ratification - introduces duty-free and quota-free access to the EU market for all Canadian minerals and metals. While most metals and minerals had already enjoyed a duty-free regime prior to CETA, the agreements eliminated tariffs for such metals as nickel (earlier up to 3.3%), copper (up to 5.2%), lead (up to 5%), zinc (5%) and non-ferrous metals such as tungsten, tin, titanium, zirconium and cobalt (earlier up to 9%). Between 2016 and 2018/2019 the exports of Canadian mineral ore to the EU rose by 39.8% and of precious stones and metals by 7.1% (compared to an overall increase of imports of 16.6%; Statistics Canada). CETA also establishes a framework of regular dialogue between the EU and Canada and these have commenced as regards raw materials. In 2020, the EU concluded with Canada the first strategic partnership for critical minerals. Raw materials dialogues with Canada and in fact all Arctic states are generally not Arctic-specific.

Russia was a source of 9.6% of EU global minerals and metals imports in 2015, and it is likely the most problematic raw materials Arctic trade partner for the EU. It produces a vast amount of raw materials, including numerous critical minerals. Significant mining activities take place in Russian Arctic regions. Political high-level tensions are one risk in terms of imports from Russia. Another challenge is the environmental impacts of their extraction, as the Russian mining sector, while formally well-regulated, underperforms in that regard (Levchenko et al. 2019). However, recent improvements in pollution and risk management, and environmental transparency have been noted (WWF 2019).

Greenland has high potential and proven deposits including molybdenum, iron, uranium and critical raw materials such as REEs, niobium and tantalum. There are several projects at different stages and previous Greenland governments strongly promoted mining. However, only two mines are currently operational. The EU and the Greenlandic government opened dialogue on raw materials. A Letter of Intent signed in 2012 and the 2014 Partnership Agreement (Greenland Decision) envisaged dialogue on minerals. Two workshops on raw materials were organised in 2012 and 2015. However, no concrete developments resulted from these interactions. Greenland chose to use EU funding towards education and training, without more direct support for mining developments. It is likely that this focus will be maintained after 2020. EU funding may, however, indirectly support human capital developments, enhancing local social benefits of future mining developments. In general terms, both objectives of the Greenland Decision, sustainable diversification of the economy and developing administrative capacity, are of relevance to mining industry developments. There are possibilities for the EIB to finance mining projects with low environmental and social risk. The EIB had approved a loan for the Canadian company Hudson Resources for a White Mountain anorthosite mine project in Greenland (currently in operation), which was eventually not drawn down by the developer (EC 2017).

Due to challenges related to conflict minerals, the EU has already introduced tracking and transparency for raw materials sourcing (Conflict Minerals Regulation 2017/821, in force from 2021) covering tin, tungsten, tantalum and gold minerals, including in principle those imported from Arctic states, although these imports are unlikely to be directly affected.

There might be some potential for the deep-sea mining of metals and minerals in the Arctic, but no projects have been proposed so far. The EU research projects related to deep sea mining and the contribution to international governance within the International Seabed Authority may indirectly affect projects in the more distant future.

10.3.3. Limiting overall EU resource footprint

An important set of actions, that can be taken by mineral users and importers such as the EU to limit the environmental and social impacts of extractive industries in the Arctic, includes increased domestic recycling of minerals and limiting consumption of mineral-based products. However, an expected global increase in demand, including from Europe, for a variety of critical and other minerals (Carrara 2019) can nonetheless be expected to facilitate numerous Arctic mining projects, including in the Fennoscandian Shield. It is therefore unlikely that EU circular economy action would affect price levels in a way that influences the demand for new Arctic resources.

While outside the scope of this study, the EU has adopted a set of policies to enhance the recovery rate for raw materials, and in particular critical minerals. The Circular Economy Action Plan envisages that circularity of raw materials from low carbon-technologies will be one of the key contributions to the future climate-neutral economy. Progress has already been achieved in this regard with over 50% of iron and zinc being recycled, metals which are extracted across the Arctic and account for over 25% of EU consumption. That is not, however, the case for many critical minerals used in high-tech applications. Further research on waste processing as well as mapping of secondary mineral sources are envisaged under the Horizon Europe programme.

10.4. Policy options

P32. Consider the Indigenous Peoples' rights and interests in Arctic raw materials extraction via dialogue, best practices and guidelines

Indigenous peoples constitute 10% of Arctic populations, including the EU's indigenous group, the Sámi. Their cultures and nature-based livelihoods are in particular at risk from adverse impacts from extractive activities. For example, the existing annual Arctic Dialogue between Indigenous Peoples organisations and EU representatives could be utilised more effectively to discuss concrete concerns related to the interaction between indigenous rights and livelihoods, and extractive industries. Appropriate preparation and participation of national regulators and agencies, as well as the industry, are key to meaningful and concrete outputs of such discussions.

The EU should consider, in line with guidance and best practices on environment and mining, the exchange of best practices and eventually the issuing of non-binding guidance on the interactions between mining activities in the EU and subsistence and traditional livelihoods, and rights of Indigenous Peoples, local inhabitants and minorities. The guidance should be in line with the EU's position on these questions in its interaction with international partners further up the supply chain. It could for example build on the existing EIB's 2019 Guidance Note on Indigenous and Local Community Participation in Environmental Impact Assessment in the European Arctic. As in the EIB document, the principle of the Free, Prior and Informed Consent, as it emerges from the UN Declaration on the Rights of Indigenous Peoples, should be addressed in such guidance. Taking account of different stakeholders with different views within indigenous communities is also important. Promoting further national and European networks with involvement of a broad spectrum of stakeholder constitutes an important premise for a wider sense of ownership and effectiveness of any such guidance.

P33. Support social impact assessments and improve the awareness, acceptance and trust of society in raw materials production in the EU

EU and national regulations and practices include social aspects but focus on the social dimension is not as prominent as in some Arctic jurisdictions. While elements of social impact assessments have become standard, they often refer primarily to jobs and economic outputs or to the health consequences of environmental changes, while social implications of mining developments are wide-ranging. For this reason, the EC can become more involved in promoting social impact assessment practices via research

projects, best practices and guidance adjusted to the specific European governance culture, even if the current EU regulatory framework remains unchanged in the coming years. The goal of improving the awareness, acceptance and trust of society in raw materials production in the EU has already been receiving attention at the EU level. Different impacts of developments on different parts of society should be considered. In the European Arctic, this applies in particular to Indigenous Peoples but is also relevant in terms of gender equality questions. Regulatory and soft instruments for land use planning should be part of this solution, with specific consideration for characteristics of the sparsely populated areas. While many aspects may not be directly regulated at the EU level, knowledge-building activities are also important. In particular, the policymakers should ensure that impact assessments take account of the possible dissonance between global sustainability, where critical and important minerals are indispensable for low carbon transition, and local sustainability where concrete local impacts occur. The new EU taxonomy for sustainable activities, if developed with understanding of possible tensions between global and local sustainability, could also become helpful here.

11. Regional development in the European Arctic and Greenland

11.1. Overview of socio-economic challenges in Arctic regions

Arctic regions are socio-economically diverse, and there are major differences also between regions within the European part of the Arctic. However, these areas face similar challenges related to climate, sparsity, remoteness, and demographics. In many parts of the Arctic, the extractive industries and primary sectors (such as mining, forestry, agriculture or fisheries) remain dominant. Regions deal with multifaceted socio-economic and demographic challenges, including gender and age imbalances, depopulation of the northern rural areas contrasting with growing urban centres, social problems and changes occurring in the extractive industries.

Extractive industries (raw materials, hydrocarbons, forestry, and fisheries) remain the cornerstone of northern economies. There is therefore an increased emphasis in the North on economic diversification, including via innovation, biotechnology, bioeconomy, digitalisation, circular economy, new tourism activities, and creative industries. Tourism in particular had been growing across the region before the Covid-19 pandemic. In the North Atlantic regions and Greenland, the potential for blue growth and bioeconomy has recently received much attention. New blue economy sectors emerge. (Rasmussen 2011; Dubois and Roto 2012; AHDR II 2014; Husebekk et al. 2015; Olsen et al. 2016; Stepien et al. 2016)

Indigenous Peoples living in the region face specific challenges related to traditional livelihoods, cultural development or language retention, while at the same time there are examples of successful Sámi entrepreneurs or young activists (AHDR II 2014; Stepien et al. 2016).

While northernmost regions have managed relatively well in terms of mitigation of the Covid-19 spread, they have been significantly affected by the international and national travel restrictions. High dependence on international tourists (e.g. in Finnish Lapland, 52% of overnight stays in 2019, resulting in 71% drop in accommodation use between January 2020 and January 2021, Statistics Finland) make this sector highly vulnerable. The tourism and hospitality sectors, although not all of their elements, experienced a significant downturn with a high number of bankruptcies and layoffs (e.g. Kopra 2021).

11.2. EU footprint: interactions between the EU economy and the development of Arctic regions

European Arctic regions and Greenland are closely linked to the EU economy. Despite remote location and sparse population some European Arctic regions are highly internationalised. In Finnish Lapland alone there were over 500 exporting SMEs, with the majority operating within the EU's single market (Lapland.fi website). The EU is the key trading partner for Greenland, although the majority of trade is with Denmark. Mineral production from Norrbotten is exported primarily to European buyers. While it is impossible to calculate the influence reliably within the scope of this study, many jobs in the region depend on EU clients and visitors. The European Arctic's connection with the EU is clearly visible in tourism. In Finnish Lapland, tourists from the EU-27 (without the UK) constituted 28% of foreign/non-Finnish visitors in 2019 (Statistics Finland, by arrivals). In Swedish Norrbotten, 65% of tourists were from the EU (primarily Germany) (visitor.io, by accommodation nights). In Greenland 44% of cruise tourists were from the EU-27 (including Denmark) and 47% of accommodation nights in 2019 were from the EU-27 (without the UK and Denmark) (Visit Greenland 2020, by accommodation nights). In the Norwegian northernmost regions (Nordland, Troms and Finnmark) and Svalbard, EU-27 tourists constituted 27% of foreign visitors in 2019 (Statistics Norway, by accommodation nights).

11.3 EU policies relevant for Arctic regional development and their impact

In the European Arctic, the EU plays a role as a regulator, a source of funding and financing, and a network-builder. The most visible elements of EU action are structural and investment funds as well as cross-border cooperation. This chapter focuses on this area of EU policy.

The EU support in Arctic Europe includes Investment for Growth and Jobs (IfGJ, henceforth mainstream cohesion policy programmes) programmes in Finland and Sweden, cross-border cooperation with Russia (Kolarctic and Karelia programmes), Interreg cross-border cooperation (Interreg North and Botnia-Atlantica Programme), and the transnational Northern Periphery and Arctic Programme (NPA). The NPA could be seen as a programme with the strongest Arctic identity, as it includes partners from Finland, Sweden, Norway, Iceland, and Greenland. The Interreg Nord programme (for Finland, Sweden and Norway) includes Sápmi as a distinct sub-area with focus on supporting Sámi culture and entrepreneurship across borders, among others. Importantly Russian authorities and partners were strongly engaged in cooperation via the Kolarctic and Karelia programmes during the previous MFF, despite a tense political climate between the EU and Russia since 2014 (see figures 10.1-10.3).

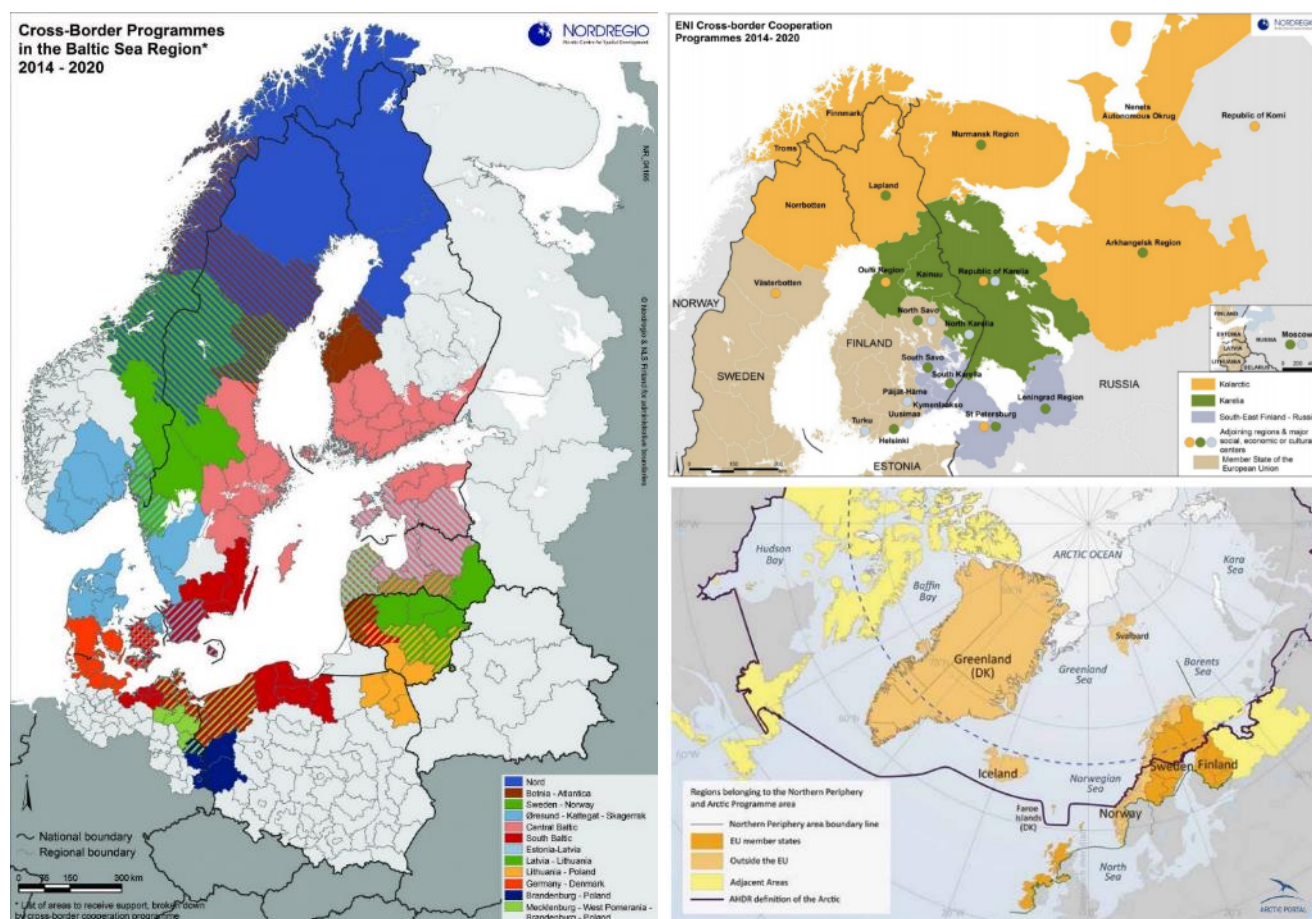
The transnational and cross-border programmes generally have limited funding, but they allow networking and joint actions bringing together actors from across the European Arctic. The much larger mainstream cohesion policy programmes allow for larger investments although the mainstream funding is still small compared to the size of Nordic economies, in contrast for instance with the situation in Central-Eastern European EU Member States.

All cohesion policy programmes (mainstream, transnational and cross-border) share various priorities including innovation, ensuring sustainable communities in the North, energy security, circular economy, entrepreneurship and SMEs, as well as cultural and natural heritage. Economic diversification is among the strategic goals in most regions. The EU shapes programme expenditure by defining focus areas, from which Member States and partner states choose priorities for each programme.

The funding for these programmes comes from the European Regional Development Fund (ERDF), the European Social Fund (ESF) for Finnish regions, as well as Member States' national funding from Finland and Sweden. The non-EU partner countries provide matching funding for projects. The ERDF is the main source of EU funding in the region and part of the ERDF funding can be used outside of the programme area if there is a clear benefit for the programme and the achievement of the objectives of projects (so-called flexibility rule). This extra-area funding was limited to 20% of ERDF resource until 2020, but this cap has been removed in the regulation proposed for 2021-2027. It has therefore been possible to involve Canadian, US (Alaskan) and Russian partners in some NPA projects. The flexibility rule allowed the use of additional resources for Faroese, Icelandic or Greenlandic beneficiaries. In the 2014-2020 programme, over EUR 600,000 was spent in Canada, EUR 150,000 in Russia, while Greenland and Faroe Islands received additional over EUR 330,000 and EUR 530,000 respectively, giving the NPA a more circumpolar dimension.

EU funding for the EU northern cross-border, transnational and mainstream programmes in the European Arctic programmes operating in the European Arctic for 2014-2020 amounted to EUR 1,256 million. Together with funding from Member States and partner countries the budget of these programmes totalled EUR 2,456 million. A big part of this funding has been allocated to Finnish regions as a part of the Finnish mainstream structural and investment funds funding (see table 11.1). In the mainstream programmes, a special allocation for sparsely-populated areas (NSPAs) adds to the available EU funding. The allocation amounted to EUR 30 per person in the 2014-2020 MFF.

In addition to the above, available EU funding also includes the EMFF and the European Agricultural Fund for Rural Development. The latter includes the LEADER programme, which is a popular tool for community development and bottom-up initiatives, with e.g. 51 LEADER groups active in rural Finland. The mainstream cohesion policy funding in Sweden and Finland also includes smaller nationwide programmes: the SME Initiative in Finland and the Investment and Growth Programme for Sweden.



Figures 11.1-11.3: EU cross-border programmes and the Northern Periphery and Arctic Programme in the European Arctic and Baltic context. 2014-2020. Includes the UK. Map production: Nordregio and the Arctic Portal.

| EU Programmes | Total allocation EUR million | EU allocation (ERDF, ESF, ENI) EUR million |
|--|---------------------------------|---|
| Finland “Sustainable growth and jobs” (“mainstream” funding: seven NSPA regions)* | 940.5 | 470.2 |
| Upper Norrland (mainstream) | 421.6 | 219.8 |
| Central Norrland (mainstream) | 306.3 | 153.1 |
| Northern Periphery and Arctic Programme (transnational) | 55.2 | 47.2 |
| Interreg Nord (cross-border programme) | 47.7 | 39 |
| Interreg Botnia-Atlantica (cross-border programme) | 61 | 30.5 |
| Kolarctic (cross-border cooperation) | 63.5 | 24.7 |
| Karelia (cross-border cooperation) | 43 | 21.5 |
| Total: all programmes in the European Arctic | 2456.2 | 1264.9 |

Table 11.1: Budget of EU mainstream and cross-border and transnational programmes within the 2014-2020 MFF. Data: programmes’ websites, EU’s Regional PolicyAtlas at https://ec.europa.eu/regional_policy/en/atlas/programmes, OECD 2017; EP 2016.

*original allocation for seven northern Sparsely Populated Area regions in North-East Finland is together EUR 1458.2 million (EUR 729.1 million EU funding), which constitutes 79% of Finnish ERDF funding and 59% of the ESF funding. Allocation for three northernmost regions (Northern Ostrobothnia, Lapland and Kainuu) is EUR 701.6 million (EPRD and ESF funding EUR 350.8 million). Additional funding comes from funds not allocated regionally. Calculation based on the data from the Ministry of Economic Affairs and Employment of Finland.

Examples of diverse projects funded by EU programmes in the European Arctic:

- Visit Arctic Europe, Interreg Nord - creating pan-European Arctic tourist offer and dealing with barriers to tourism flows across the regions;
- RESEM, Interreg Nord - using remote sensing data from satellites in mining safety and environmental monitoring in northern conditions;
- IMPROVE, NPA - facilitating technology-driven public service solutions;
- BUSK Building Shared Knowledge capital to support natural resource governance in the Northern periphery, NPA - development of inclusive planning tools for resource management;
- WAX - developing extraction of wax from cranberries and blueberries;
- Giellagáldu, Interreg Nord - strengthening the use of Sámi languages in different sectors;
- IMPRESS, Kolarctic - adapting management of Barents forests to future climate and economy conditions;
- Capacity Building for Black Carbon mitigation efforts: a roadmap for cross-border activities, Kolarctic;
- ARCTAQUA, Kolarctic - Cross-border Innovations in Arctic aquaculture.

The cooperation with Russia is further supported by the common policy of Northern Dimension (between the EU, Russia, Norway and Iceland). Most ND projects, in particular within the NDEP, are implemented in northwest Russia, partly in its Arctic Zone. Examples include the improvement of water services in Arkhangelsk (EUR 25 million), as well as nuclear safety projects such as the development of the Radiation Monitoring and Emergency Response System of the Murmansk Region (EUR 5 million) (NDEP website).

It is difficult to assess the tangible impacts of EU programmes on regional development. Altogether thousands of projects are implemented, but EU structural and investment funds constitute a minuscule percentage of public investment in Finland and Sweden and they are too small to allow e.g. major infrastructural investments (EC 2017). Lack of EU support for infrastructure in regions characterised by vast distances has in fact been criticised (EP 2016), but it is unlikely that major change occurs in this area. The small size of EU funding means that these instruments cannot by themselves significantly influence challenging economic, social and demographic trends in the region. The northernmost regions continue to have higher unemployment than the southern parts of their nation states. There is a growing disparity between depopulating countryside and growing cities, including both the national capitals and the northern regional urban centres (e.g. Grunfelder et al. 2020). Reversal of these trends requires major mobilisation of regional, national and European resources and structural economic changes.

Nonetheless, it has been shown that for the sparsely-populated regions (e.g. Swedish Norrbotten) EU funding is a noticeable driver for regional governance and development (EP 2016; Giordano and Dubois 2019; OECD 2017). The northernmost regions of the EU are part of the richest EU and EEA Member States, but they have limited financial and human resources. For policy areas such as employment and business development, EU funding constitutes a big part of resources that regional authorities dedicate to these policy portfolios. Regions and municipalities utilise EU funding for planning and for smaller investments. EU programmes are of great importance for the northern educational and research institutions, allowing them to increase their societal impact and cooperate more closely with the private sector as well as network internationally. Funds are also readily taken up by Arctic SMEs. For instance, tourism has been among the important recipients of EU support across the region. The latest evaluation of the NPA (McMaster et al. 2019) suggested that the programme facilitated SMEs' links to research and development institutions, improved provision of services in remote communities, induced change of perception among participants, and increased local capacities to deal with macroeconomic issues. Some transnational networks, induced by projects, have persisted following the end of the lifecycle of the projects. The impacts are usually on a small scale for a single project, but seem to be visible.

It is clear that without the EU cross-border programmes, the cooperation across Arctic Europe would be much less rich and dynamic. The regional actors have a long history of collaboration, including under the umbrella of Nordic cooperation. However, EU funding helps to bring people and institutions together around concrete actions on an unprecedented scale and across sectors and social groups. Without EU programmes the current level of multifaceted integration in the North would likely not be possible.

While the programming for the new MFF is ongoing, a new set of objectives has been proposed for all EU programmes: 1) a smarter Europe (innovative economic transformation); 2) a greener, low-carbon Europe (energy transition, circular economy, climate adaptation – all programmes need to address this objective); 3) a more connected Europe (mobility and ICT); 4) a more social Europe (promoting social rights); 5) a Europe closer to citizens (sustainable development of urban, rural and coastal areas including local initiatives). Importantly, the EU programmes will need to spend at least 30% of their expenditure on climate-related actions. Increasing focus on biodiversity and digitalisation is expected, and specific indicators for gender equality have been introduced.

The new 2021-2027 MFF also brings about changes to the organisation of EU programmes in the European Arctic. The northern Finland-Sweden-Norway programmes merge into a new Aurora Programme, which will still include Sápmi as a separate sub-area, possibly with greater focus on language and cultural preservation. Not all regions have been satisfied with the merger into one Aurora programme, but the Member States believe that this will cut administrative costs and promote critical mass for interesting, innovative undertakings across a greater area of the sparsely populated regions. There are concerns that the presence of large, resourceful and experienced institutions may be affecting the capacity of smaller actors across the region to obtain funding. The NPA's capacity to achieve good results may be challenged by Brexit, as a big part of the population previously covered by the programme lives in Northern Ireland and Scotland, which affects resources available in the programme. During the 2014-2020 MFF, the cross-border cooperation programmes dedicated to collaboration with Russia moved from the purview of DG DEVCO (Development Cooperation, currently DG for International Partnerships INTPA) to DG REGIO. The new cross-border Interreg NEXT programmes for 2021-2027, which will replace ENI, are in the very early phase of programming, but the first programme documents indicate slightly greater focus on an Arctic dimension. As regards mainstream programmes (national programs for Sweden and Finland), Finland decided already to have one programme for the whole country from 2014, so NSPAs do not have their own programme as is the case in neighbouring Sweden. However, 79% of ERDF and 59% of ESF funding in Finland is allocated to seven Finnish NSPAs.

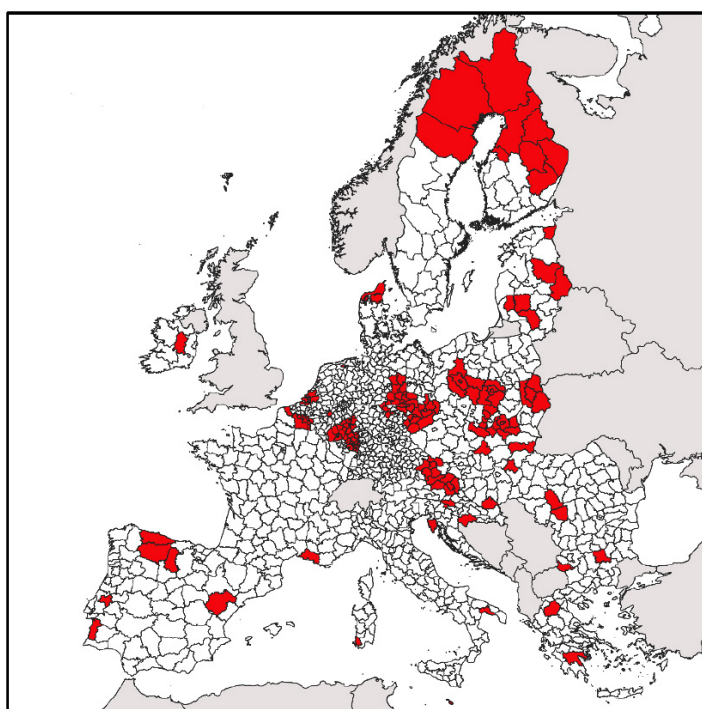


Figure 11.4: Regions identified in European Semester Country Reports as facing serious socio-economic challenges deriving from the transition (marked in red, i.e. regions most “at risk”).

Source: European Parliament 2020, based on the European Semester Country Reports 2019, 2020.

While it is difficult to assess which European regions are at the greatest risk related to transition, the regions were identified differently in each country based on “statistics such as employment in industries expected to decline, regional development, unemployment rates, youth unemployment rates, and age and gender distribution in the population” (EP 2020).

A new instrument launched under the 2021-2027 MFF is the Just Transition Fund (JTF). The northernmost regions of Finland and Sweden were identified in the European Semester reports (EP 2020) as being socio-economically among the most “at risk” regions in the context of transition to a low-carbon economy (EP 2020; EC 2020, see figure 11.4). In the European Arctic, the JTF will be most likely utilized for the transition away from peat in Finland (over EUR 400 million) and the transformation of a carbon-intensive (primarily steel) industry in Swedish Västerbotten and Norrbotten (over EUR 150 million).

Further funding in the near future would be available through the post-COVID Recovery Plan for Europe (NextGenerationEU stimulus package), which also includes a focus on green transition. This support may be needed, as parts of the tourism and hospitality sectors dependent on international travel in the European Arctic have experienced near collapse due to pandemic travel restrictions. Importantly, the 2014-2020 programmes have already been responding to the Covid-19 pandemic with new actions of existing projects designed to respond to new health, social and economic challenges. For instance, the NPA PLEASE-EE project, which focuses on improving the quality of life of the elderly, took up the problems of sadness and loneliness related to the lockdown.

In 2016 the EU’s Arctic policy Joint Communication launched the process of identifying key investment and research priorities. This task was overseen by DG MARE as a DG responsible for Arctic policy and carried out by the European Arctic regions (Northern Sparsely Populated Areas, West Nordics and the Sámi) and resulted in a report (EC 2017). It is unclear how, if at all, the results of this process have been utilised in designing project calls under the previous MFF, whether it influences the current programming of the forthcoming programmes or the financing decisions made by the EIB (if it does, this is not visible from interviews conducted during the present study). Rather, the process may have a stronger indirect effect as it allowed the regions to jointly reflect on common challenges and development options.

A long-standing challenge related to EU funding across the continent is the interaction between the different programmes which overlap in terms of area. The 2016 Arctic Joint Communication created the possibility for the NPA programme to launch cooperation between different programmes. Studies had been carried out earlier e.g. Van Der Zwet et al. 2014, and the programme managers have been consulted regarding calls, while keeping the autonomy of programmes. Joint seminars and awards for the best projects implemented under different programmes across the European Arctic have been introduced. Further, the projects with overlapping themes funded under different EU programmes now form collaborative clusters; organising joint meetings, exchanging experiences, best practices and outputs, interlinking their project participants and stakeholders. Four such clusters have been launched: ARCTIC CLUSTER (good energy practices), North-European Energy Cluster (energy use in buildings), Champions for Climate Action (energy carbon emissions mitigation), and Arctic Pacer (better public services provision). Altogether the cooperation between programmes, fairly unique in the European context, has been assessed as a success.

Another challenge for both the mainstream cohesion policy programmes and transnational/cross-border programmes operating in sparsely-populated areas has been the complexity of project application and management, making it difficult for smaller actors to fully benefit from the EU funding (EP 2016; Stepien and Koivurova 2017). As a result, a set of the same institutions in the region develop and lead projects over the years. This has been of particular concern for the Sámi actors, who would like to develop projects on their own rather than join larger applications. There are also concerns about limited interest among microenterprises. The EC has made efforts to simplify application and project management (for 2021-2027 MFF the EC has proposed over 80 simplifications) but many of its proposals have not been endorsed by Member States. The levels of trust and transparency in Europe’s northernmost regions are relatively high compared to the situation in other parts of Europe and in principle, the European Arctic could benefit from simplified rules and procedures. Instruments that could be useful for smaller actors are provided by small project funds, already used across the EU and currently incorporated for the first

time into the proposal for new EU regulations governing the programmes for the 2021-2027 MFF period (EC website). A small project fund provides funding to an agency that then distributes the funding for micro-projects. The final recipient of the funding can implement very small actions with minimal administrative resources. The instrument would have been potentially very useful for smaller actors and for the Sámi and microenterprises, but so far it has not been accepted by Nordic states as a part of their programmes. Notwithstanding adoption or not of a small project fund, there is currently an obligation for all programmes to also fund microprojects. However, while microprojects may have some bureaucratic simplification, they are generally subject to the same procedures as larger undertakings.

The EU mainstream and transnational/cross-border programmes are not genuinely interlinked with the EU's broader Arctic policy, apart from being mentioned in the EU's policy statement as an EU Arctic contribution. This is in contrast with e.g. EU Strategy for the Baltic Sea Region, and reflects the difference between the macroregional and sea basin strategies, which have more specific objectives and are more actionable, and the loose format of the EU's Arctic policy, which reflects the existing EU policies rather than influences their development and implantation in the Arctic context. For instance, there is no specific requirement for projects funded by the EU to even identify whether the actions contribute to the EU Arctic policy priorities. For instance, the NPA secretariat reports on the contribution of its projects to Baltic and Atlantic strategies, but not to the EU's Arctic policy (e.g. NPA 2020). This is not surprising considering that no concrete EU priorities are established for the Arctic. A more targeted overarching EU Arctic policy, especially as regards the European Arctic, would also allow stronger reflection of the Arctic dimension in EU funding programmes.

Due to the way mainstream structural funding had been structured at the onset of the 2014-2020 MFF, the EU influenced the way European Arctic regions strategically think about their development. The prerequisite to obtain EU funding is the elaboration of Regional Strategies for Research and Innovation for Smart Specialisation Strategies (RIS3). The idea is to define the strengths of the region and the possible positioning of the region in the European and global economy and innovation, and eventually direct resources and organise human capital and networking around these areas. The goal is to better position regions within a globally competitive environment and avoid attempting to reproduce pathways that were successful elsewhere, but may not work for the conditions of a given region. The EU funding is then supposed to support the regionally-chosen prioritisation. Many actors in the North believe that this approach is particularly suited to regions that have special characteristics such as sparse population, unique industries, human capital and labour market gaps, and niche expertise. While the intake of an EU-mandated way of strategic planning varies across the EU, some northernmost regions have fully utilised it (Teräs et al. 2015; Teräs et al. 2018). The Finnish region of Lapland is the best example as its Arctic Smartness strategy (Regional Council of Lapland, 2013) has won praise across the continent. Interestingly, non-EU regions such as Norwegian Nordland and Finnmark decided to utilise elements of the RIS3 framework in their regional planning, finding them useful. Apart from the RIS3 framework, the EU funding, due to its seven-year budgeting, also allows and encourages regions to engage in long-term planning. It is however difficult to measure the tangible effects on regional development arising from the new way of strategic thinking.

In addition to EU programmes, support for investments in the North is also carried out through the lending of the EIB and the European Bank for Reconstruction and Development. However, neither of these institutions has a special funding line dedicated to Arctic projects. The EIB provides public sector lending in the European Arctic just as it does in the rest of the continent. There is a good uptake of support for SMEs and innovative actions through InnovFin ("EU Finance for Innovators") and COSME (EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises) facilities (wide range of loans, guarantees and equity-type funding). Good examples of larger single EIB-financed projects in Arctic states are the Northvolt demonstration battery factory in Northern Sweden (EUR 52.5 million loan). In Iceland the expansion of two geothermal power plants near Reykjavik was financed as well as investments in the metals industry and medical infrastructure development. The EIB also finances a Sierilä hydropower project in Finnish Southern Lapland. The EIB made EUR 100 million

available exclusively for the OCTs (including Greenland) during 2014-2020. The bank is now tasked with aligning its financing with the Paris Agreement (20% of climate-related lending by 2025) and contributing to the European Green Deal goals. This will include projects supporting climate adaptation, biodiversity and a low carbon economy. As a result, the EIB will need to be even more selective in terms of projects that receive financing, and the projects will have to be even more in line with the EIB's Environmental and Social Standards (EIB 2018) and the EU taxonomy.

The EIB has developed taxonomy for the sustainability of investments, clarifying the preconditions for defining which activities are not sustainable and therefore not eligible e.g. for financial support. The EU as a whole also established a binding taxonomy framework. (Regulation (EU) 2020/852 (Taxonomy) on the establishment of a framework to facilitate sustainable investment

A broad range of EU policies affect regional development in the European Arctic, including especially transport, energy and connectivity, therefore, the discussion on these sectoral EU policies will not be repeated here. EU transport corridors, including projects eligible for EIB support and support from the Connection Europe Facility, extend into northernmost regions. The EU push for the expansion of renewable energy contributes to the current boom for wind power developments (which are not uncontroversial in the North due to their impacts on environment and landscape, and the largely unresolved question of Indigenous Peoples' land rights).

The EU also promotes developments within the bioeconomy and the blue economy, both being of high relevance for the European Arctic. Forestry remains the key industry in Northern Finland and North Sweden, while the blue economy comprises key sectors across the North Atlantic, with increasing interactions between maritime sectors, both traditional ones like fisheries and shipping, and the more recent renewable energy, extraction of hydrocarbons, bioprospecting and tourism ones. The EU attempts to make the bioeconomy (see e.g. the Bioeconomy Action Plan, EC 2018) and the blue economy (EC 2007, SWD(2017) 128 final) more sustainable and has therefore adopted standards for defining sustainability in bioeconomy, in terms of bioenergy generation. Of increasing importance in this context is food security of indigenous communities in the North. This means on the one hand access to locally-produced, safe and culturally-appropriate food; and on the other hand, possibilities for Arctic producers to create added value to their products, e.g. through high quality organic foods or cosmetics marketed locally and across the EU. Various EU projects in the 2014-2020 MFF period contributed to the latter. In terms of food safety, the EU's 2020 Farm to Fork Strategy (COM(2020) 381 final) is of relevance, although while it promotes sustainable production and diets, it does not refer to culturally-appropriate or traditional food, local hunting and gathering practices, which are a part of northern lifestyles for many inhabitants and contribute to food sustainability.

Greenland is the largest recipient of EU funding from all jurisdictions defined by the EU as an OCT. For 2014-2020, support in the form of a dedicated External Financing Instrument amounted to EUR 217 million. The EU partnership with Greenland is related to the status of Greenland as a non-EU country within the Kingdom of Denmark and the Fisheries Partnership Agreement (discussed in chapter 7 on fisheries). EU funding (Greenland Decision 2014/137/EU) is dedicated to education and training. Prioritisation of the education sector was chosen by the Greenlandic government. The specific objectives are the reduction of inequalities with better quality pre-school and elementary education, with more educators employed, as well as a lowering of drop-out rates. The programme provides around a tenth of the Greenlandic annual total education budget. EU funding also covers technical support for education, for instance through studies related to topics such as transition to labour market, resulting in concrete education system reforms. The developments in areas covered by EU funding are noticeable. The share of children in pre-school education is gradually growing, and school completion rate is rising, although not consistently. The availability of professional educators remains a challenge (EC 2017). However, the EU mid-term review highlighted that progress in the education sector has not yet produced spill-over effects, e.g. as regards economic diversification and greater economic self-sufficiency (EC 2017; EP 2019).

The impact of EU support is however broader. The governance conditions attached to EU budget support incentivised the Greenland Government to introduce reform to its public financial management (PFM) system following several EU-supported studies on the PFM. One of the results was the adoption of a new procurement law in 2019, which is now more closely aligned with EU standards. Moreover, the need to develop long-term plans for education has had a spill-over effect and currently several ministries are developing long-term strategies, which was not the case earlier.

Negotiation of the new partnership only commenced at the time of writing this report. The cooperation on issues strategic for the EU, such as critical minerals, has not been particularly effective so far, and it appears there is little interest on the Greenlandic side towards moving away from the education focus. However, via Business Greenland the EU currently supports SMEs affected by the Covid-19 pandemic, which could open new ways of using EU funding in the future. Moreover, a stronger focus on gender in education is likely, as cooperation with OCT has to incorporate a gender dimension after 2020.

Greenland is also eligible for other sources of EU funding, including Horizon 2020 and the future Horizon Europe, as well as EU programmes such as the NPA.

11.4. Policy options for the EU's inputs into sustainable regional development

P34. Strengthening the NPA and maintaining its role as a facilitator of cooperation between northern programmes

For two decades, the NPA has been a mainstay of transnational/cross-border cooperation actions co-funded by the EU. The 2016 Joint Communication opened a possibility for the NPA to facilitate cooperation between different EU funding instruments operating in the European Arctic. The interaction between programme managers has resulted in some level of coordination and in creating project clusters. These developments have been assessed positively. However, the departure of the UK from the EU significantly limits the coverage of the NPA. After 2021 the NPA may find it challenging to fund more substantial interventions and carry out cooperation between programmes. Strengthening of the NPA as one of the cornerstones of the European Arctic dimension of the EU's Arctic policy is important. Following recent legislative changes there is a stronger incentive for mainstream programmes operating in Finland and Sweden to include elements of cross-border cooperation into funded projects. The experience of Interreg managers can prove useful for introducing this dimension of mainstream cohesion policy programmes. Additional funding and administrative resources for fulfilling broader Arctic political objectives could for instance come from the Neighbourhood, Development and International Cooperation Instrument (NDICI) or the DG MARE Technical Assistance, as many of the NPA activities contribute to EU relations with Arctic countries and are directly linked to the Arctic policy objectives. However, innovative approach in bringing together different objectives and frameworks would be needed here. This could also include promotion of the NPA programme in Canada and Alaska by the EU missions in Ottawa and Washington, as a part of ERDF funding can be used outside the NPA programme area, if that benefits programme objectives.

P35. Promote small project funds in the Arctic context

The decision on utilising the small project fund tool lies with the states designing the programmes and not with the EC. However, the EC should continue to promote this instrument in order to allow smaller organisations from the region, including Sámi organisations and microenterprises, to develop and lead their own actions with minimal administrative burden.

Annex 1: List of EU legislation and policy documents mentioned in the report

General – primarily Arctic policy - documents referred to throughout the report

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

Council of the European Union (12 May 2014), Council conclusions on developing a European Union Policy towards the Arctic Region, Foreign Affairs Council meeting, Brussels.

Council of the European Union (2019). Council Conclusions on the EU Arctic policy, 9 December 2019.

EEA Consultative Committee, Resolution and Report on the opportunities and challenges in a changing Arctic region, Brussels, 10 October 2013, Ref. 1126150.

European Commission (10 October 2007). “An Integrated Maritime Policy for the European Union”, Communication, COM(2007) 574 final).

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

European Commission and High Representative (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.

European Commission and High Representative (2016), Joint Communication on an integrated EU policy for the Arctic followed by Council conclusions on Arctic issues, JOIN(2016) 21 final.

European Economic and Social Committee (17 April 2013), “Opinion of the European Economic and Social Committee on EU Arctic Policy to address globally emerging interests in the region – a view of civil society”, Rapporteur: Mr Hamro-Drotz, REX/371.

European Parliament (2011). Resolution of 20 January 2011 on a sustainable EU policy for the high North, A7-0377/2010, P7_TA(2011)0024.

European Parliament (2014). Joint Motion for a Resolution on the EU strategy for the Arctic (2013/2595(RSP)). URL: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+MOTION+P7-RC-2014-0229+0+DOC+XML+V0//EN>.

European Commission (2019). Improving International Ocean Governance – Two years of progress JOIN/2019/4 final, Joint Report. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=JOIN:2019:4:FIN>

European Commission (2016). Joint communication: International ocean governance agenda for the future of our oceans (JOIN(2016) 49).

Council of the European Union, EU Maritime Security Strategy, Brussels, 24 June 2014, 11205/14.

Connectivity

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ 1992 L 206/7.

European Commission (2011). Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system, White Paper.

European Maritime Agency (2021). EMSA Outlook 2021.

European Parliament (2011). Resolution on a sustainable EU policy for the High North, 20 January 2011.

European Parliament (2014). Resolution on the EU Strategy for the Arctic, 12 April 2014.

Innovation and Networks Executive Agency (2011). Haparanda rail line in Sweden to receive EU funding, 26 April 2011. URL: ec.europa.eu/inea/en/news-events/newsroom/haparanda-rail-line-sweden-receive-eu-funding.

Regulation (EC) No 392/2009 of the European Parliament and of the Council of 23 April 2009 on the liability of carriers of passengers by sea in the event of accidents, OJ 2009 L 131/24.

Regulation (EU) No 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications networks within the Union, OJ 2012 L 172/10.

Research and Innovation

Council of the European Union (2020). Proposal for a Regulation of the European Parliament and of the Council establishing Horizon Europe - the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination. Brussels, 18 December 2020. 14239/20.

Council of the European Union (2016), Conclusions of Foreign Affairs Council on the Arctic, 20 June 2016, 10172/1/16 REV 1.

Council of the European Union (2014). Council Conclusions on Developing a European Union Policy towards the Arctic Region. Brussels: Foreign Affairs Council meeting.

Council of the European Union (2009). Council Conclusions on the Arctic Issues. Brussels: 2985th Foreign Affairs Council meeting.

European Commission (2008). Communication from the Commission to the European Parliament and the Council: The EU and the Arctic Region, 20 November 2008, COM (2008) 763 final.

European Commission and High Representative (2016). An Integrated European Union Policy for the Arctic, JOIN (2016) 21 final, Brussels, 27 April 2016.

European Commission and High Representative (2012). Joint Communication from the High Representative and the European Commission to the European Parliament and the Council on Developing a EU Policy towards the Arctic Region: Progress since 2008 and Next Steps JOIN(2012) 19 Final.

European Parliament (2020). A Balanced Arctic Policy for the EU, Policy Department for External Relations, Directorate General for External Policies of the Union, PE 603.498, July 2020. URL: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2020/603498/EXPO_IDA\(2020\)603498_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2020/603498/EXPO_IDA(2020)603498_EN.pdf).

European Parliament (2017). Resolution of 16 March 2017 on an integrated European Union policy for the Arctic, 2016/2228 (INI).

European Parliament (2014). Resolution of 12 March 2014 on the EU strategy for the Arctic, 2013/2595 (RSP).

European Parliament (2008). Resolution of 9 October 2008 on Arctic governance.

Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC.

Indigenous Peoples' Rights

Charter of Fundamental Rights of the European Union, OJ 2012 C 326/391.

Council of the European Union, Council Conclusions on "Space solutions for a sustainable Arctic", 29 November 2019. URL: <https://data.consilium.europa.eu/doc/document/ST-13996-2019-INIT/en/pdf>.

EEAS [European External Action Service] (2020). Protecting Indigenous Peoples is pursuing a better world, 8 August 2020. URL: https://eeas.europa.eu/headquarters/headquarters-homepage/83887/protecting-indigenous-peoples-pursuing-better-world_en.

Treaty on European Union, OJ 2012 C 326/1.

Gender

Council of the European Union (2020). Proposal for a Regulation of the European Parliament and of the Council establishing Horizon Europe - the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination. Brussels, 18 December 2020. 14239/20.

European Commission (2020a). A Union of Equality: Gender Equality Strategy 2020-2025. Brussels, 5.3.2020 COM (2020)152 final.

European Commission (2020b). Union of Equality: LGBTIQ Equality Strategy 2020-2025, Brussels, 12.11.2020 COM(2020) 698 final.

European Commission (2020c). A new ERA for Research and Innovation. Brussels, 30.9.2020 COM(2020) 628 final.

European Commission and High Representative (2020). Joint Communication to the European Parliament and the Council. EU Gender Action Plan (GAP) III – An Ambitious Agenda for Gender Equality and Women’s Empowerment in EU External Action. JOIN (2020) 17 Final, 25 November 2020.

Climate change

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) Text with EEA relevance. OJ L 334, 17.12.2010, p. 17–119.

EC (European Commission) (2013). An EU Strategy on adaptation to climate change. Communication from the Commission COM/2013/0216 final Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (Text with EEA relevance), OJ L 344, 17.12.2016, p. 1–31.

EC (European Commission) (2016). A European Strategy for Low-Emission Mobility Brussels, COM(2016) 501 final, 20.7.2016.

Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance), PE/3/2018/REV/2, OJ L 156, 19.6.2018, p. 26–42.

EC (European Commission) (2020). EU strategy to reduce methane emissions. Communication from the European Commission COM/2020/663 final.

EU (2020, March). National report by the European Union. Enhanced Black Carbon and Methane Emissions Reductions. Arctic Council Framework for Action. URL: https://oaarchive.arctic-council.org/bitstream/handle/11374/2545/EGBCM3_2020_National-Report-EU.pdf.

EC (European Commission) (2021). Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change. Communication from the Commission COM(2021) 82 final, Brussels, 24.2.2021.

Long-range pollution

EC (European Commission) (2005). Thematic Strategy on air pollution Communication from the Commission COM/2005/0446 final.

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (Text with EEA relevance).

Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, OJ L 152, 11.6.2008, p. 1–44.

Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC, OJ L 309, 24.11.2009, p. 1–50.

Commission Implementing Regulation (EU) No 540/2011 of 25 May 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances. (Text with EEA relevance). OJ L 153, 11.6.2011, p. 1–186.

Commission Regulation (EU) No 546/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards uniform principles for evaluation and authorisation of plant protection products. (Text with EEA relevance). OJ L 155, 11.6.2011, p. 127–175.

Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products. (Text with EEA relevance). OJ L 167, 27.6.2012, p. 1–123.

Commission Regulation (EU) No 283/2013 of 1 March 2013 setting out the data requirements for active substances, in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market. (Text with EEA relevance). OJ L 93, 3.4.2013, p. 1–84.

Commission Regulation (EU) No 284/2013 of 1 March 2013 setting out the data requirements for plant protection products, in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market. (Text with EEA relevance). OJ L 93, 3.4.2013, p. 85–152.

Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants (Text with EEA relevance). OJ L 313, 28.11.2015, p. 1–19.

Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (Text with EEA relevance). OJ L 344, 17.12.2016, p. 1–31.

Regulation (EU) 2017/852 of the European Parliament and of the Council of 17 May 2017 on mercury, and repealing Regulation (EC) No 1102/2008 (Text with EEA relevance), OJ L 137, 24.5.2017, p. 1–21.

Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants (Text with EEA relevance), PE/61/2019/REV/1, OJ L 169, 25.6.2019, p. 45–77.

Macro- and microplastic pollution

European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste, OJ L 365, 31.12.1994, p. 10–23.

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 (Marine Strategy Framework Directive) (Text with EEA relevance), OJ L 164, 25.6.2008, p. 19–40.

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance), OJ L 312, 22.11.2008, p. 3–30.

EC (European Commission) (2015). Communication from the Commission: Closing the loop - An EU action plan for the Circular Economy. COM(2015) 614 final. Brussels, 2.12.2015.

Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Text with EEA relevance), PE/11/2018/REV/2, OJ L 150, 14.6.2018, p. 109–140.

EC (European Commission) (2018). Communication from the Commission: A European Strategy for Plastics in Circular Economy. COM(2018) 28 final. Brussels, 16.1.2018.

Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (Text with EEA relevance), PE/11/2019/REV/1, OJ L 155, 12.6.2019, p. 1–19.

Commission Delegated Regulation (EU) 2020/2174 of 19 October 2020 amending Annexes IC, III, IIIA, IV, V, VII and VIII to Regulation (EC) No 1013/2006 of the European Parliament and of the Council on shipments of waste (Text with EEA relevance), C/2020/7091, OJ L 433, 22.12.2020, p. 11–19.

EC (European Commission (2020). Circular Economy Action Plan: For a cleaner and more competitive Europe. URL: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf.

Biodiversity

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

EC (European Commission) (1998). Communication from the Commission to the Council and the European Parliament on a European Community biodiversity strategy, COM/98/0042 final.

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

The Council of the EU (2010). Biodiversity: Post-2010 EU and global vision and targets and international ABS regime - Council conclusions, 7536/10, Brussels, 16 March 2010.

Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market (Text with EEA relevance), OJ L 295, 12.11.2010, p. 23–34.

EC (European Commission) (2011). Our life insurance, our natural capital: an EU biodiversity strategy to 2020. Communication from the Commission COM/2011/0244 final.

EC (European Commission) (2013). A new EU Forest Strategy: for forests and the forest-based sector, COM(2013) 659 final, Brussels, 20.9.2013.

EC (European Commission) (2013). Roadmap to a Resource Efficient Europe. Communication from the Commission. COM(2011) 571.

EC (European Commission) (2015). The Mid-term Review of the EU Biodiversity Strategy to 2020. Report from the Commission, COM(2015) 478 final, Brussels, 2.10.2015.

EC (European Commission) (2016). Fitness check of the EU Nature Legislation (Birds and Habitats Directives), SWD(2016) 472 final, Brussels, 16.12.2016.

Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (Text with EEA relevance), PE/68/2017/REV/1, OJ L 156, 19.6.2018, p. 1–25.

Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean.

EC (European Commission) (2020). EU Biodiversity Strategy for 2030. Communication from the Commission COM(2020) 380 final. Brussels, 20.5.2020.

UN (n.d.). Statement of the European Union and its Member States at the Intergovernmental Conference on an internationally binding instrument under the United Nations Convention of the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, United Nations, URL: <http://statements.unmeetings.org/media2/19407932/eu-general-statement-written-version.pdf>.

Fisheries

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 (Marine Strategy Framework Directive) (Text with EEA relevance), OJ L 164, 25.6.2008, p. 19–40.

Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and

repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC, OJ L 354, 28.12.2013, p. 22–61.

Regulation (EU) No 1379/2013 of the European Parliament and of the Council of 11 December 2013 on the common organisation of the markets in fishery and aquaculture products, amending Council Regulations (EC) No 1184/2006 and (EC) No 1224/2009 and repealing Council Regulation (EC) No 104/2000, OJ L 354, 28.12.2013, p. 1–21.

EC (European Commission) (2020). EU Biodiversity Strategy for 2030. Communication from the Commission COM(2020) 380 final. Brussels, 20.5.2020.

Agreed record of fisheries consultations between the European Union and Norway for 2021, 16 March 2021. URL: <https://www.regjeringen.no/contentassets/10e46d5fa21440aa8b23c076d5f0a829/bilateral-avtale-med-eu.signert.pdf>.

Marine transport

Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC, OJ L 121, 11.5.1999, p. 13–18.

Directive 2005/33/EC of the European Parliament and of the Council of 6 July 2005 amending Directive 1999/32/EC, OJ L 191, 22.7.2005, p. 59–69.

Directive 2009/16/EC of the European Parliament and of the Council of 23 April 2009 on port State control (Text with EEA relevance), OJ L 131, 28.5.2009, p. 57–100.

Directive 2012/33/EU of the European Parliament and of the Council of 21 November 2012 amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels, OJ L 327, 27.11.2012, p. 1–13

Commission Implementing Decision (EU) 2015/253 of 16 February 2015 laying down the rules concerning the sampling and reporting under Council Directive 1999/32/EC as regards the sulphur content of marine fuels, OJ L 41, 17.2.2015, p. 55–59.

Directive (EU) 2016/802 of the European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels, OJ L 132, 21.5.2016, p. 58–78.

EP (European Parliament) (2017, February 8). Report on an integrated European Union policy for the Arctic (2016/2228(INI)).

Council Decision (EU) 2017/1757 of 17 July 2017 on the acceptance on behalf of the European Union of an Amendment to the 1999 Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-Level Ozone, OJ L 248, 27.9.2017, p. 3–75.

Energy, including renewables and offshore hydrocarbons

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Text with EEA relevance). OJ L 140, 5.6.2009, p. 16–62.

EC (European Commission) (2011). On an EU strategy for liquefied natural gas and gas storage. Communication from the Commission. COM/2016/049 final.

EC (European Commission) (2011). On security of energy supply and international cooperation: The EU Energy Policy: Engaging with Partners beyond Our Borders. Communication from the Commission. COM/2011/0539 final.

EC (European Commission) (2012). Renewable Energy: a major player in the European energy market. Communication from the Commission. COM/2012/0271 final.

Directive 2013/30/EU of the European Parliament and of the Council of 12 June 2013 on safety of offshore oil and gas operations and amending Directive 2004/35/EC Text with EEA relevance. OJ L 178, 28.6.2013, p. 66–106.

EC (European Commission) (2014). A policy framework for climate and energy in the period from 2020 to 2030. Communication from the Commission. COM(2014) 15 final. Brussels, 22.1.2014.

EC (European Commission) (2014). European Energy Security Strategy. Communication from the Commission. COM/2014/0330 final.

Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010 (Text with EEA relevance). OJ L 280, 28.10.2017, p. 1–56.

Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814 (Text with EEA relevance). OJ L 76, 19.3.2018, p. 3–27.

Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance). PE/3/2018/REV/2. OJ L 156, 19.6.2018, p. 26–42.

Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (Text with EEA relevance). PE/68/2017/REV/1. OJ L 156, 19.6.2018, p. 1–25.

Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (Text with EEA relevance). PE/55/2018/REV/1. OJ L 328, 21.12.2018, p. 1–77.

Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (Text with EEA relevance.) PE/48/2018/REV/1. OJ L 328, 21.12.2018, p. 82–209.

Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency (Text with EEA relevance). PE/54/2018/REV/1. OJ L 328, 21.12.2018, p. 210–230.

EC (European Commission) (2019). The European Green Deal. Communication from the Commission. (COM(2019) 640 final.

EC (European Commission) (2020). A hydrogen strategy for a climate-neutral Europe. Communication from the Commission. COM/2020/301 final.

EC (European Commission) (2020). Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people. Communication from the Commission. COM/2020/562 final.

EC (European Commission) (2020). Amended proposal for a Regulation on establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law). COM/2020/563 final.

EC (European Commission) (2020). An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future. Communication from the Commission. COM/2020/741 final.

Raw materials

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

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.

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).

Directive 2006/21/EC on the management of waste from extractive industry.

Regulation (EC) No 1907/2006 of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Directive 2006/118/EC of 12 December 2006 on the protection of groundwater against pollution and deterioration.

EC (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.

Directive 2008/1/EC of 15 January 2008 concerning integrated pollution prevention and control (Codified version).

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

European Commission (July 2010). Guidance on undertaking non-energy extractive activities in accordance with Natura 2000 requirements. URL:

https://ec.europa.eu/environment/nature/natura2000/management/docs/nee_i_n2000_guidance.pdf.

Directive 2011/92/EU of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification).

European Commission (2012). Greenland’s raw materials potential and the EU’s strategic needs.

European Commission Report on the implementation of the Raw Materials Initiative, COM(2013)442 final. URL: <http://register.consilium.europa.eu/doc/srv?l=EN&t=PDF&gc=true&sc=false&f=ST%2011876%202013%20INIT>.

EC (European Commission). Evaluation of the Council Decision on relations between the European Union, on the one hand, and Greenland and the Kingdom of Denmark on the other (Greenland Decision). Midterm Review Report on the External Financing Instruments. Brussels, 15.12.2017, SWD(2017) 609 final.

European Commission (2020). Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability, Brussels, 3.9.2020, COM(2020) 474 final.

Regional development

Council Decision 2014/137/EU of 14 March 2014 on relations between the European Union on the one hand, and Greenland and the Kingdom of Denmark on the other OJ L 76, 15.3.2014, p. 1–5.

EC (European Commission) (2017). Report on the Blue Growth Strategy Towards more sustainable growth and jobs in the blue economy. Staff Working Document. SWD(2017) 128 final, Brussels, 31.3.2017.

EC (2018). Bioeconomy: The European way to use our natural resources: action plan 2018.

Proposal for a Regulation of the European Parliament and of the Council on specific provisions for the European territorial cooperation goal (Interreg) supported by the European Regional Development Fund and external financing instruments, COM/2018/374 final - 2018/0199 (COD).

Proposal for a Regulation of the European Parliament and of the Council on the European Regional Development Fund and on the Cohesion Fund, COM/2018/372 final - 2018/0197 (COD).

EC (European Commission) (2020). A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system. Communication from the Commission COM(2020) 381 final, Brussels, 20.5.2020.

Regulation (EU) 2020/852 (Taxonomy) on the establishment of a framework to facilitate sustainable investment.

Annex 2: References cited in the report, a list of interviewees (institutions), list of figures and tables

All URL links accessed last time on 14 May 2021.

Introduction and methodology and general references

AMAP (Arctic Monitoring and Assessment Programme) (2017). *Adaptation Actions for a Changing Arctic - Perspectives from the Barents Area*.

Berman, M. & L. How (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. & J. Roto, (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

EC (European Commission) (n.d.). *Rural areas and the primary sector in the EU*, URL: https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/eu-rural-areas-primary-sector_en.pdf.

EC knowledge4policy website. URL: https://ec.europa.eu/knowledge4policy/increasing-demographic-imbalances_en.

Heleniak, T. (2020). "The future of the Arctic populations", *Polar Geography*, DOI: 10.1080/1088937X.2019.1707316.

IPCC (International Panel on Climate Change) (2015). Chapter 15. Polar Regions (Arctic and Antarctic). Fifth Assessment Report.

Jungsberg, L, E. Turunen, T. Heleniak, S. Wang, J. Ramage and J. Roto (2019). *Atlas of population, society and economy in the Arctic*. Nordregio Working Paper 2019:3. URL: <http://norden.diva-portal.org/smash/get/diva2:1352410/FULLTEXT03.pdf>.

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

Liu, N., E. A. Kirk & T. Henriksen (eds.) (2017), *The European Union and the Arctic*. Brill/Nijhoff, Leiden/Boston pp. 11-39.

Olsen, L. S. et al. (2016) *Sustainable Business Development in the Nordic Arctic*. Stockholm: Nordregio Nordic Centre for Spatial Development.

Rasmussen, R. O. (2011). *Megatrends*. Nordregio: Nordic Centre for Spatial Development, Copenhagen.

Shibata, A., L. Zou, N. Sellheim & M. Scopelliti (Eds.) (2019), *Emerging Legal Orders in the Arctic: The Role of Non-Arctic Actors*. Routledge Research in Polar Law, London and New York.

Stepień, A. & T. Koivurova (2017). *Arctic Europe: Bringing together EU Arctic policy and Nordic cooperation*, Publications of the Government's Analysis, Assessment and Research Activities 15/2017 (Prime Minister's Office).

Stepien, A. & A. Raspotnik (2019, September 11). "Can the EU's Arctic policy find a true north?", *CEPS in Brief*, Centre for European Policy Studies CEPS.

Stepien, A., T. Koivurova & P. Kankaanpää (eds.) (2014), *Strategic Assessment of Development of the Arctic: Assessment Conducted for the European Union*. Arctic Centre, University of Lapland, commissioned by the European Commission. URL: www.arcticinfo.eu/sada.

UNCTAD (UN Conference on Trade and Development) (2021). *Key Statistics and Trends in International Trade 2020. Trade Trends under the Covid-19 Pandemic*. UN Publications. URL: https://unctad.org/system/files/official-document/ditctab2020d4_en.pdf.

Connectivity

Athens Convention relating to the Carriage of Passengers and their Luggage by Sea (PAL), adopted 13 December 1974, entered into force 28 April 1987.

Athens Convention relating to the Carriage of Passengers and their Luggage by Sea, 2002 Protocol (PAL 2002), adopted 1 November 2002, entered into force 23 April 2014.

DG ECHO (European Commission DG for European Civil Protection and Humanitarian Aid Operations) website: RescEU: https://ec.europa.eu/echo/what/civil-protection/resceu_en; UCPM. URL: https://ec.europa.eu/echo/what/civil-protection/mechanism_en.

EC (European Commission) (2008). Communication from the Commission to the European Parliament and the Council: The European Union and the Arctic Region, COM(2008) 763 final.

Holthaus, E. (2020). *The Future Earth*. New York: Harper One.

Kirchner, S., G. Tüngler & J. M. Hoffmann (2015). "Carrier Liability for Damages Incurred by Ship Passengers: The European Union as a Trailblazer Towards a Global Liability Regime?", 23 *University of Miami International and Comparative Law Review*, pp. 193-214.

Kuhn, G. (2020). *Liberating Sápmi - indigenous Resistance in Europe's Far North*. Oakland: PM Press.

Morgera, E. & K. Kulovesi (2020). "Environmental Law", in: Catherine Barnard & Steve Peers (eds.), *European Union Law*. Oxford: Oxford University Press, pp. 673-703.

Schram Stokke, O. (2020). "Governing Arctic Shipping: Institutional Niches and Regional Regimes", in: Vigeland Rottem, Svein & Folkestad Soltvedt, Ida (eds.), *Arctic Governance, Volume 2, Energy, Living Marine Resources and Shipping*. London: I. B. Tauris, pp. 228-252.

Transport Research and Innovation Monitoring and Information System (2021). NordicWay 2, <https://trimis.ec.europa.eu/project/nordicway-2>.

Widdowson, F. (2019). *Separate but Unequal - How Parallelist Ideology Conceals Indigenous Dependency*. Ottawa: Ottawa University Press.

Research and Space

2nd Arctic Science Ministerial. (2018). Joint Statement of Ministers on the occasion of the Second Arctic Science Ministerial. 26 October 2018, Berlin, Federal Republic of Germany. URL: https://www.arcticsscienceministerial.org/files/ASM2_Joint_Statement.pdf.

3rd Arctic Science Ministerial. (2020). Themes, Third Arctic Science Ministerial. URL: https://asm3.org/library/Files/ASM3_Themes.pdf.

Agreement on Enhancing International Arctic Scientific Cooperation. (2017). URL: <https://oaarchive.arctic-council.org/handle/11374/1916>.

Boniface, K., Gioia, C., Pozzoli, L., Diehl, T., Dobricic, S., Fortuny Guasch, J., Van Wimersma Greidanus, H., Kliment, T., Kucera, J., Janssens-Maenhout, G., Soille, P., Strobl, P. & Wilson, J. (2020). *Europe's Space capabilities for the benefit of the Arctic*. Joint Research Centre. EUR 30162 EN, Publications Office of the European Union, Luxembourg, 2020. URL: <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/europes-space-capabilities-benefit-arctic>.

EU-PolarNet. (2020). Integrated European Polar Research Programme. (D. Velázquez, M. Houssais, & N. Biebow, Eds.). Bremerhaven: Alfred Wegener Institute.

EU Directorate-General for Research and Innovation. (2014). Arctic research funded by the European Union. (F. Immler, Ed.). DOI: <https://doi.org/10.4324/9781315071299-36>.

EU Directorate-General for Research and Innovation. (2018). Arctic Research and Innovation – Understanding the changes, responding to the challenges, 24. DOI: <https://doi.org/10.2777/41766>.

EU Polar Cluster (website). (2020). Retrieved March 3, 2021. URL: <https://www.polarcluster.eu>.

- Graczyk, P., & Koivurova, T. (2015). "The Arctic Council". In L. C. Jensen & G. Hønneland (Eds.). *Handbook of the Politics of the Arctic* (pp. 298–327). Cheltenham, UK; Northampton, MA, USA: Edward Elgar.
- Hoag, H. (2018, June 18). "Fieldwork in the Arctic is surprisingly costly, limiting the research done there". *Science*. URL: <http://www.sciencemag.org/news/2018/06/fieldwork-arctic-surprisingly-costly-limiting-research-done-there>.
- IPCC. (2018). *Global Warming of 1.5 oC. Summary for Policymakers*. Retrieved from <https://www.ipcc.ch/sr15/>.
- Mallory, M. L., Gilchrist, H. G., Janssen, M., Major, H. L., Merkel, F., Provencher, J. F., & Strøm, H. (2018). "Financial costs of conducting science in the Arctic: examples from seabird research". *Arctic Science* 4(4), 624–633. DOI: <https://doi.org/10.1139/as-2017-0019>.
- Meredith, M., Sommerkorn, M., Cassotta, S., Derksen, C., Ekaykin, A., Hollowed, A., ... & Schuur, E. A. G. (2019). Polar Regions. In H.-O. Pörtner, D. C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, ... & N. M. Weyer (Eds.), *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*. Geneva.
- MOSAIC (website). (2019). Retrieved March 4, 2021, from <https://mosaic-expedition.org>.
- Petrov, A. N., Hinzman, L. D., Kullerud, L., Degai, T. S., Holmberg, L., Pope, A., & Yefimenko, A. (2020). "Building resilient Arctic science amid the Covid-19 pandemic". *Nature Communications* 11(1), 1–4. DOI: <https://doi.org/10.1038/s41467-020-19923-2>.
- Smieszek, M. (2017). "The Agreement on Enhancing International Arctic Scientific Cooperation: From Paper to Practice". *Arctic Yearbook* 2017.
- Smieszek, M. (2020). "Steady as She Goes? Structure, Change Agents and the Evolution of the Arctic Council". *The Yearbook of Polar Law* 11(1), 39–80. DOI: 10.1163/22116427_011010006.
- Smieszek, M., & Kankaanpää, P. (2015). "Observer States' Commitments to the Arctic Council: The Arctic Policy Documents of the United Kingdom and Germany as Case Study". *The Yearbook of Polar Law*, VI, 375–397.
- Starkweather, S., Larsen, J., Krümmel, E., Eicken, H., Arthurs, D., Biebow, N., & Christensen, T. (2020). *Sustaining Arctic Observing Networks (SAON) Roadmap for Arctic Observing and Data Systems (ROADS)*. *Arctic Observing Summit*, 1–12. URL: https://arcticobservingsummit.org/sites/default/files/2019_049_Starkweather_SAON_RMTF_AOS_Version_20th_December_2019.pdf.

EU External Relations

- Airoidi, A. (2008). "The European Union and the Arctic: Policies and Actions" (No. ANP 2008:729). Copenhagen: Nordic Council of Ministers. URL: www.norden.org/en/publications/publikationer/2008-729/.
- Bailes, A. J. K., & K. P. Ólafsson, (2017). "The EU Crossing Arctic Frontiers: The Barents Euro-Arctic Council, Northern Dimension, and EU-West Nordic Relations". In: N. Liu, E. A. Kirk, & T. Henriksen (Eds.), *The European Union and the Arctic* (pp. 40–62). Brill.
- Dolata, P. (2020). "A Balanced Arctic Policy for the EU" (No. EP/EXPO/AFET/FWC/2019-01/Lot1/1/C/02). Brussels: European Parliament, Directorate-General for External Policies. URL: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2020/603498/EXPO_IDA\(2020\)603498_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2020/603498/EXPO_IDA(2020)603498_EN.pdf).
- Franco, M. (2021). "The EU and Russia: A New Foreign Policy for the "Carcass"?" *Security Policy Briefs* No. 139). Egmont - Royal Institute for International Relations. URL: <https://www.egmontinstitute.be/the-eu-and-russia-a-new-foreign-policy-for-the-carcass/>.
- Goldthau, A., Westphal, K., Bazilian, M., & Bradshaw, M. (2019). "How the energy transition will reshape geopolitics". *Nature* 569.
- Leonard, M., Pisani-Ferry, J., Shapiro, J., Tagliapietra, S., & Wolff, G. (2021). "The Geopolitics of the European Green Deal" (Policy Brief). European Council on Foreign Relations. URL: <https://ecfr.eu/publication/the-geopolitics-of-the-european-green-deal/>.
- Rasputnik, A. (2018). *The European Union and the Geopolitics of the Arctic*. Cheltenham & Northampton: Edward Elgar.

Raspotnik, A. (2020, December 17). “A quantum of possibilities: The strategic spectrum of the EU’s Arctic policy”. URL: <https://www.ceps.eu/a-quantum-of-possibilities/>.

Raspotnik, A. (2021, March 16). “The presence of the EU’s Arctic future”, *EurActiv*. URL: <https://www.euractiv.com/section/arctic-agenda/opinion/the-presence-of-the-eus-arctic-future/>.

Raspotnik, A., & A. Østhagen (2021). A Global Arctic Order Under Threat? An Agenda for American Leadership in the North (No. Polar Point No. 3). Wilson Center. URL: <https://www.wilsoncenter.org/blog-post/no-3-global-arctic-order-under-threat-agenda-american-leadership-north>.

Raspotnik, A., & A. Stępień (2020). “The European Union and the Arctic: A Decade into Finding Its Arcticness”. In J. Weber (Ed.), *Handbook on Geopolitics and Security in the Arctic: The High North Between Cooperation and Confrontation* (pp. 131–146). Cham: Springer.

Sebentsov, A. B. (2020). “Cross-Border Cooperation on the EU-Russian Borders: Results of the Program Approach”. *Geography, Environment, Sustainability* 13(1), 74–83.

Stang, G. (2016). “EU Arctic policy in regional context” (Study No. EP/EXPO/B/FWC/AFET/2015-01/03). Brussels: European Parliament, Directorate-General for External Policies (Policy Department). URL: [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/578017/EXPO_STU\(2016\)578017_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/578017/EXPO_STU(2016)578017_EN.pdf).

Indigenous Peoples’ Rights

Airoidi, A. (2014). “The European Union and the Arctic - Developments and perspectives 2010-2014”. Copenhagen: Nordic Council of Ministers.

C169 - Indigenous and Tribal Peoples Convention, 1989 (No. 169) [ILO 169], adopted 27 June 1989, entered into force 5 September 1991, 1650 United Nations Treaty Series 383.

Craig, P., & G. de Búrca (2020). *EU Law - Text, Cases and Materials*. Oxford: Oxford University Press.

Dodds, K. & M. Nuttall (2019). *The Arctic*. Oxford: Oxford University Press.

Dumon, E. & G. Portzky (2014). General Guidelines on Suicide Prevention, URL: <https://www.euregenas.eu/wp-content/uploads/2014/01/EUREGENAS-General-Guidelines-on-Suicide-Prevention-F.pdf>.

Durfee, M., & R. L. Johnstone (2019). *Arctic Governance in a Changing World*. Lanham: Rowman & Littlefield.

European Convention on Human Rights [Convention for the Protection of Human Rights and Fundamental Freedoms], adopted 4 November 1950, entered into force 3 September 1953, European Treaty Series No. 5.

Heinämäki, L. & S. Kirchner (2017). “Assessment on recent developments regarding Indigenous Peoples’ legal status and rights in international law: With Special Focus on Free, Prior and Informed Consent”, in: L. Heinämäki, Ch. Allard, S. Kirchner, A. Xanthaki, S. Valkonen, U. Mörkenstam, N. Bankes, J. Ruru, J. Gilbert, P. Selle, A. Simpson & L. Olsén, *Saamelaisten oikeuksien toteutuminen: kansainvälinen oikeusvertaileva tutkimus*. Helsinki: Valtioneuvoston kanslia, pp. 224-282. URL: https://valtioneuvosto.fi/documents/10616/3866814/4_Saamelaisten+oikeuksien+toteutuminen+kansainv%25C3%25A4linen+oikeusvertaileva+tutkimus/e765f819-d90c-4318-9ff0-cf4375e00688?version=1.0.

International Covenant on Civil and Political Rights, adopted 16 December 1966, entered into force 23 March 1976, 999 United Nations Treaty Series 171.

International Covenant on Economic, Social and Cultural Rights, adopted 16 December 1966, entered into force 3 January 1976, 993 United Nations Treaty Series 3.

Koivurova, T. (2011). “Jurisprudence of the European Court of Human Rights Regarding Indigenous Peoples: Retrospects and Prospects”, 18 *International Journal on Minority and Group Rights*, pp. 1-37.

Macfarlane, H. (2019). *Divided Highways - Road Narrative and Nationhood in Canada*. Ottawa: University of Ottawa Press.

Rowan Wright, D. (2020). *Future Sea - How to Rescue and Protect the World’s Oceans*. Chicago: University of Chicago Press.

Schram Stokke, O. (2015). "Asian Stakes and Arctic Governance", in: Sinha, Uttar Kumar & Jo Inge Bekkevold (eds.), *Arctic: Commerce, Governance and Policy*. Abingdon: Routledge, pp. 3-17.

Stepien, A. (2017), "Incentives, Practices and Opportunities for Arctic External Actors' Engagement with Indigenous Peoples: China and the European Union", In: T. Koivurova, T. Qin, S. Duyck & T. Nykänen (eds.) *Arctic Law and Governance: The Role of China and Finland*. Hart Publishing.

United Nations Declaration on the Rights of Indigenous Peoples, 13 September 2007, A/RES/61/295, <https://undocs.org/A/RES/61/295>.

Widdowson, F. (2019). *Separate but Unequal - How Parallelist Ideology Conceals Indigenous Dependency*. Ottawa: Ottawa University Press.

Wilson Rowe, E. (2018). *Arctic Governance*. Manchester: Manchester University Press.

Gender

Allwood, G. (2020). Mainstreaming Gender and Climate Change to Achieve a Just Transition to a Climate-Neutral Europe, The JCMS Annual Review of the European Union 2019, Vol. 58, Issue S1, Sep 2020, pp. 173-186.

Alston, M. (2013). "Research, action and policy: Addressing the gendered impacts of climate change". In: M. Alston & K. Whittenbury (Eds.), *Research, Action and Policy: Addressing the Gendered Impacts of Climate Change* (pp. 3–14). Dordrecht: Springer. DOI: <https://doi.org/10.1007/978-94-007-5518-5>.

Azcona, G., Bhatt, A., Encarnacion, J., Plazaola- Castaño, J., Seck, P., Staab, S., & Turquet, L. (2020). "From Insights to Action. Gender Equality in the Wake of Covid-19. UN Women". URL: <https://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2020/gender-equality-in-the-wake-of-covid-19-en.pdf?la=en&vs=5142>.

Bunce, A., & Ford, J. (2015). "How is adaptation, resilience, and vulnerability research engaging with gender?", *Environmental Research Letters* 10(12), 123003. <https://doi.org/10.1088/1748-9326/10/12/123003>.

Clabots, B., & Gilligan, M. (2017). "Gender and biodiversity: Analysis of women and gender equality considerations in National Biodiversity Strategies and Action Plans (NBSAPs)". Washington, DC: IUCN Global Gender Office.

Dugarova, E. (2018). Gender Equality as an Accelerator for Achieving the Sustainable Development Goals. UN Women & United Nations Development Programme. DOI: <https://doi.org/10.5121/ijmvsc.2013.4204>.

Government of Canada (2019), Canada's Arctic and Northern Policy Framework. URL: <https://www.rcaanc-cimac.gc.ca/eng/1560523306861/1560523330587>.

Ministry for Foreign Affairs of Sweden. (2011). Sweden's strategy for the Arctic region. Government Offices of Sweden. URL: <https://www.government.se/country-and-regional-strategies/2011/10/swedens-strategy-for-the-arctic-region/>.

Ministry for Foreign Affairs of Sweden. (2020). Sweden's strategy for the Arctic region. Government Offices of Sweden. URL: <https://www.government.se/4aaec5/contentassets/85de9103bbbe4373b55eddd7f71608da/swedens-strategy-for-the-arctic-region-2020.pdf>.

Ministry of Social Affairs and Health. (2002). Taking Wing. Conference Report. Conference on Gender Equality and Women in the Arctic, 3-6 August 2002, Saariselkä, Inari, Finland. Helsinki, Finland.

Sloan, J. (Ed.). (2006). "Women and Natural Resource Management in the Rural North". Arctic Council Sustainable Development Working Group.

Sloan, J. (Ed.). (2004). "Women's participation in decision-making processes in Arctic fisheries resource management". Arctic Council.

Smieszek, M. & T. Prior (2021), "Gender and Environment, in: Pan-Arctic Report. Gender Equality in the Arctic. Phase 3". Iceland's Arctic Council Chairmanship and the Arctic Council Sustainable Development Working Group.

UN Women. (2020). Gender Equality: Women's Rights in Review 2020. <https://doi.org/10.18356/90ff6c86-en>.

UNEP. (2016). Global Gender and Environment Outlook. Nairobi, Kenya: UN Environment.

United Nations. (1995). Beijing Declaration and Platform of Action, Fourth World Conference on Women, 15 September 1995, A/CONF.177/20 (1995) and A/CONF.177/20/Add.1 (1995).

United Nations. (2015). Paris Agreement. Paris. URL: https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

United Nations Women. (2018). Towards a Gender-Responsive Implementation of the Convention on Biological Diversity.

Vincent, K. E., Tschakert, P., Barnett, J., Rivera-Ferre, M. G., & Woodward, A. (2014). “Cross-chapter box on gender and climate change”. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, L. L. White (Eds.), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 105–107). Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Williamson, K. J., Hoogensen, G., Lotherington, A. T., Hamilton, L. H., Savage, S., Koukarenko, N., ... & Poppel, M. (2004). “Gender Issues”. In: *Arctic Human Development Report* (pp. 187–205). Akureyri, Iceland: Stefansson Arctic Institute.

Trade

EC (European Commission) (2020). Report the implementation of Regulation (EC) No 1007/2009, as amended by Regulation (EU) 2015/1775, on the Trade in Seal Products. COM(2020) 4 final. Brussels, 10.1.2020. EC (European Commission) (2020). Report on the implementation of EU Free Trade Agreements 1 January 2019 - 31 December 2019. URL: https://trade.ec.europa.eu/doclib/docs/2020/november/tradoc_159039.pdf.

EC (European Commission) (2020). Individual reports and info sheets on implementation of EU Free Trade Agreements, accompanying the document on Implementation of EU Trade Agreements. Staff Working Document Brussels, 12.11.2020. SWD(2020) 263 final. URL: https://trade.ec.europa.eu/doclib/docs/2020/november/tradoc_159048.pdf.

Garces de los Fayos, F. (2015). “The outcome of the ninth Arctic Council ministerial meeting”. *At a glance*. European Parliament. DG for External Relations. URL: [https://www.europarl.europa.eu/RegData/etudes/ATAG/2015/549036/EXPO_ATA\(2015\)549036_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2015/549036/EXPO_ATA(2015)549036_EN.pdf).

Government of Nunavut (2012). Report on the Impact of European Union Seal Ban, (EC) No 1007/2009, in Nunavut. URL: https://www.gov.nu.ca/sites/default/files/impactssealban_web.pdf.

Sellheim, N. (2015). “The goals of the EU seal products trade regulation: from effectiveness to consequence”. *Polar Record* 51(3): 274 - 289.

Climate change

AFPA (Arctic Footprint and Policy Assessment) (2020). “Final Report” (Cavalieri et al.; Ecologic Institute et al). URL: https://www.arctic-footprint.eu/sites/default/files/AFPA_Final_Report.pdf.

AMAP website (n.d.). EU-funded Action on Black Carbon (EUA-BCA). Policy Action. Arctic Monitoring and Assessment Programme. URL: <https://eua-bca.amap.no/policy-action>.

AMAP (Arctic Monitoring and Assessment Programme) (2015). Summary for Policy-makers: Arctic Climate Issues 2015. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway.

AMAP (Arctic Monitoring and Assessment Programme) (2019). Arctic Climate Change Update 2019: An update to key findings of snow, water, ice and permafrost in the Arctic (SWIPA) 2017. Arctic Council. URL: <https://www.amap.no/documents/download/3295/inline>.

AMAP (Arctic Monitoring and Assessment Programme) (2021). “Impacts of Short-lived Climate Forcers on Arctic Climate, Air Quality and Human Health. Summary for Policy Makers.” Arctic Council. URL: <https://oaarchive.arctic-council.org/handle/11374/2609>.

CCAC (Climate and Clear Air Coalition) (2018). Annual Science Update: Black Carbon Briefing Report. URL: <https://www.ccacoalition.org/en/resources/2018-annual-science-update-black-carbon-briefing-report>.

EC website (2020). Carbon Border Adjustment Mechanism. URL: <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12228-Carbon-Border-Adjustment-Mechanism>.

EC website (2020). The Just Transition Mechanism. URL: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/just-transition-mechanism_en.

EC website (2021, February 10). Public consultation on future EU rules for reducing methane emissions in the energy sector. URL: https://ec.europa.eu/info/news/public-consultation-future-eu-rules-reducing-methane-emissions-energy-sector-2021-feb-10_en.

EEA (European Environment Agency) (2020, November 18). Greenhouse gas emission targets, trends, and Member States MMR projections in the EU, 1990-2050. EEA website. URL: <https://www.eea.europa.eu/data-and-maps/figures/greenhouse-gas-emission-targets-trends>.

EEA (European Environment Agency) (2020, December 18). Total greenhouse gas emission trends and projections in Europe. EEA website at <https://www.eea.europa.eu/data-and-maps/indicators/greenhouse-gas-emission-trends-7/assessment>.

EEA (European Environment Agency) (2020, December 18). Greenhouse gas emissions from transport in Europe. EEA website at <https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases-7/assessment>.

EEA (European Environment Agency) (2018, August 3). Overall progress towards the European Union's '20-20-20' climate and energy targets. EEA website at <https://www.eea.europa.eu/themes/climate/trends-and-projections-in-europe/trends-and-projections-in-europe-2017/overall-progress-towards-the-european>.

EMEP (European Monitoring and Evaluation Programme) (2020). Status Report 1/2020. The co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe. URL: https://emep.int/publ/reports/2020/EMEP_Status_Report_1_2020.pdf.

EU Polar Research Cluster website at <https://www.polarcluster.eu/about>.

Eurostat, Renewable energy statistics. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics#Share_of_renewable_energy_more_than_doubled_between_2004_and_2019.

Eurostat, Energy saving statistics. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_saving_statistics#cite_note-1.

Ge, M. & J. Friedrich (2020, February 6). “4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors”. World Resources Institute. URL: <https://www.wri.org/blog/2020/02/greenhouse-gas-emissions-by-country-sector>.

IPCC (Intergovernmental Panel on Climate Change) (2018), “Global warming of 1.5C”, IPCC SR1.5.

MMM (Ministry of Agriculture and Forestry) (2014). Finland's National Climate Change Adaptation Plan 2022. Government Resolution of 20 November 2014. URL: https://mmm.fi/documents/1410837/0/Finland_s_National_climate_Change_Adaptation_Plan_2022+%281%29.pdf.

Regeringen (2017). Regeringens proposition 2017/18:163. Nationell strategi för klimatanpassning. Submitted to Riksdag on 8 March 2018. URL: https://www.regeringen.se/494483/contentassets/8c1f4fe980ec4fcb8448251acde6bd08/171816300_webb.pdf.

Statista. Black Carbon Emissions: EU-28. URL: <https://www.statista.com/statistics/1171112/black-carbon-emission-european-union-eu-28/>.

Long-range pollution

AMAP (Arctic Monitoring and Assessment Programme) (2006). AMAP Assessment 2006: Acidifying Pollutants, Arctic Haze, and Acidification in the Arctic. Arctic Monitoring and Assessment Programme (AMAP), Arctic Council. Oslo, Norway. URL: <https://www.amap.no/documents/download/1162/inline>.

AMAP (Arctic Monitoring and Assessment Programme) (2014). Trends in Stockholm Convention Persistent Organic Pollutants (POPs) in Arctic Air, Human media and Biota. By: S. Wilson, H. Hung, A. Katsoyiannis, D. Kong, J. van Oostdam, F. Riget, & A. Bignert. AMAP Technical Report No. 7. Arctic Monitoring and Assessment Programme (AMAP), Arctic Council, Oslo.

AMAP (Arctic Monitoring and Assessment Programme) (2015). Summary for Policy-makers: Arctic Pollution Issues 2015. Persistent Organic Pollutants; Radioactivity in the Arctic; Human Health in the Arctic. URL: <https://www.amap.no/documents/download/2222/inline>.

EC (European Commission) (2009). The European Union and the Stockholm Convention: Implementing Measures on Persistent Organic Pollutants. Brochure. URL: https://ec.europa.eu/environment/chemicals/international_conventions/pdf/convention_stockholm.pdf.

EC (European Commission) (2019, September). Final Report. Supporting the Fitness Check of the EU Ambient Air Quality Directives (2008/50/EC, 2004/107/EC). Written by COWI, Eunomia, Milieu.

EC (European Commission) (2021). The Second Clean Air Outlook. Report from the Commission COM(2021) 3 final, Brussels, 8.1.2021.

EEA (European Environment Agency) (2019). Persistent organic pollutant emissions. EEA website. URL: <https://www.eea.europa.eu/data-and-maps/indicators/eea32-persistent-organic-pollutant-pop-emissions-1/assessment-10>.

European Environment Agency (2020). Air quality in Europe – 2020 report. EEA Report no 09/2020, URL: <https://www.eea.europa.eu/publications/air-quality-in-europe-2020-report>.

EMEP (European Monitoring and Evaluation Programme) (2020). Assessment of transboundary pollution by toxic substances: Heavy metals and POPs EMEP. Status Report 2/2020. The co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe. Meteorological Synthesizing Centre - East, Norwegian Institute for Air Research (NILU), Umweltbundesamt GmbH. URL: http://en.msceast.org/reports/2_2020.pdf.

Gusev, A. & M. MacLeod (2013). “Chapter 4: Global and regional modelling of POPs”. In: *Hemispheric Transport of Air Pollution 2010*. United Nations Publications. pp 127-166.

Stockholm Convention on Persistent Organic Pollutants (2017, January 23). Second global monitoring report. UNEP and Stockholm Convention.

Stockholm Convention on Persistent Organic Pollutants (2017). Outcomes of the effectiveness evaluation of the Stockholm Convention: Executive summary. Stockholm Convention website. URL: <http://www.pops.int/Implementation/EffectivenessEvaluation/Outcomes/tabid/5559/Default.aspx>.

UNEP (UN Environmental Programme). Global Mercury Assessment 2018. URL: <https://www.unep.org/resources/publication/global-mercury-assessment-2018>.

Macro- and microplastic pollution

Addamo, A. M., P. Laroche, & G. Hanke (2007). “Top Marine Beach Litter Items in Europe”, EUR 29249. European Commission Joint Research Centre. Publications Office of the European Union, Luxembourg.

Bishop, G., D. Styles & P. N. L. Lens (2020), “Recycling of European plastic is a pathway for plastic debris in the ocean”, *Environment International* 142, 105893.

Buhl-Mortensen, L. & P. Buhl-Mortensen (2017). “Marine litter in the Nordic Seas: Distribution composition and abundance”, *Marine Pollution Bulletin* 125(1-2): 260-270.

EC (European Commission) (2019). Report on the implementation of the Circular Economy Action Plan. COM(2019) 190 final. Brussels, 4.3.2019.

- EC (European Commission) Marine Litter website. URL: https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm.
- ECA (European Court of Auditors) (2020). EU action to tackle the issue of plastic waste. Review No 04. Review headed by ECA Member Samo Jareb.
- EDJNet (The European Data Journalism Network). (nd). Plastic packaging: Europe faces a waste problem. Data based on Eurostat, ECA 2020, PlasticsEurope; URL: <https://www.europeandatajournalism.eu/eng/News/Data-news/Plastic-packaging-Europe-faces-a-waste-problem>.
- Eriksen, M., Lebreton, L. C., Carson, H. S., Thiel, M., Moore, C. J., Borerro, J. C., & Reisser, J. (2014). "Plastic pollution in the world's oceans: more than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea". *PloS one*, 9(12), e111913.
- European Parliament News (2018, December 19) "Plastic waste and recycling in the EU: facts and figures". URL: <https://www.europarl.europa.eu/news/en/headlines/society/20181212STO21610/plastic-waste-and-recycling-in-the-eu-facts-and-figures>.
- Evangelidou, N., Grythe, H., Klimont, Z. et al. (2020). "Atmospheric transport is a major pathway of microplastics to remote regions". *Nat Commun* 11: 3381. <https://doi.org/10.1038/s41467-020-17201-9>.
- Everaert G., De Rijcke M., Lonneville B., Janssen C. R., Backhaus T., Mees J., van Sebille E., Koelmans A. A., Catarino A. I. & Vandegehuchte M. (2020). "Risks of floating microplastic in the global ocean" *Environmental Pollution* 267, DOI: <https://doi.org/10.1016/j.envpol.2020.115499>.
- Halsband, C. & D. Herzke (2019). "Plastic litter in the European Arctic: What do we know?", *Emerging Contaminants* 5: 308-318.
- Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., ... & Law, K. L. (2015). "Plastic waste inputs from land into the ocean". *Science* 347(6223): 768-771.
- Kay, P., Hiscoe, R., Moberley, I. et al. (2018). "Wastewater treatment plants as a source of microplastics in river catchments". *Environ Sci Pollut Res* 25: 20264-67.
- Lebreton, L. C., Van der Zwet, J., Damsteeg, J. W., Slat, B., Andrady, A., & Reisser, J. (2017). "River plastic emissions to the world's oceans". *Nature Communications* 8, 15611.
- PAME (Protection of Arctic Marine Environment) (2019). "Desktop Study on Marine Litter including Microplastics in the Arctic". Arctic Council. Primary author: J. Fabres.
- PAME (Protection of Arctic Marine Environment) (2019). Regional Action Plan on Marine Litter. Arctic Council. URL: <https://oaarchive.arctic-council.org/handle/11374/2649>.
- Plastics Europe (2020). *Plastics – the Facts 2020*. An analysis of European plastics production, demand and waste data. URL: <https://www.plasticseurope.org/en/resources/publications/4312-plastics-facts-2020>.
- Ross, P.S., Chastain, S., Vassilenko, E. et al. (2021). "Pervasive distribution of polyester fibres in the Arctic Ocean is driven by Atlantic inputs". *Nature Communications* 12, 106. DOI: <https://doi.org/10.1038/s41467-020-20347-1>.
- van Sebille, E., M. H. England & G. Froyland (2012). "Origin, dynamics and evolution of ocean garbage patches from observed surface drifters", *Environ. Res. Lett.* 7(4): 044040.
- Strietman, W. J. (2017, June 7). "The Arctic Marine Litter Project: knowing the sources to work on solutions". *The Arctic Marine Litter Project Blog*. URL: <https://weblog.wur.eu/coastsea/ocean-pollution-gulfstream>.
- Ziajahromi, S., Kumar, A., Neale, P.A. et al. (2017). "Impact of Microplastic Beads and Fibers on Waterflea (*Ceriodaphnia dubia*) Survival, Growth, and Reproduction: Implications of Single and Mixture Exposures". *Environmental Science & Technology* 51: 13397-13406. DOI: 10.1021/acs.est.7b03574.

Biodiversity

AMAP (Arctic Monitoring and Assessment Programme) (2018). Arctic Ocean Acidification, Summary for policy-makers. Arctic Council. URL: <https://www.amap.no/documents/doc/arctic-ocean-acidification-assessment-2018-summary-for-policy-makers/1762>.

Arctic Council (2020). SAO Marine Mechanism Webinar Series: Summary of Proceedings. Arctic Council SAO Meeting 17-18 November 2020, Reykjavik Iceland. URL: https://oaarchive.arctic-council.org/bitstream/handle/11374/2550/SAOIS202_2020_Virtual1_04_SMM-Final-Summary-of-Proceedings.pdf.

Arctic Council website IEA: Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA). URL: https://oaarchive.arctic-council.org/bitstream/handle/11374/2550/SAOIS202_2020_Virtual1_04_SMM-Final-Summary-of-Proceedings.pdf?sequence=1&isAllowed=y.

Barry, T. (2021). *The Arctic Council, an Agent of Change*. Doctoral dissertation, University of Iceland 2021.

CAFF (1996). CPAN Strategy and Action Plan. CAFF Habitat Conservation Report No. 6, URL: <https://www.caff.is/strategies-series/95-cpan-strategy-and-action-plan>.

CAFF (Conservation of Arctic Flora and Fauna) (2013). Arctic Biodiversity Assessment 2013: Report for Policy Makers. Arctic Council, URL: <https://www.caff.is/assessment-series/arctic-biodiversity-assessment/229-arctic-biodiversity-assessment-2013-report-for-policy-makers-english>.

CAFF (Conservation of Arctic Flora and Fauna) (2013). State of Arctic Terrestrial Biodiversity Report. Arctic Council (Aronsson, M., S. Heiðmarsson, H. Jóhannesdóttir, T. Barry, J. Braa, C.T. Burns, S.J. Coulson, C. Cuyler, K. Falk, H. Helgason, K.F. Lárusson, J.P. Lawler, P. Kulmala, D. MacNearney, E. Oberndorfer, V. Ravolainen, N.M. Schmidt, M. Soloviev, C. Coon and T. Christensen.).

CAFF website, Resolutions of Cooperation, URL: <https://www.caff.is/resolutions-of-cooperation>.

CAFF website, International Partnerships, URL: <https://www.caff.is/international-partnership>.

CAFF CBMP website, URL:

https://www.caff.is/index.php?option=com_content&view=article&id=387&Itemid=1187.

CORDIS website at <https://cordis.europa.eu/project/id/869471> CHARTER Drivers and Feedbacks of Changes in Arctic Terrestrial Biodiversity.

EC (European Commission) (2010). EU Biodiversity Action Plan. 2010 Assessment. URL: https://ec.europa.eu/environment/nature/info/pubs/docs/2010_bap.pdf.

ECOTIP website at <https://ecotip-arctic.eu/>.

EEA website (2020). Ecological footprint of European countries. URL: <https://www.eea.europa.eu/data-and-maps/indicators/ecological-footprint-of-european-countries-2/assessment>.

IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Addendum to the Report of the Plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on the work of its seventh session. IPBES/7/10/Add.1. United Nations. IPBES Seventh session, Paris, 29 April–4 May 2019. URL: https://www.ipbes.net/sites/default/files/ipbes_7_10_add.1_en_1.pdf.

IPCC (Intergovernmental Panel on Climate Change) (2018). “Summary for Policymakers”. In: *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland.

JRC (Joint Research Centre, EC) (2011). Landscape fragmentation in Europe. Joint EEA-FOEN report. EEA Report No 2/2011. URL: <https://www.eea.europa.eu/publications/landscape-fragmentation-in-europe>.

Maes, J., Teller, A., Erhard, M., Conde, S., Vallecillo Rodriguez, S., Barredo Cano, J.I., Paracchini, M., Abdul Malak, D., Trombetti, M., Vigiak, O., Zulian, G., Addamo, A., Grizzetti, B., Somma, F., Hagyo, A., Vogt, P., Polce, C., Jones, A., Marin, A., Ivits, E., Mauri, A., Rega, C., Czucz, B., Ceccherini, G., Pisoni, E., Ceglar, A., De Palma, P., Cerrani, I., Meroni, M., Caudullo, G., Lugato, E., Vogt, J., Spinoni, J., Cammalleri, C., Bastrup-Birk, A., San-Miguel-Ayanz, J., San Román, S., Kristensen, P., Christiansen, T., Zal, N., De Roo, A., De Jesus Cardoso, A., Pistocchi, A., Del Barrio Alvarcellos, I., Tsiamis, K., Gervasini, E., Deriu, I., La Notte, A., Abad Viñas, R., Vizzarri, M., Camia, A., Robert, N., Kakoulaki, G., Garcia Bendito, E., Panagos, P., Ballabio, C., Scarpa, S., Montanarella, L., Orgiazzi, A., Fernandez Ugalde, O. & Santos-Martín, F., (2020). Mapping and Assessment of Ecosystems and their Services: An EU ecosystem assessment, EUR 30161 EN, Publications Office of the European Union, Luxembourg.

Witze, A. (2020). “The Arctic is burning like never before — and that’s bad news for climate change”. *Nature* 585: 336-337.

Fisheries

EC website: fisheries facts and statistics. URL: https://ec.europa.eu/fisheries/facts_figures_en?qt-facts_and_figures=2.

EC website: Fishing outside of the EU. URL: https://ec.europa.eu/fisheries/cfp/international_en.

EC website: international ocean governance. URL https://ec.europa.eu/maritimeaffairs/policy/ocean-governance_en.

EC website: 2021 EU-Norway Fisheries Consultations, URL: https://ec.europa.eu/fisheries/sites/fisheries/files/docs/body/2021-eu-norway-fisheries-consultations_en.pdf.

Elvestad, C. & Veggeland, F. (2020). ”Sjømateksport og veterinær grensekontroll med og uten EØS”. In: Melchior, A. og Nilssen, F. 2020 (red.): *Sjømatnæringen og Europa*. Universitetsforlaget, Oslo.

EUMOFA (2020). The EU Fish Market. 2020 Edition. URL: https://www.eumofa.eu/documents/20178/415635/EN_The+EU+fish+market_2020.pdf/fe6285bb-5446-ac1a-e213-6fd6f64d0d85?t=1604671147068.

FAO (2020). The State of World Fisheries and Aquaculture. URL: <http://www.fao.org/3/ca9229en/CA9229EN.pdf>.

Garcia, S. et al. (eds.) (2014). *Governance in Fisheries and Marine Biodiversity Conservation*. Wiley- Blackwell.

Hilborn, R., et al. (2019). “Effective fisheries management instrumental in improving fish stock status”. *PNAS* January 28, 2020 117 (4) 2218-2224; first published January 13, 2020; <https://doi.org/10.1073/pnas.1909726116>.

Hoel, A.H. (2018). “Northern Fisheries”. In M. Nuttall (ed.) 2018: *The Routledge Handbook of the Polar Regions*. Routledge, London.

Hoel, A.H. & VaderZwaag, D. (2014). “Global Legal Dimensions of Fisheries and Conservation Governance: Navigating the Currents of Rights and Responsibilities”. In: Garcia, S., Charles, A. and Rice, J. (eds.) *Governance in Fisheries and Marine Biodiversity Conservation*. Wiley- Blackwell. Pp. 96-109.

ICES (International Council for the Exploration of the Sea) (1964). Convention for The International Council for the Exploration of the Sea 12 September 1964. URL: https://www.ices.dk/about-ICES/who-we-are/Documents/ICES_Convention_1964.pdf.

Jardim, E. et al. (2019). “Monitoring the performance of the Common Fisheries Policy. Scientific, Technical and Economic Committee for Fisheries (STECF)”. JRC Science for Policy Report. URL: <https://op.europa.eu/en/publication-detail/-/publication/52ca7c1b-8377-11ea-bf12-01aa75ed71a1/language-en/format-PDF/source-125053124>.

Macfadyan, G. & R. Cappell (2019). “Ex ante and ex post evaluation study of the fisheries partnership agreement between the European Union and Greenland”.

Melchior, A. (2020). ”Norges handelsforhandlinger med Europa gjennom 50 år”. In: Melchior, A. og Nilssen, F. 2020 (red.): *Sjømatnæringen og Europa*. Universitetsforlaget, Oslo.

TheFishingDaily (2021, January 11). “EU and Greenland reach agreement on new fisheries partnership”. URL: <https://thefishingdaily.com/latest-news/eu-and-greenland-reach-agreement-on-new-fisheries-partnership/>.

UK Government website: Fishing industry statistics. URL: <https://www.gov.uk/government/news/fishing-industry-in-2019-statistics-published>.

Marine transport

AMSA (2009). Arctic Marine Shipping Assessment. Protection of Arctic Marine Environment, Arctic Council. URL: <https://pame.is/index.php/projects/arctic-marine-shipping/amsa>.

AFPA (Arctic Footprint and Policy Assessment) (2020). Final Report (Cavalieri et al.; Ecologic Institute et al). URL: https://www.arctic-footprint.eu/sites/default/files/AFPA_Final_Report.pdf.

Antidormi, R. (n.d.). “Marine Fuels - Impacts of the 0,50% sulphur limit as of 2020”. Presentation. URL: https://www.energy-community.org/dam/jcr:f6750b27-2673-4969-a430-256f10fedf42/OF092018_EC.pdf.

Copernicus website. Copernicus and the EU’s Arctic Policy. URL: <https://marine.copernicus.eu/news/copernicus-eu-arctic-policy>.

Bardin, A. (2002). “Coastal State's Jurisdiction over Foreign Vessels”, 14 *Pace Int'l L. Rev.* 27.

Berge, J., Geoffroy, M., Daase, M. et al. (2020). “Artificial light during the polar night disrupts Arctic fish and zooplankton behaviour down to 200 m depth”. *Commun Biol* 3, 102. <https://doi.org/10.1038/s42003-020-0807-6>.

Boniface, K., Gioia, C., Pozzoli, L., Diehl, T., Dobricic, S., Fortuny Guasch, J., Van Wimersma Greidanus, H., Kliment, T., Kucera, J., Janssens-Maenhout, G., Soille, P., Strobl, P. & Wilson, J. (2020). “Europe’s Space capabilities for the benefit of the Arctic”, Joint Research Centre. EUR 30162 EN, Publications Office of the European Union, Luxembourg, 2020. URL: <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/europes-space-capabilities-benefit-arctic>.

EC (European Commission) (2005). “Impact Assessment. Annex to: The Communication on Thematic Strategy on Air Pollution and the Directive on “Ambient Air Quality and Cleaner Air for Europe”. SEC (2005) 1133 Brussels, 21 9.2005.

EC FPI (European Commission) (2019, August 27). EU Action Sheds Light on Black Carbon Emissions. Service for Foreign Policy Instruments. URL: https://ec.europa.eu/fpi/news/eu-action-sheds-light-black-carbon-emissions_en.

GIIGNL (2020). GIIGNL Annual Report: the LNG Industry. URL: https://giignl.org/sites/default/files/PUBLIC_AREA/Publications/giignl_-_2020_annual_report_-_04082020.pdf.

IMO (International Maritime Organization) (2020). Resolution A.1137(31) Adopted on 4 December 2019 (Agenda item 6(b)). Interim safety measures for ships not certified under the SOLAS Convention operating in polar waters. URL: <https://www.wcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/A%2031-Res.1137%20-%20INTERIM%20SAFETY%20MEASURES%20IN%20POLAR%20WATERS.pdf>.

MARPOL (73/78). The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.

Reuters (2020, November 20). “UN approves ban on heavy ship fuel in Arctic”. Reuters. URL: <https://www.reuters.com/article/shipping-arctic-imo/un-approves-ban-on-heavy-ship-fuel-in-arctic-idUKL8N2HY5IS>.

Ringbom, H. (2017). “The European Union and Arctic Shipping”. In: Nengye Liu, Elizabeth A., Kirk and Tore Henriksen (eds.), *The European Union and the Arctic*, Brill/Nijhoff, Leiden/Boston.

Ryngaert, C., & Ringbom, H. (2016). “Introduction: Port State Jurisdiction: Challenges and Potential”, *The International Journal of Marine and Coastal Law*, 31(3), 379-394.

Saul, J. (2020, December 9). “Ships make record number of sailings through Arctic in 2020”. Reuters.

SOLAS (1974). International Convention for the Safety of Life At Sea, 1 November 1974, 1184 UNTS 3.

WWF (2016). “Arctic shipping: Uncertain Waters”. *The Circle* No. 3. URL: https://arcticwwf.org/site/assets/files/1610/thecircle0316_web.pdf.

Energy

Airoidi, A. (2020). “Security aspects in EU Arctic policy”. *Routledge Handbook of Arctic Security*, 337–347.

Aslani, A., Naaranoja, M., & Wong, K. F. V. (2013). “Strategic analysis of diffusion of renewable energy in the Nordic countries”. *Renewable and Sustainable Energy Reviews* 22, 497–505.

Boasson, E. L., & Jevnaker, T. (2019). “Energy Governance in Norway: Too Much of a Good Thing?” In: M. Knodt & J. Kemmerzell (Eds.), *Handbook of Energy Governance in Europe* (pp. 1–25). Cham: Springer.

BP. (2020). bp Statistical Review of World Energy 2020. URL: <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

Butler, N. (2020, November 12). “Europe’s Green Deal – no easy win for Norway”. URL: <https://theenergyagenda.com/articles/europes-green-deal-no-easy-win-for-norway/>.

Carayannis, E. G., Ilinova, A., & Cherepovitsyn, A. (2021). “The Future of Energy and the Case of the Arctic Offshore: The Role of Strategic Management”. *Journal of Marine Science and Engineering*, 9(2), 1–20.

Cavalieri, S., McGlynn, E., Stoessel, S., Stuke, F., Bruckner, M., Polzin, C., ... & Nilsson, A. E. (2010). *EU Arctic Footprint and Policy Assessment: Final Report*. Berlin: Ecologic Institute. URL: http://arctic-footprint.eu/sites/default/files/AFPA_Final_Report.pdf.

CDU TEK. (2019, February 14). “Нефтегазовый клондайк Арктики” [Arctic oil and gas Klondike], URL: https://www.cdu.ru/tek_russia/issue/2018/12/545.

Chuffart, R., & A. Rasputnik (2019). “The EU and its Arctic spirit: Solving Arctic climate change from home?” *European View*, 18(2), 156–162.

Claes, D. H., & Ø. Harsem (2010). “Arctic Energy Resources - Curse or Blessing for European Energy Security?” Working Paper under the Geopolitics in the High North Research Program. Oslo: Institute for Defence Studies (IFS) and Department of Political Science (University of Oslo).

Dobson, N., & S. Trevisanut (2018). “Climate Change and Energy in the Arctic - The Role of the European Union”. *International Journal of Marine and Coastal Law*, 33(2), 380–402.

EUOAG and JRC-EUOAG websites: EU Offshore Oil and Gas Authorities Group (EUOAG). URL https://ec.europa.eu/energy/topics/energy-security/offshore-oil-and-gas-safety/eu-offshore-oil-and-gas-authorities-group-euoag_en, and EU Offshore Authorities Group – Joint Research Centre Web Portal, URL <https://euoag.jrc.ec.europa.eu/>.

European Commission. (2020a). Quarterly Report on European Gas Markets with focus on the impact of Covid-19 on the global LNG market (Vol. 12). URL: https://ec.europa.eu/energy/data-analysis/market-analysis_en.

European Commission. (2020b, June 5). Liquefied natural gas. URL: https://ec.europa.eu/energy/topics/oil-gas-and-coal/liquefied-natural-gas-lng_en.

EC website, Energy Union: State of the Energy Union reports. URL: https://ec.europa.eu/energy/topics/energy-strategy/energy-union_en.

EC website, Secure Gas Supplies. URL: https://ec.europa.eu/energy/topics/energy-security/secure-gas-supplies/commissions-opinions-preventive-action-plans-and-emergency-plans-submitted-member-states-2019_en?redir=1.

European Topic Centre on Climate Change Mitigation and Energy. (2020). Renewable energy in Europe - 2020: Recent growth and knock-on effects (Eionet Report-ETC/CME 7/2020).

Eurostat. (2020a). Electricity and heat statistics. Eurostat. Statistics Explained. URL: <https://ec.europa.eu/eurostat/statistics-explained/index.php?oldid=493775>.

Eurostat. (2020b). Energy production and imports. Eurostat. Statistics Explained. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_production_and_imports.

- Eurostat. (2020c). EU imports of energy products - recent developments. Eurostat. Statistics Explained. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php/EU_imports_of_energy_products_-_recent_developments.
- Eurostat. (2020d). Oil and petroleum products - a statistical overview. Eurostat. Statistics Explained. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Oil_and_petroleum_products_-_a_statistical_overview#Oil_imports_dependency.
- Eurostat. (2020e). Renewable energy statistics. Eurostat. Statistics Explained. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistic.
- Hildén, M., & P. Kivimaa (2020). "Energy Governance in Finland". In M. Knodt & J. Kemmerzell (Eds.), *Handbook of Energy Governance in Europe* (pp. 1–28). Cham: Springer.
- HydroFlex website. URL: <https://www.h2020hydroflex.eu/>.
- International Energy Agency. (2020). World Energy Outlook 2020 - Executive Summary. Paris. URL: <https://www.iea.org/reports/world-energy-outlook-2020>.
- International Energy Agency, & Nordic Energy Research. (2016). Nordic Energy Technology Perspectives 2016. URL: <https://www.nordicenergy.org/project/nordic-energy-technology-perspectives/>.
- Kilpeläinen, S. (2020). "Developing Nordic Cooperation in Renewable Electricity Policy: Exploring Views from Finland and Sweden". *Politics and Governance* 8(4), 44–52.
- Koivurova, T., K. Kokko, S. Duyck, N. Sellheim & A. Stępień (2010). "EU competencies affecting the Arctic" (No. EP/EXPO/B/AFET/FWC/2009-01/LOT2/04). Brussels: Directorate-General for External Policies, European Parliament. URL: [http://www.europarl.europa.eu/RegData/etudes/etudes/join/2010/433793/EXPO-AFET_ET\(2010\)433793_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2010/433793/EXPO-AFET_ET(2010)433793_EN.pdf).
- Koivurova, T., K. Kokko, S. Duyck, N. Sellheim, & A. Stępień (2012). "The present and future competence of the European Union in the Arctic". *Polar Record* 48(4), 361–371.
- Lassila, J., & M. Siddi (2021). "Russia meets Climate Change: The Domestic Politicization of Environmental Issues and External Pressure to Decarbonize" (No. FIIA Briefing Paper 303). Helsinki: Finnish Institute of International Affairs (FIIA). URL: <https://www.fiaa.fi/en/publication/russia-meets-climate-change?read>.
- Leonard, M., Pisani-Ferry, J., Shapiro, J., Tagliapietra, S., & Wolff, G. (2021). "The Geopolitics of the European Green Deal" (Policy Brief). European Council on Foreign Relations. URL: <https://ecfr.eu/publication/the-geopolitics-of-the-european-green-deal/>.
- Middleton, A., Hersinger, A., Bryksenkov, A., Mineev, A., Dybtsyna, E., Bullvåg, E., ... & Ovesen, S. (2019). "Business Index North: A periodic report with insight to business activity and opportunities in the Arctic" (People, Business and Development conditions) (No. Issue #3-June 2019). Bodø. URL: <https://businessindexnorth.com/reports/?Article=70>.
- Ministry for Foreign Affairs of Sweden. (2020). Sweden's strategy for the Arctic region. URL: <https://www.regeringen.se/land--och-regionstrategier/2011/05/sveriges-strategi-for-den-arktiska-regionen/>.
- Ministry of Economic Affairs and Employment. (2019). Finland's Integrated Energy and Climate Plan (No. 66). Helsinki. URL: <https://julkaisut.valtioneuvosto.fi/handle/10024/161977>.
- Ministry of Energy of Russian Federation. (2020a). "Добыча нефтяного сырья" [Extraction of crude oil]. URL: <https://minenergo.gov.ru/node/1209>.
- Ministry of Energy of Russian Federation. (2020b). Добыча природного и попутного нефтяного газа (Production of natural and associated petroleum gas). URL: <https://minenergo.gov.ru/node/1215>.
- Mitrova, T., E. Grushevenko, & A. Malov (2018). "The Future of Oil Production in Russia: Life under Sanctions". SKOLKOVO Energy Centre (SEneC). URL: <https://energy.skolkovo.ru/downloads/documents/SEneC/research04-en.pdf>.
- Morgunova, M. (2020). Why is exploitation of Arctic offshore oil and natural gas resources ongoing? A multi-level perspective on the cases of Norway and Russia Maria. *The Polar Journal*, 10(1), 64–81.

- Morgunova, M., & K. Westphal (2016). Offshore Hydrocarbon Resources in the Arctic: From Cooperation to Confrontation in an Era of Geopolitical and Economic Turbulence? (No. SWP Research Paper 2016/RP 03). SWP Research Papers. Berlin: Stiftung Wissenschaft und Politik (SWP). URL: <https://www.swp-berlin.org/en/publication/offshore-hydrocarbon-resources-in-the-arctic/>.
- National Energy Authority. (2020). “Frumorkunotkun á Íslandi 1940-2019” [“Primary Energy Use in Iceland 1940-2019”] (No. OS-2020-T007-02). URL: <https://nea.is/the-national-energy-authority/energy-data/data-repository/>.
- Natural Resources Canada. (2020). Energy Fact Book 2020-2021. URL: <https://www.nrcan.gc.ca/science-data/data-analysis/energy-data-analysis/energy-facts/20061>.
- Neumann, A. (2012). “European Interests as regards Resource Exploitation in the Arctic: How Sustainable are European Efforts in this regard?” In: G. Alfredsson, T. Koivurova, & W. Hasanat (Eds.), *The Yearbook of Polar Law* (Vol. 4, pp. 619–645). Leiden & Boston: Martinus Nijhoff Publishers.
- Norden. (2019). Declaration on Nordic Carbon Neutrality - The Helsingfors Declaration, a declaration from the meeting between the Nordic Prime Ministers and the Ministers of Environment, 25 January 2019. URL: <https://www.norden.org/en/declaration/declaration-nordic-carbon-neutrality>.
- Nordic Energy Research. (2018). 10 Insights into the Nordic energy system. Nordic Council of Ministers. URL: <https://www.nordicenergy.org/publications/10-insights-into-the-nordic-energy-system/>.
- Nordic Energy Research. (2020). Tracking Nordic Clean Energy Progress 2020. Oslo. URL: <https://www.nordicenergy.org/article/tracking-nordic-clean-energy-progress-2020-edition/>.
- Rasputnik, A. (2018). The European Union and the Geopolitics of the Arctic. Cheltenham & Northampton: Edward Elgar.
- Siddi, M. (2020a). EU-Russia Energy Relations. In M. Knodt & J. Kemmerzell (Eds.), *Handbook of Energy Governance in Europe* (pp. 1–25). Cham: Springer.
- Siddi, M. (2020b). The European Green Deal: Assessing its current state and future implementation (No. FIIA Working Paper 114). Helsinki: Finnish Institute of International Affairs (FIIA). URL: <https://www.fia.fi/en/publication/the-european-green-deal>.
- Skjærseth, J. B. (2021). “Towards a European Green Deal: The evolution of EU climate and energy policy mixes”. *International Environmental Agreements: Politics, Law and Economics* 21, 25–41.
- Stang, G. (2016). “EU Arctic policy in regional context”. Study No. EP/EXPO/B/FWC/AFET/2015-01/03. Brussels: European Parliament, Directorate-General for External Policies (Policy Department). URL: [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/578017/EXPO_STU\(2016\)578017_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/578017/EXPO_STU(2016)578017_EN.pdf).
- Statistics Sweden. (2018, February 27). Most electricity are produced in Norrland while most electricity are used in western Sweden. URL: <https://www.scb.se/en/finding-statistics/statistics-by-subject-area/energy/energy-balances/local-and-regional-energy-statistics/pong/statistical-news/local-and-regional-energy-statistics/>.
- Swedish Energy Agency. (2020). Energy in Sweden 2020 - An Overview. Swedish Energy Agency. URL: <https://energimyndigheten.a-w2m.se/Home.mvc?ResourceId=174155>.
- TASS. (2020, December 20). “Новак заявил, что добыча нефти в России в 2020 году снизится на 8,4%” [Novak said that oil production in Russia in 2020 will decrease by 8.4%]. URL: <https://tass.ru/ekonomika/10321961>.
- U.S. Energy Information Administration. (2021, January 21). Alaska State Energy Profile. URL: <https://www.eia.gov/state/analysis.php?sid=AK#30>.
- Ulchenko, M. (2020). “Industrial production of natural gas in the North and Arctic regions of the Russian Federation and prospects for its implementation in the EU market”. SHS Web of Conferences, 84, 1–3.

Raw materials

BGS (British Geological Survey). (2016). "European mineral statistics 2010-2014". Brown et al., BGS - Natural Environment Research Council.

Boyd R., T. Bjerkgård, B. Nordahl & H. Schiellerup (Eds.) (2016). *Mineral Resources in the Arctic*. Geological Survey of Norway.

Bureau of Minerals and Petroleum Greenland website. URL: <http://www.govmin.gl/index.php/minerals/geology-of-greenland/mineral-occurrences>.

Carrara S., Alves Dias P., Plazzotta B. & Pavel C. (2020). "Raw materials demand for wind and solar PV technologies in the transition towards a decarbonised energy system", EUR 30095 EN, Publication Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-16225-4, doi:10.2760/160859, JRC119941.

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

van Dam, K., A. Scheepstra, J. Gille, A. Stepien, & T. Koivurova (2016). "Mining in the European Arctic" (pp. 163-185). In: Stepien, A., T. Koivurova & P. Kankaanpää (eds.). *The Changing Arctic and the European Union*. Brill/Nijhoff.

EC (European Commission) (2020a). Study on the EU's list of Critical Raw Materials. Critical Raw Materials Factsheets.

EC (European Commission) (2020b). Study on the EU's list of Critical Raw Materials. Non-Critical Raw Materials Factsheets.

EIB (European Investment Bank) (2019). Guidance Note on indigenous and Local Community Participation in the Environmental Impact Assessment in the European Arctic.

EIP (European Innovation Partnership on Raw Materials) (2018). Raw Materials Scoreboard.

Fraser, J., Anderson, J., Lazuen, J., Lu, Y., Heathman, O., Brewster, N., Bedder, J. & Masson, O. (2021). "Study on future demand and supply security of nickel for electric vehicle batteries", Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-29139-8 (online), doi:10.2760/212807 (online), JRC123439.

Heffron, R. J. (2020). "The role of justice in developing critical minerals". *The Extractive Industries and Society* 7: 855-863.

ICLG (2019). The International Comparative Legal Guide to. A practical cross-border insight into mining law. Global Legal Group, Budiardjo, Ali et al.

Levchenko E., I. Spiridonov, & D. Klyucharev (2019). "Environmental Pollution Problems in the Mining Regions of Russia". In: Glagolev S. (eds) 14th International Congress for Applied Mineralogy (ICAM2019). ICAM 2019. Springer Proceedings in Earth and Environmental Sciences. Springer, Cham. https://doi.org/10.1007/978-3-030-22974-0_111.

Mered, M. (2019, January). "The Arctic: Critical Metals, Hydrogen and Wind Power for the Energy Transition", Edito Energie, IFRI.

The N2K Group EEIG and the Institute for European Environmental Policy (2019). Non-Energy Mineral Extraction in Relation to Natura 2000. Case Studies. Coordination by C. Olmeda & B. Barov. For the European Commission.

Schüler, D., S. Degreif, P. Dolega, D. Hay, A. Manhart & M. Buchert (2017). EU raw material import flows – acknowledging non-EU environmental and social footprints. Strategic Dialogue on Sustainable Raw Materials for Europe (STRADE), European Policy Brief No. 02 / 2017, Oeko-Institut e.V.

Smed Olsen, L., A. Berlina, L. Jungsberg, N. Mikkola, J. Roto, R. O. Rasmussen, A. Karlsdottir (2016). "Sustainable Business Development in the Nordic Arctic". Nordregio Working Paper 2016:1.

Stepień, A. & T. Koivurova (2017, February), "Arctic Europe: Bringing together EU Arctic policy and Nordic cooperation", Publications of the Government's Analysis, Assessment and Research Activities 15/2017 (Prime Minister's Office).

Teräs, J., V. Salenius, L. Fagerlund & L. Stanionyte, 2018. "Smart Specialisation in Sparsely Populated European Arctic Regions," JRC Working Papers JRC114273, Joint Research Centre.

UNEP (2019). Global Resource Outlook 2019.

WWF (2019). Environmental Transparency Rating of Mining and Metals Companies Operating in Russia.

Regional development

AHDR-II. (2014). Arctic Human Development Report II. Copenhagen: Norden.

Giordano, B., & A. Dubois. (2019) Combining territory and competitiveness in EU Regional Policy? Analyzing ERDF investment profiles in regions with specific geographical features. *Regional Studies* 53:8, pages 1221-1230.

Dubois, A. & J. Roto (2012) "Making the best of Europe's Sparsely Populated Areas. On making geographic specificity a driver for territorial development in Europe", Stockholm.

EC (European Commission) (2017a). Summary report of the Arctic stakeholder forum consultation to identify key investment priorities in the Arctic and ways to better streamline future EU funding programmes for the region. URL: <https://op.europa.eu/en/publication-detail/-/publication/6a1be3f7-f1ca-11e7-9749-01aa75ed71a1/language-en/format-PDF/source-60752173>.

EC (European Commission) (2017b). Evaluation of the Council Decision on relations between the European Union, on the one hand, and Greenland and the Kingdom of Denmark on the other (Greenland Decision) Accompanying the document Report from the Commission to The European Parliament and the Council Midterm Review Report on the External Financing Instruments. Staff Working Document SWD/2017/0609 final.

EC (European Commission) (2017c). My Region, My Europe, Our Future: Seventh report on economic, social and territorial cohesion.

EC (European Commission). (2020). European Semester 2020 Country Reports: Overview of Investment Guidance on the Just Transition Fund 2021-2027 per Member State (Annex D).

EIB (European Investment Bank) (2018). Environmental and Social Standards: Overview. EIB 12/2018. URL: https://www.eib.org/attachments/strategies/environmental_and_social_overview_en.pdf.

EP (European Parliament) (2016, November). EU regional policy in the Arctic. Briefing.

EP (European Parliament) (2019, April). EU cooperation with Greenland. Briefing.

EP (European Parliament) (2020, April). A Just Transition Fund - How the EU budget can best assist in the necessary transition from fossil fuels to sustainable energy. Cameron et al. PE 651.444 - April 2020.

Gaskell, F. (2014). "Arctic Connections Collaborative Approaches for Regional Cooperation in the Arctic". Final Project & Conference Report, Glasgow.

Grenier, A. A., & D. K. Müller (Eds.). (2011). Polar tourism: A tool for regional development.

Heleniak, T. (2020). Polar Peoples in the Future: Projections of the Arctic Populations. Nordregio. Working paper 2020:3. URL: <https://nordregio.org/publications/polar-peoples-in-the-future-projections-of-the-arctic-populations/>.

Husebekk, A., M. Andersson & R. E. J. Penttilä (2015) Growth from the North. How can Norway, Sweden and Finland achieve sustainable growth in the Scandinavian Arctic? Report of an independent expert group, URL: http://valtioneuvosto.fi/documents/10616/1095776/J0415_Growth+from+the+North_net.pdf/2613b2d6-96f8-4ca1-813a-658eaa7f858.

Kopra, S. (2021, February 2). Covid-19 in the Arctic: Final Remarks. The Arctic Institute. URL: <https://www.thearcticinstitute.org/covid-19-arctic-final-remarks/>.

Grunfelder, J., G. Norlén, L. Randall & N. Sánchez Gassen (eds.) (2020). "State of the Nordic Region 2020". Nordregio. Nord 2020:001. Report for the Nordic Council of Ministers.

Larsen, J. N., Schweitzer, P., & Petrov, A. (Eds.). (2014a). "ASI. Arctic social indicators: Implementation". TemaNord, Vol. 568. Copenhagen: Nordic Council of Ministers.

Lundgren, A., L. Randall & G. Norlén (eds.) (2020). State of the Nordic Region 2020. Wellbeing, health and digitalisation edition. Nordregio. Nord 2020:052. For the Nordic Council of Ministers.

- McMaster, I., N. Wergles & H. Vironen (2019). An impact evaluation of the Northern Periphery and the Arctic Programme. Final Report. European Policies Research Centre, University of Strathclyde.
- Nordregio (Jungesberg, L. et al.) (2019). "Atlas of population, society and economy in the Arctic". Working paper 2019:3. URL: <https://nordregio.org/publications/atlas-of-population-society-and-economy-in-the-arctic/>.
- Nordregio (2020). *Post-pandemic regional development*. Nordregio Magazine 3 2020. URL : <https://nordregio.org/nordregio-magazine/>.
- NPA (Northern Periphery and Arctic Programme 2014-2020). (2020). Annual Implementation Report within the European Territorial Cooperation goal for the NPA. 2019
- OECD (Organization for Economic Development and Cooperation) (2017). OECD Territorial Reviews: Northern Sparsely Populated Areas, OECD Publishing, Paris.
- Rasmussen, R. O. (Ed.). (2011). *Megatrends*. Copenhagen: Nordic Council of Ministers.
- Regional Council of Lapland (2013b). "Lapland's Arctic Specialisation Programme", Rovaniemi, URL: www.lapinliitto.fi.
- Stepien, A., K. Banul, A. Scheepstra, K. van Dam, K. Latola and T. Koivurova (2016). "Socioeconomic and Cultural Changes in the European Arctic", In: Stepien, A., T. Koivurova and P. Kankaanpää (eds.) (2016). *The Changing Arctic and the European Union*. Brill/Nijhoff. (pp. 213-242).

INTERVIEWS:

The authors interviewed over 70 persons in the course of the study. Interviewees do not bear any responsibility for the content of this report. Some interviews were conducted with multiple interviewees. Personal communications other than interviews are not reported below. The authors are grateful to all the interviewees for their time, insights and information they shared. We are in particular grateful to Renuka Badhe from the European Polar Board, Tom Barry from CAFF, Kaarle Kupiainen from the Finnish Ministry of Environment, Elle Merete Omma from the Sami Council, Anders Turesson, chair of AMAP, and Jari Vilén, Finnish Ministry of Foreign Affairs and International Barents Secretariat. The authors are also grateful to all persons who commented on the early versions of this report, including the EU officials as well as Arild Moe (Fridtjof Nansen Institute) and Michał Łuszczuk (Maria Skłodowska-Curie University).

EU Officials were interviewed from the following services:

- European Commission Directorate-General for Environment (DG ENV)
- European External Action Service (EEAS)
- EC DG for Trade (DG TRADE)
- EC DG for Maritime Affairs and Fisheries (DG MARE)
- EC DG for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)
- EC DG for International Partnerships (DG INTPA), earlier DG for Development Cooperation (DG DEVCO)
- EC DG for Civil Protection and Humanitarian Aid Operations (DG ECHO)
- EC DG for Energy (DG ENERGY)
- EC DG for Climate Action (DG CLIMA)
- EC DG for Regional and Urban Policy (DG REGIO)
- EC DG for Research and Innovation (DG RTD)
- EC DG for Defence Industry and Space (DG DEFIS)
- Joint Research Centre (DG JRC)
- Executive Agency for Small and Medium-sized Enterprises (EASME), from 1.04.2021, European Innovation Council and SMEs Executive Agency (EISMEA)

Persons interviewed from other institutions:

- Arctic Council's Arctic Monitoring and Assessment Programme (AMAP) / Swedish Ministry of Environment
- Arctic Council's Conservation of Arctic Flora and Fauna working group (CAFF)
- European Polar Board
- European Investment Bank (EIB)
- Finnish Ministry of Environment
- Ministry for Foreign Affairs, Finland / International Barents Secretariat
- Sámi Council

LIST OF FIGURES AND TABLES

Figures

Figure ES1: Illustration of the EU economic and environmental footprint in the Arctic and the financial support for Arctic projects from chosen EU programmes. Graph by Gabriela Mlaskawa, EPRD 2021.

Figure 1.1: The definitions of the Arctic: Arctic Human Development Report boundary in red, with Arctic administrative regions marked in grey. Map produced by Nordregio, 2004. Cartographer: Johanna Roto.

Figure 3.1.: Share of countries and regions in global CO₂ emissions in 2018. Source: ClimateWatchData and European Environment Agency

Figure 3.2: Share of black carbon emitted north of 40°N. Source: AMAP 2011.

Figure 3.3: EU-27 historical and projected emissions and EU policy targets. Source: EEA.

Figure 4.1: Contribution to cumulative air concentration of selected POPs in the Arctic region from different regions. Source: Gusev and McLeod 2013: 155.

Figure 4.2 and 4.3: Two models of the effects of reducing annual air concentrations in different source regions by 20% on the concentrations in the Arctic. Source: Gusev and McLeod 2013, pp. 152, 154.

Figures 4.4 and 4.5: Anthropogenic emissions source regions for mercury deposited in the Arctic; and overall share of regions in global mercury emissions (global total at 2200 tonnes annually) (based on UNEP 2018).

Figure 4.6: Source apportionment of heavy metal and POPs anthropogenic deposition to the Arctic within the EMEP domain in 2018. Source: EMEP 2020: 79.

Figure 4.7: Development in EU-28 emissions, 2000-2018 (% of 2000 levels). Source: European Environment Agency, 2020.

Figure 4.8: Emission reductions of selected POPs in the EU-27+UK/NO/CH/IS between 1990 and 2017. Source: European Environment Agency 2020.

Figure 5.1: Pathways of plastics input into the Arctic Ocean. Cartographer: Philippe Rekacewicz, Riccardo Pravettoni, and Nieves Lopez Izquierdo, GRID-Arendal 2019, from Global linkages – a graphic look at the changing Arctic.

Figure 6.1: Impacts and risks for the Arctic region presently, at 1.5oC and 2oC warming, as compared to other selected natural, managed and human ecosystems. Source: IPCC (2018) Summary for Policymakers.

Figure 7.1: EU supply balance 2018. Source: EUMOFA 2020:26, based on Eurostat.

Figure 7.2: Most relevant extra-EU-28 (incl. UK) trade flows of seafood, 2019. Source: EUMOFA 2020: 58, based on Eurostat-COMEXT.

Figure 8.1: Direct EU share of CO₂ and BC emissions from maritime transport in the Arctic (2019).

Figure 8.2: EU share of total CO₂ and BC emissions from maritime transport in the Arctic (2019).

Figure 8.3: EU share of total CO₂ emissions 2019 and estimate for 2030.

Figure 8.4: EU share of total BC emissions 2019 and estimated share 2030.

Figure 9.1. Arctic hydrocarbon resources including prospective areas as well as existing and proposed energy infrastructure (Stepien, Koivurova and Kankaanpää 2014), map by Arctic Portal.

Figure 10.1: Mining activities in the European Arctic and Greenland. Riccardo Pravettoni, GRID Arendal 2014, for the Strategic Assessment of Development of the Arctic report, 2014.

Figure 10.2: EU imports of chosen minerals from Arctic states (including non-Arctic regions) and the EU's position as an importer of resources from Arctic states. Data: OECD, compareyourcountry.org; EC 2020a, 2020b.

Figures 11.1-11.3: EU cross-border programmes and the Northern Periphery and Arctic Programme in the European Arctic and Baltic context. 2014-2020. Map production: Nordregio and Arctic Portal based on Nordregio.

Figure 11.4: Regions identified in European Semester Country Reports as facing serious socio-economic challenges deriving from the transition. Source: European Parliament 2020.

Tables

Table 2.1: Trade in goods between the EU27 and non-EU Arctic states in 2019 in EUR bln. Data by Eurostat and EC DG Trade.

Table 8.1: Direct Emissions from Maritime Transport in the Arctic, in tonnes (2019),

Table 8.2: EU Footprint of CO₂ and BC Emissions from Maritime Transport 2019.

Table 8.3: Estimated EU Footprint of CO₂ and BC Emissions from Maritime Transport, 2030.

Table 10.1: Examples of mines and known reserves in the Arctic states for selected critical minerals and some important minerals. Based on OECD, compareyourcountry.org database; EC 2020a, EC 2020b; Boyd et al. 2016).

Table 11.1: Budget of EU mainstream and cross-border and transnational programmes within the 2014-2020 MFF. Data: programmes' websites, EU's Regional PolicyAtlas.

All graphs used in this report reproduced from external source are under open or creative commons non-NC licenses.

Annex 3: Assessment of proposed policy options

| Policy option | Theme | When should the PO be implemented? | When do we expect effects? | EU competence (e.g. sector, scope, earlier actions) | What would change compared to current situation or to the continuation of current situation (business as usual)? | What would be monetary or administrative costs for the EU? (this can be qualitative or non-applicable for some options) Does the benefit justify these costs? | What are the challenges for adoption and implementation (resources, political will, interest of EU partners, etc.)? | Are there any negative implications of proposed action? If so, can they be mitigated? | Are there alternatives to this policy option? Leave blank if not applicable. |
|--|---------------|------------------------------------|----------------------------|---|--|--|--|---|--|
| P1. Considering Arctic-specific impacts of policy proposals | Cross-cutting | Short-term | Mid-to-long-term | The EC Better Regulation Guidelines on Impact Assessments (Chapter 3) already include consideration for disproportionate/negative implications of EU policy for particular regions (as one of the classifications). | Currently, while the EC officials or subcontractors have possibility to include particular regional consideration into the IAs, that rarely happens for the Arctic region. A more regular reflection on Arctic impacts would allow to identify interventions where input of Arctic stakeholders is needed during the consultation processes, include Arctic-specific perspective or indicators in monitoring processes, as well as enhance the EU's internal understanding on its influence on the EU-neighbouring region that is of global importance in light of the climatic changes. | The additional consideration for Arctic impacts in IAs would require additional time effort of EU officials, including those who have the Arctic as a part of their portfolios. In case more significant specific implications are identified, there is a possibility for commissioning external consultancy work, which would entail monetary costs. The regulatory development process could also be slowed down. In particular, the question of long-range environmental impact of EU actions on the Arctic could be difficult to assess. | The EU policies have global implications and there is understandable resistance to a forceful inclusion of one specific region while not others. It could be, however, possible to consider specific implications of EU policies for all regions where the EU has specific policy (of general nature, macroregional, or sea-basin policy). | Not identified | Arctic-specific impacts could be considered via consultations rather than through impact assessments. The challenge for Arctic actors is a limited understanding of EU regulatory process and difficulty to identify which legislative actions have specific implications for northern inhabitants and environment. One option would be to task EU officials with identifying which policy developments could be of interest to Arctic stakeholders. |

| | | | | | | | | | |
|--|---------------|------------------|------------------|--|--|--|---|--|---|
| P2. Enhance the role of the DG REGIO and EU northern programmes in the EU's Arctic policy | Cross-cutting | Short-term | Mid-to-long-term | The arrangement as regards the coordination and leadership for the Arctic policy is a political decision and can be adjusted internally in the EC. | Most of the EU direct funding in the Arctic is managed by the DG REGIO via the EU cohesion and cross-border programmes. This policy domain is highlighted as a part of the EU's Arctic policy but it plays secondary role as evident from the 2016 Joint Communication. At the same time the main new actions introduced in the 2016 document referred to the DG REGIO work. Stronger involvement would allow the Arctic policy to be seen more as a mixed domain, where internal and external affairs coexist, and gave possibility for the EU programmes to not only be referred to as EU contribution but also used more actively as tools for implementing the EU Arctic objectives. | Costs would involve only greater work effort as regards Arctic policy work from the DG REGIO staff. | The Arctic policy has been from the beginning implemented by the DG MARE and the DG RELEX and later the EEAS. This has created important source of institutional memory as regards EU Arctic affairs. The expertise and experience existing in these services should not be undermined. | There is a risk that the Arctic policy becomes dominated by the concerns related to funding for regional development in the European Arctic, and dominated by a couple of EU-Arctic regions. The strong role of the EEAS and the DG Mare would allow for continued international focus in the Arctic policy. | N/A |
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P3. Continued assessment of own footprint and promoting this action towards other actors | Cross-cutting | Mid to long-term | Long-term | Yes, the EU has already carried out such studies. | The policy option encourages the continuation of current activity in order to strengthen the image of the EU as a responsible self-critical Arctic actor. If any other states were inspired by EU actions, the level of responsible Arctic policy would improve globally. | Each study carries costs related to its conduct and so far the studies were carried out by external consultants/researchers. There would be no specific costs of promotion of the action towards other actors. | The assessment of Arctic footprint has to be carried out carefully in order not to imply that the existence and addressing of economic and environmental impacts is fully a responsibility of the EU | None, if the footprint assessment does not imply responsibility on the side of the EU where there is no competence that EU could utilize to address a given impact. | None |
| P4. Organisation of an EU Arctic roundtable | Cross-cutting | Short-term | Mid-term | Yes (maybe also under the lead of MS presidency) | EU and MS could enter honest and EU-wide debate on the Arctic role of the EU | Some (limited) monetary costs, yet maybe some higher administrative costs | Main challenge related to political will (probably within MS) on the necessity of such Arctic roundtable | Diplomatic challenges on how to internationally (among non-EU Arctic states) sell such roundtable | Continuation of none/less coordinated Arctic policies between EU and MS |

| P5. Coordinated and consistent contribution to the Arctic Council working groups' activities | Cross-cutting | Short-term | Mid-to-long-term | The EU already contributes to the work of the Arctic Council, even though it acts as an observer in principle or observer de facto. The EC is free to internally organize and coordinate this involvement. | The EU involvement would become more long-term, enhancing EU institutional memory. It would be also more visible for the other actors present in the Arctic Council. It would increase a chance of more effective involvement. | The more long-term involvement in the work of the working groups would require potentially more consistent attendance especially from the staff of EU agencies: EEA, EMSA, possibly ECHA in the future, as well as the EC JRC. This would entail travel costs (although possibly limited if the remote format of meetings continues after the Covid-19 pandemic) but more importantly working time of officials for preparation, participation and reporting from the meetings. The working time, however, would partly result in enhanced learning by the said officials. | The time of the experts working in EU agencies and in the EC is limited. The resources for travel are also constrained. There may be internal challenges related to who is to have oversight over the whole involvement in the AC work. | Some meetings of the working groups may be less of interest to EU officials and experts than others. Participation that focuses on a set of topics where the EU has strong expertise or interest would mitigate this problem. | N/A |
|---|---------------|--------------|------------------|--|--|--|---|---|--|
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P6. Enhance internal coherence and integrated approach to Indigenous Peoples in the EU | Cross-cutting | Long-term | Long-term | Yes, the EC documents as well as (indirectly) the TEU require the EU to maintain policy coherence. | Improved understanding and awareness of indigenous issues. | Significant administrative burden, especially if a staff working document is written. | Difficulty to affect change across the relatively fragmented landscape of EU engagement with Indigenous Peoples globally and internally. | administrative reorganization and/or reallocation of resources might be necessary | increase awareness of indigenous issues through staff working documents which include information on indigenous issues |
| P7. Institutionalise and operationalise EU-Indigenous interactions | Cross-cutting | Mid-term | Long-term | Yes, this would build on existing EU-Arctic dialogue. However, the financial support for establishing a representation for Indigenous Peoples in Brussels may be problematic. | Improved communication and exchange of information between EU and representatives of Arctic (and possibly world's) Indigenous Peoples. | More working time of EU officials would need to be dedicated to the preparation of Arctic Dialogue meetings. There would be costs related to group dialogue format. The costs of supporting indigenous (or specifically Sámi) representation in Brussels would amount to several hundred euros, depending on the scope of the support. At least two working positions would need to be funded. | Some administrative and transitional challenges appear likely, in particular as long as EU indigenous policies are not (yet) streamlined | Costs as well as pressure from other vulnerable groups to have dedicated dialogues or support for their Brussels representation. | The policy option includes several possible alternatives. |

| | | | | | | | | | |
|--|---------------|---------------------|---------------------|----------------------|---|--|--|--|--|
| P8. Include gender equality as one of the overarching principles in a new EU Arctic Communication | Cross-cutting | Short-term | Short to long-term. | Yes. | Greater promotion and advancement of gender equality in the Arctic context. Bringing EU Arctic policy in line with the new EU Gender Equality Strategy and EEAS Gender Action Plan III. | No significant monetary or administrative costs for the EU. | One potential challenge could be lack of understanding of gender equality by some officials who equate it only with inequities in labour market conditions or with questions of gender-based violence. Accordingly, in the Arctic context they consider gender equality an internal matter of Arctic states - despite the fact that it concerns also climate change, conservation of biodiversity, pollution, etc. | One could point out that the EU has not achieved gender equality within its borders, thus promoting it outside might be seen as incoherent. However, in response to that, it can be noted that gender equality has not been achieved in any country in the world but remains official commitment of most of the world nations and is a central goal in realization of Agenda 2030. | |
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P9. Enhance engagement with the youth and inclusion of young voices in EU-Arctic matters | Cross-cutting | Short to long-term. | Mid to long-term. | Yes. | Dialogue with young people would help EU understand their perspectives, which are often distinct from older generations. Development and implementation of EU Arctic policy that would be supportive of viability of northern communities and future generations. | If engagement with the youth would take form of separate meetings or additional consultations, then preparation of those meetings would incur costs. It would also likely generate costs to cover participation of representatives of the youth, especially if a meeting involved travels. Alternatively, meetings could be organized online, which would make their organization much easier and cheaper. | Some EU officials might consider it not relevant enough, even though youth engagement is now strongly promoted in the Arctic Council and in Arctic states (e.g. Norway). | One could argue that if such engagement with the youth is promoted in the Arctic context, it should be incorporated also into other regional policies. | There is no alternative to the policy option per se, but different formats of effective and meaningful engagement with young people could be considered. |

| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
|--|-------------------------|------------|---------------------|--|---|---|---|---|--|
| P10. Enhance Satellite Connectivity and observation in the High Arctic | Cross-cutting | Mid-term | Long-term | Yes, EU Space Policy, Copernicus, Galileo, EGNOS, Horizon Europe | Increased communication and navigation possibilities in the High Arctic (north of 70°N), improvement for maritime safety, facilitation of Search-and-Rescue (SAR) operations and of scientific research | significant costs if the goal is pursued through research funding, very high costs if the fleet of Galileo and Copernicus satellites were to be increased significantly by adding more satellites in polar orbit and developing more arctic services | High costs | High costs might be reduced marginally by deploying multiple identical satellites | Research funding to search for alternative solutions instead of simply increasing the number of satellites |
| P11. Facilitate Digital Futures for Remote Regions | Cross-cutting | Short-term | Short-term | Yes, European Digital Programme | Increasing business / work opportunities in remote regions, reducing outmigration from remote towns and villages, sustainable communities | Comparatively low costs which can be covered by existing budget allocations as part of the European Digital Programme | Accessibility of information on the local level, some translation costs might arise | none | N/A |
| P12. Provide stronger support for developing green air mobility | Cross-cutting | Mid-term | Long-term | Yes, European Green Deal, Horizon Europe | Enhanced intra-Arctic connectivity, reduction of GHG emissions | very high costs, which can be covered by existing budget allocations (European Green Deal, Horizon Europe), but possibility to significantly advance the European aviation industry and to ensure its long-term competitiveness, while simultaneously contributing to a reduction of GHG emissions and enhanced economic and other opportunities in the European Arctic, all of which amount to benefits which are very likely to outweigh (also financially) the initial costs | High initial costs | Increasing demand for raw materials due to increasing need for batteries and renewable energy infrastructure; can be mitigated by sourcing raw materials through e-waste mining | N/A |
| P13. Emphasise in a new EU Arctic Communication a need for collection of sex- and gender-disaggregated data in Arctic research projects | Cross-cutting/ Research | Short-term | Short to long-term. | Yes. | Significantly improved understanding of the effects of changes and developments in the Arctic on all groups within societies. Possibility to respond with more tailored, suited policies and more effective support for adaptation. | No additional costs beyond those within Horizon Europe dedicated to Arctic research. | Lack of sufficient interest in the subject by involved EU officials. | No. | N/A |

| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
|---|----------------------------|---------------------|--------------------|--|---|--|--|------------------|--|
| P14. Promote and emphasise gender equality and empowerment of women in and through Arctic research | Cross-cutting/ Research | Short to mid-term. | Mid- to long-term. | Yes, in relation to EU-funded Arctic research. | Contribution to closing gender gap in science, in particular in STEM fields. Improved research quality and relevance of produced knowledge, technologies and innovations to northern communities and societies at large. | Policy option would be realized within Horizon Europe, without additional monetary or administrative costs for the EU. | Initially, institutions applying for EU funding might not have capacity to deliver e.g. mentoring schemes. However, under Horizon Europe, subsequently they all will need to have gender plans in place, thus that should not be an obstacle. | No. | N/A |
| P15. Support early career scientists in Arctic science | Cross-cutting/ Research | Short to mid-term. | Mid to long-term. | Yes, in relation to EU-funded Arctic research. | Improved training for next generation of Arctic scientists. Potentially higher retention rate. | Costs would be covered by funding from Horizon Europe for projects dedicated to Arctic-research (so no additional cost compared to existing budget). Mentorship schemes would be also a part of the funded projects. | The implementation would be primarily in hands of partner institutions within EU-funded Arctic projects. No foreseen challenges for adoption and implementation in calls for proposals. | No. | N/A |
| P16. Enhance capacity-building for resilient science | Cross-cutting/ Research | Short to long-term. | Mid to long-term. | Yes, in relation to EU-funded Arctic research. | Building local and community competence for observations and monitoring of diverse variables of Arctic change. Improved quality, systematisation, sustainability and long-term viability of Arctic observation and monitoring. Assuring continued observations even during the events such as pandemic. | Costs of training programs for northern local populations. Those could be covered from Horizon Europe or other funds available for northern development, especially with regard to sustained, long-term observations and collaborations. | Potential challenge for implementation could be recruitment and training of persons from northern communities, including language barriers. Organization and effective maintenance of the network of local observers could be another challenge, which could, however, be significantly reduced via technology and development of uniform protocols. | No. | Potential but more costly technological developments that could match the quality of local observations (highly unlikely). |
| P17. Minimise environmental impact of Arctic science | Cross-cutting/ Research | Short to long-term. | Mid to long-term. | Yes, in relation to EU-funded Arctic research. | Reduction of environmental and carbon footprint of conducting scientific activities in the Arctic. | Initial costs could be related to carrying out a study and development of methodology for calculating environmental and carbon footprint of scientific activities and overall conduct of research projects. | Reluctance toward focusing on reducing carbon footprint in the sector that is not major emitter of GHG per se. Challenge of developing adequate methodology and relevant standards. | No. | N/A |

| | | | | | | | | | |
|---|----------------|---------------------|---------------------|---|--|---|---|-------------------------|---------------------|
| P18. EU common target for black carbon reductions | Climate change | Short to mid-term. | Short to mid-term. | Yes, it is committing only to a voluntary reduction commitment that is achievable for the EU. | Currently, the observers can participate in the expert group work but the reduction targets are only for member states of the AC. By committing to this, EU could put some leverage to also other observers to their work on black carbon. | It is expected that the EU could with its current policy fulfil this voluntary commitment. | Since this would be a new move within this expert group, and the EU is not even a regular observer, it might cause some political pushback but this is really hard to evaluate. | No. | N/A |
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P19. Continued inclusion of the development of black carbon inventories and mitigation in dialogues with China and India | Climate change | Short to mid-term. | Short to mid-term. | Yes, within its already existing dialogues. | The EU would place more emphasis in these dialogues to black carbon, given that both of these countries are heavy emitters of BC and therefore also warm with their actions the Arctic even further. | None, since these would be within the existing dialogues. | None, as it is likely that these partner countries can also discuss this issue. | No. | N/A |
| P20. Utilizing the Northern Dimension Environmental Partnership towards black carbon work | Climate change | Short to mid-term. | Short to mid-term. | Yes, the work has to some extent already commenced. | There would be even stronger emphasis on BC reduction projects, especially in Russia. | Continuation of work that to some extent has already commenced. | It is not clear that all parties see the need to make this change, although it is presumed that there is fair amount of consensus on the benefits of this. | No. | N/A |
| P21. Supporting work on the understanding of the global impacts of Arctic climate change | Climate change | Short to long-term. | Short to long-term. | Yes, as it is already funding a lot of research and is participating in the work of the AC. | With increased knowledge of e.g. how Arctic warming is directly impacting the EU there would also be better motivation from the part of the EU to work even harder for cutting down both long-lived and short-lived climate forcers (but this applies to all mid-latitude actors, which participate in the work of the AC. | That it would engage more with the relevant WG's of the AC, especially AMAP, and continue supporting Arctic research so not much more what it already does. | None, as also AMAP is heading to this direction. | No. | N/A |

| | | | | | | | | | |
|--|-----------------------|--------------------|--------------------|---|---|---|---|---|---|
| P22. Bringing long-range aspect of pollutants more strongly into EU regulatory and institutional framework | Long-range pollutants | Short to mid-term. | Short to mid-term. | Yes, it is an internal decision, not requiring legislative changes. | The EU's internal work would be more supportive of its international work in the Stockholm Convention. | The evaluation would be more rigorous so some costs would come from that. | The current system where the focus is on persistent, bioaccumulative and toxic qualities for the European environment. If there is a pattern of conducting these, changing these evaluations would probably confront some resistance. | No. | N/A |
| P23. Improving the understanding of the long-distance transport of plastic waste in the North Atlantic and air transport of microplastics | Plastics | Short-to-mid-term | Mid-to-long-term | Yes, the EU has competence to fund and operate research programmes and commission expert assessments. | Better understanding of the long-distance transport would raise awareness of the broader impacts of European plastic pollution outside Europe and direct better policy-making. The EU could better contribute to the work in the AC on plastics. | The modelling, sampling and assessment projects could have budgets between 100.000 euros to several million euros when combined with other objectives. However, this funding is already dedicated to research and assessment activities and it is a question of prioritisation. | Based on the available literature, the research community is interested in this line of research. However, bringing together a consortium of experts may constitute a challenge. The poor availability of data may not allow for high-confidence modelling exercises. | None | The research focus could alternatively be primarily on the impacts of marine litter and macroplastics on Arctic environment, with long-range transport designed as a secondary objective. |
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P24. Developing policy measures for unintentionally released microplastics from synthetic textiles and road traffic | Plastics | Mid-term | Long-term | Yes, the EC has already indicated the need for addressing these pollutants in the Plastics Strategy. | Lack of addressing these sources of microplastics will result in continued accumulation of the particles in Arctic environment, which acts as a sink. It will be in any case only in the long-term that any policy measures adopted will have tangible effects on the amount of microplastics in the Arctic environment as the emissions will continue. | There are costs of commissioning analysis and administrative costs on the side of the EC and ECHA. There would be costs - impossible to assess here - for producers and consumers if any measures are implemented. Awareness-raising campaign would create additional costs. | Both microplastics from synthetic textiles and especially road traffic are difficult to manage and technological developments are needed. It will be only in the long-term that regulations have impact on the appliances and parts used by consumers. | There may be unforeseen economic and environmental consequences of any new technological solutions used in home appliances and in road transport. | The EU could focus in the short-to-mid-term on investing in targeted technological development and awareness raising before developing regulatory measures. |

| | | | | | | | | | |
|---|--------------|--|--|----------------------------------|---|--|--|-------------------------|---------------------|
| P25. Creating stronger institutional presence of the EU in the work of the CAFF to advance the protection of Arctic biodiversity, for instance via supporting the efforts to commence a new Arctic Biodiversity Assessment. | Biodiversity | Long-term engagement. | For some actions fairly short-term impacts and for some mid and long-term. | Yes. | EU's presence in the CAFF is ad hoc and fragmented so this would guarantee more systematic influence of EU in CAFF, together with EU having sustained engagement with CAFF (with institutional memory). | Participation in CAFF meetings and work input. | Even if EU is not a formal observer in the Arctic Council, it is considered a de facto one, and its input into the work of the working-groups is welcomed. | No. | N/A |
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P26. Establishing a Commission's internal task-force to follow and, if necessary, to take stance on what should be the EU's role in the biodiversity governance of the Central Arctic Ocean | Biodiversity | Starting quite soon and following the process at least through out the BBNJ process. | Mid-term. | Yes, it is an internal decision. | There would be more awareness of the complexity of the situation in the Central Arctic Ocean where the EU plays many roles. When there is more awareness and information about the developing situation, policy stances can also be more informed of the overall situation. | Greater work input from several staff members. | None. | None. | N/A |

| | | | | | | | | | |
|---|--------------------|--------------|----------------|---|---|--|--|--|--|
| P27. Contributing to the scientific work and cooperation of the central Arctic Ocean fisheries | Fisheries | Mid-term | Long-term | Yes, the EU has ratified the CAO fisheries agreement and the EC can contribute directly to the scientific cooperation as well as fund research projects via Horizon Europe that support knowledge-building as regards the CAO ecosystem and biodiversity. | The EU officials have been involved in the early discussions on scientific cooperation. The course of scientific cooperation is not fully clear. However, strong EU input will certainly have an added value. | The participation of EU officials in the meetings, preparatory work may consume significant time resources. The funding for relevant research within the Horizon Europe can reach several million euros. | There is limited possibility that viable commercial fisheries occur in the central Arctic Ocean, which may discourage participation from some officials, experts and researchers. The format of the cooperation and the interest of other parties to the CAO fisheries agreement will influence the possibilities for EU engagement. | None. | The EU can focus more on its own research and analysis rather than CAO cooperation. This could constitute a viable course of action if the scientific cooperation under CAO fisheries agreement will be limited and unsatisfactory. |
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P28. Strengthening the Polar Code | Maritime transport | Mid-term | Mid-term | Yes, in coordination with MSs via the IMO. | Include thousands of currently-exempt vessels in the Polar Code resulting in reduction of environmental impact from maritime transport in the Arctic. | Limited costs related to policy and coordination efforts to drive expansion of the Polar Code within IMO fora. | Though the EU Commission is an observer to the IMO, it has limited direct competence, it has to coordinate MSs position and has to work within the constraints of the IMO to achieve consensus opinions. | Expansion of the Polar Code to include vessels below 300 tons those operators may face substantial costs for vessel retrofit and crew training. Such expenditures could be attenuated through financial aid. | A collaborative pan-European consortium study providing an overview of the potential application of sustainability taxonomy for a variety of regions with special circumstances could be considered as an alternative. The experiences of the EIB with the implementation of sustainability standards should be considered in that regard. |

| | | | | | | | | | |
|--|--------------------|--------------|----------------|---|--|---|--|--|---|
| P29. Strengthening Port State Control | Maritime Transport | Short-term | Short-term | Yes, in coordination with MSs. | Achieve greater compliance with and enforcement of existing as well as future rules related to Arctic shipping, such as the Polar Code and the IMO2020 regulations. | Costs would be largely limited to port state control authorities of MSs. | The interests and political will of MSs to more strictly implement and enforce regulations related to maritime transport in the Arctic may differ. | If regulations related to Arctic maritime transport are enforced unevenly between different MSs, shipping operators may choose to alter destinations to avoid those jurisdictions. | Flag state control is an alternative to port state control measures, but would likely face a greater number of challenges, such as de-flagging. |
| P30. Rethinking Arctic Energy: A comprehensive Arctic energy policy | Energy | Mid-term | Long-term | Yes; long-term strategic considerations; European Green Deal as foreign policy tool | Currently lack of knowledge on how much imported oil/gas comes from Russian Arctic. Honest debate on EU need for those resources could provide for action-oriented examples of Green Deal efforts and thus be of relevancy for EU domestic considerations. Moreover, it could - in the long-run - impact EU-Russian energy relations, fostering renewable energy collaboration between the EU and Russia | Considerable monetary and administrative costs. | Proposal would involve EU-wide discussions, diplomatic efforts in EU-Russian (and maybe Norwegian) relationship, etc. | Diplomatic tension, broad debates on energy use within the EU. | Continuation of Arctic energy import from Russia (and Norway). |
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P31. Actively engage in BEAC's Joint Working Group on Energy | Energy | Short-term | Mid-term | Yes, EEAS part of BEAC; EU competences in energy - international relations | EU could actively engage in cross-border energy collaboration, exchange of knowledge, etc with Russian Federation | Probably some, yet limited, administrative costs | Limited challenges - maybe need to link expertise from COM (DG ENER) and EEAS | None | N/A |
| P32. Consider the Indigenous Peoples' rights and interests in Arctic raw materials extraction via dialogue, best practices and guidelines | Raw materials | Mid-term | Long-term | There are several options for creating such guidelines or best practice compilations. It could be done as an internal non-obligatory staff working document or as a best practice study. It could be done either by the EC or by the European Parliament. | The guidelines would be useful for the EU research projects related to raw materials as well as any investment funding. It would allow the indigenous persons to directly refer to such an EU-internal set of principles of best practice, which is not possible at the moment. | Drafting guidelines or best practice could be done internally but it is more likely that an external consultant is commissioned to prepare background for such an action. The preparation has to be participatory with enhanced involvement of indigenous and local actors, involving not only meetings but funding for work of such persons. | The adoption may be challenging due to difficult political discussions around Indigenous Peoples rights and conflicting values related to raw materials extraction. Implementation is, however, the key challenge as the guidelines or best practice are useful only if they are known in the industry and among stakeholders and actually applied and referred to. That is not fully within the control of EU institutions. | There may be concerns among non-indigenous inhabitants on specifically addressing Indigenous Peoples concerns in relation to raw materials extraction. | A broader set of principles for raw materials extraction in the EU addressing multiple stakeholders could be considered as an alternative. |

| | | | | | | | | | |
|---|----------------------|--------------|----------------|---|---|---|---|--|---|
| P33. Support social impact assessments and efforts to improve the awareness, acceptance and trust of society in raw materials extraction | Raw materials | Mid-term | Long-term | Yes, the EU adopted EIA and SIA directives and has been already involved in sponsoring analysis of the efforts for improving the awareness, acceptance and trust of society principles. | Stronger and broader assessment of social impacts would encourage taking into account aspects that are currently rarely a part of the projects impact assessments. Lack of clearer rules in Europe puts the European Arctic as a regions standing out from some of the practices adopted around the circumpolar North. | Apart from administrative costs of adopting new policy measures and even guidelines, there would be further costs for those implementing projects if broader social impacts are to be considered. | There may be lack of interest among Member States to expand the assessment of social impacts. There are also concerns about lack of clarity related to the concept of the social license to operate. | As assessment of social impacts is usually a question of interpretation, such impact assessments may be subject to contestation by different groups depending on their values and interests. | Creating non-regulatory measures for assessment of social impacts and continue developing and collecting best practice. |
| Policy option | Theme | When? | Effects | EU competence | What would change? | Costs | Challenges | Negative impacts | Alternatives |
| P34. Strengthening the NPA and maintaining its role as a facilitator of cooperation between northern programmes | Regional development | Short-term | Mid-term | Yes, although the proposed support of some functions of the NPA from other funding and administrative pulls may be a challenge. | The limited geographic scope and resources of the NPA will likely undermine its position as a key Arctic programme of the EU and make its leadership for the cooperation between northern programmes potentially very challenging. Additional resources (financial and human) would address these challenges. | Several hundreds of thousands to several millions of euros could be dedicated to the NPA promotion of the EU Arctic policy objectives. | Difficulty in locating appropriate source of funding. Utilizing Neighbourhood, Development and International Cooperation Instrument (NDICI) or the DG MARE Technical Assistance funding for some actions could be considered but there is a need for highly innovative approach in the EC. Lack of political interest in the continued cooperation among programmes may become a challenge in the future. | None. | It is difficult to assign the co-operation responsibilities to another EU programme due to the NPA's coverage, experience and network of actors. |
| P35. Promote small project funds in the Arctic context | Regional development | Short-term | Mid-term | Yes, the small project fund is already part of the proposed regulation and the instrument was used earlier in different programmes. The EC officials, however, can only promote its use as the decision is for the programming committees not for the EC. | The lack of small project fund would make participation of small actors in the projects less likely and not allow them to lead the projects independently, which is of relevance in particular to indigenous peoples. The challenge is primarily the administrative burden related to the application and implementation processes. | For the programmes, there are costs of outsourcing the management of part of the funding to an external institution. | The key challenge is lack of willingness of national actors to outsource part of the responsibilities to an actor external to managing authorities and creation of additional level of administration, which entails additional administrative costs. | Additional administrative costs. Possible tensions over the funding decisions made by externally chosen institution. | Supporting smaller organizations in application and implementation of projects, so that they can take leadership roles in EU-funded projects more often. This could be done at national level |

Report authors: bios

Prof. Timo Koivurova is among the key experts on Arctic governance, the EU's Arctic policy and regulatory aspects of Arctic development. He is based at the Arctic Centre of the University of Lapland. He has significant experience in policy advice and in leading assessment work for Arctic policy analysis, including projects with a strong stakeholder engagement component. His expertise extends to international and national law, regional development in the North, Indigenous Peoples' rights, oil and gas regulation, and Arctic environmental and climate policies. In the present study, Timo Koivurova acted as a Team Leader and led the work on climate change, long-range pollution and biodiversity.

Prof. Alf Håkon Hoel works at the University of Tromsø – the Arctic University of Norway. He has over 30 years of experience in fisheries and ocean governance science. He possesses excellent knowledge of fisheries management and ocean governance at domestic, EU and global levels of governance. Mr. Hoel's research interests and more than 200 publications include international relations in marine affairs, with an emphasis on the Arctic. He has participated in Arctic Council meetings since 1997 and participated in a number of its assessments. He is a lead author for fisheries in the Arctic Climate Impact Assessment and lead author of the Arctic Ocean Review Phase I. In the study "Overview of EU actions in the Arctic and their Impact" he was primarily responsible for the chapter of fisheries.

Malte Humpert is a key expert on Arctic maritime transport and trade with extensive additional background in Arctic energy development and Arctic environmental policy acquired through his work at The Arctic Institute - Center for Circumpolar Security Studies, Washington DC, which he founded in 2011. Today, he is a Senior Fellow and Leadership Group Member at The Arctic Institute. He has substantial experience participating in and leading international research projects. He routinely advises and engages with policy makers and stakeholders on both sides of the Atlantic. Malte Humpert is an author of the maritime transport chapter in this study.

Prof. Stefan Kirchner, based at the Arctic Centre of the University of Lapland, is an international expert on Arctic and space issues. His work focuses on the crossroads of the Arctic, outer space, human rights, the environment, climate change, and international trade. In addition to practical work as an attorney in government service and private practice in Germany, he has taught on the law of the sea, space law, Arctic law, human rights, EU foreign policy, EU Arctic policy and EU environmental policy in Finland, Greenland, Germany, Italy, Lithuania and Ukraine. In the current study, he covered connectivity, EU space programmes as well as the rights and issues of Indigenous Peoples.

Dr. Andreas Rasputnik works as a Senior Researcher at the High North Center for Business and Governance, Nord University in Bodø, Norway. He is also a Senior Fellow and Leadership Group Member at The Arctic Institute - Center for Circumpolar Security Studies, Washington DC, and a Senior Fellow at the Fridtjof Nansen Institute, Oslo. Andreas wrote the first monograph on the European Union's Arctic engagement, entitled *The European Union and the Geopolitics of the Arctic* (Edward Elgar, 2018). In the present study, he wrote the sections on energy and the EU's external relations.

Dr. Małgorzata Śmieszek is one of the key experts on the Arctic Council (AC) and currently works at the University of Tromsø – the Arctic University of Norway. She has been involved with the International Arctic Science Committee (IASC) since 2014. She worked on Arctic studies for the European Commission, Finnish Prime Minister's Office, German Arctic Office, Poland's Ministry of Foreign Affairs, and Iceland's Ministry for Foreign Affairs. Her areas of expertise include Arctic governance and international collaboration, Arctic scientific cooperation, science policy and the science-policy interface, science diplomacy, and the gender and sustainable development nexus. In this study, Małgorzata Śmieszek worked on the sections on gender and Arctic research.

Adam Stępień works at the Arctic Centre of the University of Lapland. He has extensive experience in EU policy analysis regarding the Arctic, acquired through work on studies for the European Commission, the European Parliament, Finland's Prime Minister's Office and the Polish MFA. His expertise areas cover strategic environmental impact assessment, regional development in peripheral areas, Arctic resources, Arctic international cooperation and indigenous politics. He has significant experience with organizing stakeholder engagement. For the present report, Adam was responsible for the chapters on plastics pollution, raw materials and regional development.