



# REGIONAL PERSPECTIVES REPORT ON THE ARCTIC

STRATEGIC FORESIGHT ANALYSIS





I am pleased to present the Allied Command Transformation (ACT) Strategic Foresight Analysis (SFA) Regional Perspectives Report on the Arctic. This Report is the third in a series of Regional Perspectives Reports, following the Africa and Russia Reports, contributing to other ACT Strategic Foresight studies planned for the upcoming year. This on-going foresight programme of work supports the development of the NATO Warfighting Capstone Concept (NWCC) future operating environment.

The Arctic and High North Perspectives Report comes at a time of significant global change. Geostrategic competition and the accelerated effects of climate change in the Arctic has drawn interest from major global powers and several smaller powers as well. The region is likely to become an increasingly competitive space in terms

of resources, infrastructure and access. Consequently, the Alliance needs to improve its understanding of both Russia and China's strategic and economic approach to the Arctic and the wider impacts that will emanate from increased global interest.

Governance of the Arctic will remain critical. The region needs to be managed responsibly and characterised by stability, as failure to do so has potential implications for both Euro-Atlantic and global security. Furthermore, NATO nations should not underestimate the hostile nature of the environment nor the difficulties of operating in such extreme conditions. Regional advantage will come to those who adapt to environmental change and are prepared for tensions to escalate even while working to maintain peace and stability.

This Regional Perspectives Report supports the need for NATO to increase its focus on the region, consider the Arctic within the Warfighting Development Agenda (WDA), and include it as a topic of interest in Chief/Head of Defence discussions.

**André Lanata**  
General, French Air and Space Force  
Supreme Allied Commander Transformation



Geostrategic competition and the accelerated effects of climate change in the Arctic has drawn interest from major global powers.





<b>1</b>	<b>FOREWORD</b>	<b>43</b>	<b>CH. 4 - TECHNOLOGY</b> 4.1 Increasing Dependency on Technology 4.2 Technological Transformation of the Region 4.3 Importance of Situational Awareness
<b>5</b>	<b>EXECUTIVE SUMMARY</b>	<b>51</b>	<b>CH. 5 - ECONOMICS/ RESOURCES</b> 5.1 Increase in Maritime Transit 5.2 Increased Interest in Resource Extraction 5.3 Infrastructure Development
<b>10</b>	<b>INTRODUCTION</b>	<b>57</b>	<b>CH. 6 - FUTURE ARCTIC SCENARIOS</b>
<b>15</b>	<b>PROLOGUE</b>	<b>63</b>	<b>CONCLUSION</b>
<b>19</b>	<b>CH. 1 - ENVIRONMENT</b> 1.1 Accelerated Pace of Environmental Change 1.2 Arctic Environment Transformation 1.3 Land and Infrastructure Degradation	<b>66</b>	<b>APPENDIX A</b> SUMMARY OF THEMES, TRENDS AND IMPLICATIONS
<b>27</b>	<b>CH. 2 - POLITICAL</b> 2.1 Increasing Geostrategic Significance 2.2 Challenges to Regional Power (Primacy of the A8) 2.3 Increasing Emphasis on Regional Security	<b>68</b>	<b>BIBLIOGRAPHY</b>
<b>37</b>	<b>CH. 3 - HUMAN</b> 3.1 Societal Change 3.2 Shifting Demographics 3.3 Growth in Urbanisation	<b>77</b>	<b>SOURCES AND ACKNOWLEDGEMENTS</b>



1. At a time of significant global transformation, renewed and growing interest in the Arctic's strategic and commercial potential is evolving rapidly as environmental conditions shift. Due to the unprecedented rate of change, the region has the potential to become a key space for great power competition and social disruption in the coming decades. Despite this development, the Arctic is still held up by many as a paragon of regional stability and cooperative governance.

2. For NATO, the Arctic will produce a number of potential implications for Euro-Atlantic and global security at a time when the international system is increasingly strained. Increasing access creates the possibility for new strategic and commercial sites and corridors to emerge. The extent to which these can be utilised as political and military Instruments of Power (IoP) is of particular significant for the Alliance, as it will influence the NATO's freedom to operate, produce strategic uncertainty and affect the future deterrence

calculus.

3. Climatic change has become a new feature of geostrategic competition. Thinking of the Arctic as 'isolated' is firmly in the past. Firstly, with summertime sea-ice cover diminishing rapidly, the region is becoming more accessible and

more important, not only to Arctic and NATO nations, but to countries across the world. Secondly, the Arctic's renewed geostrategic importance will make this particular region another area where tensions between

NATO and Russia may increase, yet common interests and the opportunity for cooperation should not be ignored. Additionally, expanding Chinese interests within the region add to Allied concerns that destabilisation may occur in what has long been a peaceful part of the world. Taken together, climate change, growing global interest in the Arctic and a renewed geostrategic competition between major powers, all of which is unfolding against the backdrop of an increasingly stressed international system, demands that the Arctic be

Taken together, climate change, growing global interest in the Arctic, and a renewed geostrategic competition between major powers are all unfolding against the backdrop of an increasingly stressed international system, which demands that NATO brings the Arctic to the forefront of Alliance thinking.

//

The Arctic will produce a number of potential implications for Euro-Atlantic and global security at a time when the international system is increasingly strained.

//



brought to the forefront of Alliance thinking.

4. By 2040, expectations are that the Arctic and High North will likely become an area of intensified great power competition. This is not to say that the Arctic is destined to become a new conflict 'hot spot'. Rather, the increased activity in the region could lead to cooperation among states, in particular in search and rescue or disaster response. However, the Alliance should strive to support existing Arctic governance architecture and rules-based diplomacy, thus improving its awareness of environmental, social and commercial transformation of the region, whilst focusing on understanding Russia and China's strategic and economic ambitions. The 'watchful eye' should include observing emerging regional players like India and Japan but also other extra-regional actors and organisations who are seeking to expand their presence in the Arctic. Collective awareness of other actors operating in this space, and their intentions, is essential to avoid accidents and miscalculations that could lead to conflict.

5. The accelerated pace of physical change in the region will affect all aspects of future life; loss of ice will alter the ocean's chemical balance, shift currents and create potentially volatile weather systems impacting biodiversity, eco-systems and infrastructure. Despite

such changes, the Arctic will remain an austere environment characterised by issues involving vast distance, extended timescales, harsh conditions and remoteness. Even with enhancing human resilience, environmental degradation will impact inward and outward migration in northern regions. This may destabilise social and political demographics in exposed communities. The negative or positive effects of climate change is not yet fully understood. The region will therefore demand collaborative efforts ranging from shipping to offshore oil and gas, fisheries and tourism, and with natural disasters occurring more frequently, technological adaptation and resilient environmental management will be key.

6. Critical international governance structures can promote a cooperative atmosphere and build on shared interests in regional development and environmental protection. As the primary intergovernmental forum for regional affairs, the Arctic Council has proven, for the most part, adept at maintaining dialogue between the Arctic states. The Council has also managed to incorporate the perspectives of a growing number of extra-regional stakeholders, despite tensions elsewhere

in the world. Although limited mainly to addressing economic and environmental concerns, the Arctic Council should remain the most important forum on Arctic interests among the Arctic states and nations with Arctic observer status. Crucially, the Council's lack of hard power, its scientific focus, consensus-based approach and its avoidance of military issues have contributed to a cooperative spirit that bloomed in the region after the Cold War and more recently produced several binding international treaties.

7. As strategic competition and increasing interest test the regional governance architecture, the suspension of mechanisms to discuss Arctic security and military activity is a major concern for all eight Arctic States (A8) and especially for NATO. The Arctic Chiefs of Defence Staff (ACDS) annual meeting was suspended in 2014 as a collective response to Russian brinkmanship. Additionally, Russia has not been invited to the annual Arctic Security Forces Roundtable (ASFR),

---

Although limited mainly to addressing economic and environmental concerns, the Arctic Council should remain the most important forum on Arctic interests among the Arctic states and nations with Arctic observer status.

---

which includes several non-A8 states. Where Arctic security has been discussed with Russia, it has been through other mechanisms such as the Arctic Coast Guard Forum and Search and Rescue (SAR) agreements. To date, there is little appetite to bring military affairs into the Arctic Council, but Moscow's Foreign Ministry recently indicated it is now willing to recommence talks at the military expert level. In light of increasing military activity in the region, a reinvigorated forum with full Russian participation (potentially through the NATO-Russia Council), or a new reimagined mechanism to promote dialogue around military affairs in the Arctic, is essential for maintaining future stability.

8. Russia, as an Arctic Council member state, appears, at face value, to promote collaborative Arctic governance; yet, Russia's anti-Western posturing also presents a significant dilemma for the Alliance. On one side, Moscow aims to exploit and promote its Arctic territory as a new energy frontier and to be seen to be acting as a reasonable, responsible and collaborative stakeholder; on the other side, Moscow's unrelenting confrontational approach towards the Alliance includes growing concerns over the vulnerability of its northern border and future resource base, leading to increasing militarization. Russia's portrayal of NATO as a principal adversary is indispensable to its internal narrative, as it uses any NATO actions to justify military expenditures and the safeguarding of interests that benefit the regime. Moscow may continue with its cautious interactions with China for future investment in areas that do not encroach upon issues of sovereignty. Russia's methodology

also serves to undermine international institutions and test Alliance cohesion by exploiting bilateral relationships between NATO states and other allies. The deterrence calculus for NATO will be critical. If the West pushes Moscow to a level that it becomes increasingly dependent on Beijing, a more permanent Chinese presence in the Arctic will be likely. The challenge for the Alliance will be how to balance Russian ambition while at the same time avoiding closer Sino-Russian military/economic cooperation.

9. The future management of the Arctic region also presents a complex challenge for Russian leadership. While NATO membership emphasizes cooperative attitudes, Russia conducts disinformation campaigns focused on anti-Western narratives. NATO must work to deter these efforts by positively influencing external dynamics and reinforcing established relationships across the region. By utilising all Instruments of Power (IoP) to encourage cooperation amongst NATO allies, partners and other actors, the Alliance can avoid political fragmentation and support indigenous societies, as congestion and complexity in the future Arctic increases. Russia's upcoming leadership of the Arctic Council and Arctic Coast Guard Forum from 2021-2023 will place it in an advantageous position to set the agenda for international Arctic cooperation. Moscow may seek to leverage that advantage in pursuit of national aims but the opportunity to engage and potentially resume Northern Chiefs of Defence (NCHOD) and/or hold military level discussions must not be lost.

10. China's expanding ambition and presence in the region will affect all Arctic actors, including Russia, particularly as Beijing increases its influence, expands cooperation with Russia, and establishes its image as a global power. China will continue to attempt to position itself as a regional stakeholder; utilise its rights under international law to access the international spaces of the Arctic region and invest in commercial enterprise to promote itself as a 'near-Arctic' state. As a result, increased interest from China will mean NATO forces must be prepared for the growing likelihood of encountering Chinese forces and commercial companies operating in the region.

11. The application of new technologies in the Arctic will transform the dynamics of operating in the region. For the Alliance to out-pace potential adversaries, it will need to address evolving technologies that could give states like Russia and China a competitive edge in Arctic operations. Critically, for all actors in the region, the opening of the Russian Arctic seaboard is likely to occur first and may influence how future commercial and military entities use technology to gain footholds in the region. NATO's ability to aggregate technological and industrial development capabilities will become increasingly important. Any social or cultural disruption related

to environmental, commercial and technological transformation of the Arctic may provide Russia and China with opportunities for sowing discord among NATO Arctic states and partners.

12. NATO must consider its position in the region as a leading or supporting organisation, in the development of a regional strategy while tensions remain low and Arctic actors can best be engaged in cooperative discussions. The Arctic will become increasingly important and interconnected to the global context as the region transforms. Any successful Alliance policy or response plan must reconceptualise the region as a whole; recognising the nuanced components from the High North/Atlantic to other areas, including the Baltic region, Northern Europe, North America, Russia and Pacific Central. Notwithstanding whether Russia and China behave cooperatively or competitively, NATO will have to consider how to prepare, operate and respond in a vastly increased area of operations, as well as consider a military code of conduct for the Arctic. Similar to the Code for Unplanned Encounters at Sea (CUES), NATO may need to set the conditions for legitimate and acceptable military practice amongst regional stakeholders; above all, this will facilitate communications by NATO, regional partners, Russia and China in order to prevent miscalculation.

13. The Arctic will become of increasing strategic significance for Euro-Atlantic security as the region transforms at an unprecedented rate and at a time when the international system is increasingly strained. Operational advantage will come to those that adapt to environmental change and are prepared for regional tensions to escalate even while working to maintain peace and stability. Now is the time for NATO to increase its focus on the region and consider a comprehensive approach using all IoPs while tensions remain low.



// NATO may need to set the conditions for legitimate and acceptable military practice amongst regional stakeholders; above all, this will facilitate communications by NATO, regional partners, Russia and China in order to prevent miscalculation.

//

# GLOSSARY OF ARCTIC ABBREVIATIONS

A5	Canada, Denmark (by virtue of Greenland, a member country of the Kingdom of Denmark), Norway, Russia, and United States (Alaska),
A8	Canada, Denmark (by virtue of Greenland, a member country of the Kingdom of Denmark), Finland, Iceland, Norway, Russia, Sweden, and United States (Alaska),
AC	Arctic Council
ACGF	Arctic Coast Guard Forum
AMAP	Arctic Monitoring Assessment Programme
ASAT	Anti-satellite
ASFR	Arctic Security Forces Roundtable
BRI	Belt and Road Initiative
CAO	Central Arctic Ocean
COSCO	China Ocean Shipping Company
CUES	Code for Unplanned Encounters at Sea
EDTs	Emerging Disruptive Technologies
EEC	European Economic Community
EEU	European Economic Union
EEZ	Exclusive Economic Zone
EPSC	European Political Strategy Centre
IMO	International Maritime Organisation
FDI	Foreign Direct Investments
FFAO	Framework for Future Alliance Operations
FoN	Freedom of Navigation
GIUK(N)	Greenland-Iceland-United Kingdom (Norwegian) Gap
HDAR	Humanitarian and Disaster Relief
IMO	International Maritime Organisation
IoP	Instruments of Power
ISR	Intelligence, Surveillance and Reconnaissance
JADC2	Joint All Domain Command and Control
JEF	Joint Expeditionary Force

LNG	Liquid Natural Gas
MloP	Military Instruments of Power
NCHOD	Northern Chiefs of Defence
NORAD	North American Aerospace Defence Command
NORTHCOM	US Northern Command
NSR	Northern Sea Route
NWCC	NATO Warfighting Capstone Concept
NWP	North West Passage
OPK	Operative Personen Kontrolle
OSCE	Organization for Security and Cooperation in Europe
PLA	People's Liberation Army
RBIO	Rules-Based International Order (theoretical concept only)
R&D	Research and Development
RPR	Regional Perspective Report
RPW	Regional Perspectives Workshop
SAR	Search and Rescue
SDG14	UN Sustainable Development Goal
SFA	Strategic Foresight Analysis
SLOC	Sea Line of Communication
SME	Subject Matter Experts
STATOIL	Now Equinor – Norwegian energy / oil company
S&T	Scientific and Technological
TSR	Transpolar Sea Route
UAV	Unmanned Aerial Vehicle
UCGV	Unmanned Combat Ground Vehicle
UNDRIP	United Nations Department for the Rights of Indigenous Peoples
UUV	Unmanned Underwater Vehicle



//  
Climate-related security implications are gaining increasing prominence in global security considerations.



## AIM

1. The aim of the Regional Perspective Report (RPR) on the Arctic is to identify regional trends and implications for the Alliance out to 2040 and beyond. This report supports decision-making by providing a common starting point from which to examine the consequences of change in the Arctic for future Alliance operations, in terms of both challenges and opportunities. This RPR also informs the next NATO Warfighting Capstone Concept (NWCC) future operational environment, as well as other studies and reports that require a long-term perspective of the future security environment.

## BACKGROUND

2. Strategic Foresight Analysis (SFA) Reports provide the Alliance with a long-term shared assessment of the future through a global lens, while Regional Perspectives Reports focus on specific regions that are pertinent to Euro-Atlantic security. Like SFA Reports, this RPR does not attempt to predict the future, for the future is neither predictable nor predetermined, but provides an insight of what the future security environment might look like to inform decision makers today.

3. Over the past decade, the geostrategic landscape has continued to evolve with four key factors that warrant consideration. First, tests of

international law and rules based diplomacy occur repeatedly because of increasing great power competition. Second, Chinese ambitions to revise the international order will alter strategic conditions around the globe in the years out to 2040 and beyond. Third, the experience of the COVID-19 pandemic shows how challenges relating to health and environmental security can accelerate any existing distrust and discontent trends in the international system, whilst also exposing the need for greater resilience within nations. Finally, climate-related security implications are gaining increasing prominence in global security considerations. The combination of all four factors mark a significant shift in current and future multilateral and international rules based relationships.

4. NATO will continue to defend Alliance territory and populations against attack as set out in the Washington Treaty. Trend analysis and the resultant defence and security implications allow NATO to determine how the Alliance could accomplish several key objectives. Foresight is required to develop a shared understanding of the future. The effort aims to provide a unifying vision for different plausible futures so that the Alliance may adapt and transform to fulfil its core tasks (Collective Defence, Crisis Management, and Cooperative Security), address a full range of security challenges, and advance a conceptual

framework for forces and abilities required to succeed beyond the mid-term planning horizon. These actions will allow NATO to address a recognised set of security challenges and provide the means to deter and defend, and serve to protect common values and project stability beyond the Euro-Atlantic region.

5. Preceding the Regional Perspective Workshop (RPW), several national engagements occurred with Arctic states and Arctic stakeholders to understand national Arctic policies, formal state positions and the geopolitical nuances regarding the Arctic as a whole. These engagements included governmental and military organisations, think tanks, academia and industry. During the RPW from 17-19 September 2019 in Oslo, Norway, moderated plenary sessions involving in-depth discussions with Subject Matter Experts (SME) representing military and civil institutions from NATO and Partner Nations. The sessions examined key regional issues, trends and implications out to 2040. This Regional Perspective Report (RPR) synthesises the information collected from three main sources, namely: (1) national policies and engagements; (2) the Oslo SFA RPW; (3) and Strategic Foresight Branch research.

6. In addition, this RPR factors in early analysis of the outcomes and implications of the COVID-19 pandemic, with the caveat that a great deal of unknowns remain about the long-term consequences for all aspects of human life.

## SCOPE

7. The RPR utilises a similar structure to previous SFA reports by analysing trends and implications in the framework of five themes: Environment; Political; Human; Technology; and Economics/Resources. However, within the themes, since this is a regional report and the trends identified vary from those identified at a global level, the definitions and their sequence are different as follows:

a. **Environment.** Trends and implications related to significant aspects of the local and regional climates, weather patterns and the impacts of climate change. Within this report, environmental factors and implications will pervade almost all the other elements of the report framework, as it is the fundamental driver for change in the Arctic.

b. **Political.** Trends and implications related to governance, the relationships between governments and the people they govern, political stability, the roles and functions of governments, the impact of ideologies on politics and governance, and the roles of key political actors at national and

regional levels; including indigenous peoples.

c. **Human.** Trends and implications related to people and their lives, how they interact, where they live, societal norms and values, and demographic and social patterns.

d. **Technology.** Trends and implications related to how technology is advancing, how accessible it is, the key emerging technologies in the region with the most significant impact, and the roles of key technology players in the region.

e. **Economics/Resources.** Trends and implications related to the significant aspects of national and regional economies including economic growth, employment, poverty, the role of formal versus informal economies, the engines of economic growth, the key players, and the major natural and human resources that fuel national and regional economies.

8. There will be three non-linear scenarios provided of plausible futures aside from the baseline future.

## TERMINOLOGY

9. This RPR is an integrated part of the SFA process. It will use the same SFA terminology, with the only difference being in the definition of "implication."

10. For the purpose of this study, themes, trends, and implications are defined as:

a. **Theme.** A collection of similar or related trends.

b. **Trend.** A discernible pattern or a specified direction of change.

c. **Implication.** Implications relate to the impact of one or more trends on: the cooperation between Arctic states, the bearing on sovereignty and security, the influence and the interests of non-Arctic states, and how both may affect the governance and security of the increasingly accessible Arctic Ocean; in turn, it examines the implications for NATO and wider Euro-Atlantic security.

## DEFINITIONS

### The Arctic

11. In its strictest sense, the 'Arctic' is defined as the area of the Earth that is north of the Arctic Circle, located at approximately 66 degrees, 34 minutes North Latitude. The area within the Arctic Circle is about 8.14 million square miles, which is approximately 4.1% of the Earth's surface, and more than twice the land area of the US (about 3.5 million square miles). However, this definition is notoriously problematic. In reality, the region's



//

The High North is a broadly 'elastic' term used in various European states to describe the area of Northern Europe below the Arctic Circle, as well as the North Atlantic, Nordic and Baltic approaches.

//

geography is generally a matter of perspective, reflecting competing social, cultural, scientific, political and economic interests, accentuated by differences between those who live in the Arctic and those who do not. Reflecting the area that should be of most interest to NATO, this RPR adopts the definition of the Arctic used by the Arctic Council's Arctic Monitoring and Assessment Programme (AMAP). The AMAP definition includes the terrestrial, airspace and marine areas north of the Arctic Circle (66°32'N), as well as those areas north of 62°N in Asia and 60°N in North America (modified to include the marine areas north of the Aleutian chain, Hudson Bay and parts of the North Atlantic Ocean including the Labrador Sea).

### Arctic Countries – Arctic Coastal States

12. Eight countries have territory north of the Arctic Circle: the United States (Alaska), Canada, Russia, Norway, Denmark (by virtue of Greenland, a member country of the Kingdom of Denmark), Finland, Sweden, and Iceland. Of these eight, Denmark organised five nations, which they considered as coastal states, into a group to enhance cooperation, commonly known in political and academic circles as the A5: the United States, Canada, Russia, Norway, and Denmark.

### The High North

13. The High North is a broadly 'elastic' term used in various European states to describe the area of Northern Europe below the Arctic Circle, as well as the North Atlantic, Nordic and Baltic approaches. The term is designed primarily to encourage and expand the number of actors in the discussion. It is worth noting that many NATO nations use the term slightly differently, but the basic geographical limits are largely the same. The European Arctic encompasses both the marine Arctic and Arctic landmass stretching from Greenland in the West to the Norwegian/Russia border in the Barents Sea in the East, and it includes areas of strategic importance such as the Greenland-Iceland-United Kingdom (GIUK) gap and Svalbard.

### North American Definitions

14. Canada's North starts above the 60° latitude line, which is also the boundary between its provinces and northern territories. It is comprised of all three territories and the four Inuit homelands, which includes the Inuvialuit Settlement Region in the Northwest Territories, Labrador's Nunatsiavut region, the territory of Nunavik in Quebec, and Nunavut. Canada's Arctic is a subset of Canada's North and starts above the 66.5° latitude line or Arctic Circle. This differs from the US, which

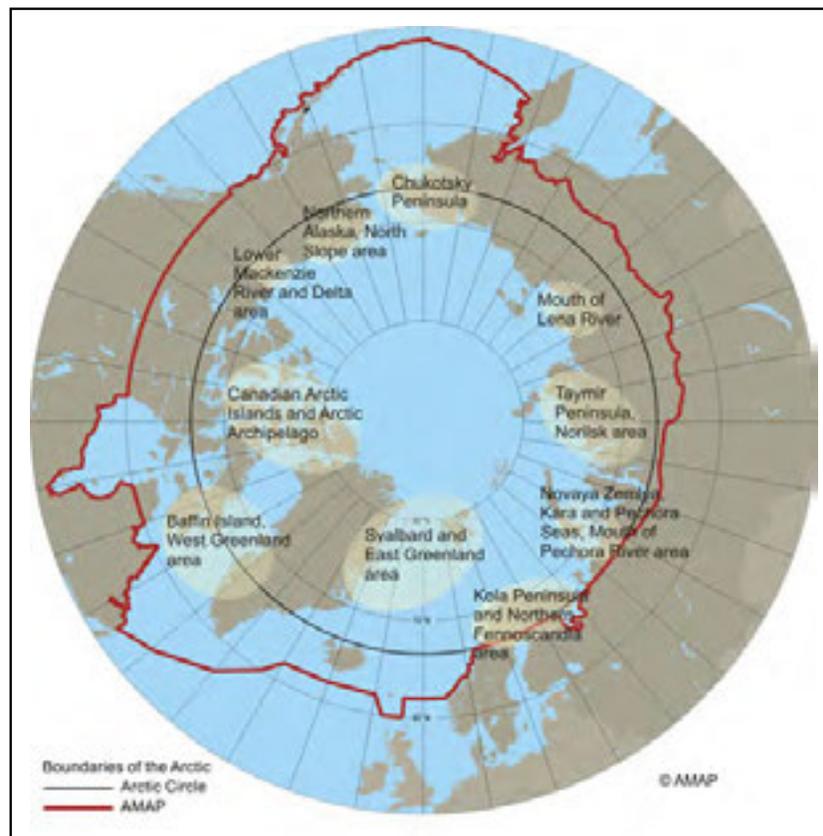


Figure 1: Arctic boundaries

Arctic Council. "AMAP Assessment Report: Arctic Pollution Issues." AMAP, 1998, 9.

uses the 'Arctic Circle' definition and includes the northernmost third of Alaska, as well as the Chukchi Sea (separating that part of Alaska from Russia), and U.S. territorial and Exclusive Economic Zone (EEZ) waters north of Alaska. It excludes, approximately, the lower two-thirds of Alaska and the Bering Sea, which separates lower Alaska from Russia.

Greenland, and Svalbard, which reaches almost 85°N in some cases. Therefore, with the region becoming more accessible, including the Arctic within NATO's purview is a practical development. Nonetheless, as with most questions concerning NATO transformation, NATO's role in the Arctic will be a political decision on how to address any changes in the strategic environment.

**NATO Arctic AOR (excludes much of the North American Arctic)**

15. NATO, although focused on peace and security in the North Atlantic Area, never defines its northernmost limit. NATO's AOR covers the North American Arctic from an Article 5 perspective, but this is distinct from the AOR of SACEUR. Yet as Article 6 makes clear, the Treaty covers the territory of all parties, including North America's western coast, the northern tips of Canada,



Figure 2: High North / European High North Map  
 Price, Tim. "The High North: A Matrix Game of Arctic Crises." Pax Sims, April, 2018, 15.

“ In terms of the Treaty contents, there is every reason for NATO to include the Arctic within its purview. ”



## Historical to Contemporary Context

1. The prospect of armed conflict in the Arctic is not new. Since at least the Napoleonic Wars, nearly every major war in Europe has involved an Arctic dimension; that includes the Crimean War (1853-1856), the two World Wars and the Cold War. For Russia, the invasion of the Kola Peninsula and Archangel in 1918, had a deep and long-lasting impact on the importance the Arctic for both the Russian populace and the subsequent relationship between the Soviet Union and the West. However, it was during the Cold War, mainly due to developments in long-range strategic bombing, intercontinental ballistic missiles and nuclear submarines, that the region's importance solidified in the minds of defence planners in North America, Western Europe, the Soviet Union and, less commonly noted, China. Within NATO, the challenge of defending the 'Northern Flank' was subject to extensive debate. At the height of the Cold War in the 1980s, the US-led Forward Maritime Strategy increased the pressure on Soviet military assets in the Arctic. The gradual diffusion of tensions paved the way for Gorbachev's 1987 Murmansk speech emphasising the potential for the Arctic to become a "zone of peace". This helped inspire the idea that the Arctic could be an 'exceptional' space of cooperation – an idea that underpinned the 1996 establishment of the Arctic Council.

2. Post-Cold War, strategic interest in the Arctic diminished almost overnight, and NATO nations significantly reduced their cold weather capabilities. The financial, tactical, strategic and intellectual focus switched to Former Yugoslavia and latterly Afghanistan. With a much-reduced

threat picture in the 'North,' as well as wider Europe, the Arctic temporarily was out of NATO's conscience.

3. Throughout the beginning of the new millennium, Norway and Iceland began to elevate concern over the lack of coordinated Alliance deterrence in the region. In 2009, Iceland invited NATO member states to a seminar in Reykjavik, intending to raise greater awareness of challenges in the region. Russia (not invited) was not the focus, but energy and maritime security emerged as key challenges that were placed firmly on NATO's agenda. The Secretary General at the time, Jaap de Hoop Scheffer, went as far as to stress that we were not seeing a return to the Cold War in the Arctic, but rather the emergence of a new security environment, where Russia's contributions would be essential to any security considerations in the region. Despite concerns over sovereignty and some resistance to bringing the Arctic into the NATO narrative, larger Arctic exercises were established, although many were not under the banner of NATO. These exercises served to reinforce that the Arctic debate was gathering momentum as a potential political hotspot. Russian use of conventional and hybrid warfare tools in the Ukraine, Georgia, Syria, Belarus, and Estonia fuelled this debate and were reinforced by an obvious Russian refocus on capabilities in the Arctic.

4. Arctic Allies historically have preferred avoiding NATO discussions regarding the region to prevent unnecessary tensions with Russia in the Arctic, wishing instead to encourage cooperation in areas of mutual interest. However, if a crisis occurs in the Arctic, they would benefit from NATO membership.

“ Many NATO nations now seem to call for increased Alliance awareness and capabilities in the High North. ”

//  
Climate change is a recognizable and growing global security issue that will have a significant bearing on the Alliance's freedom to operate over the coming decades.

//

Many NATO nations now seem to call for increased Alliance awareness and capabilities in the High North.

5. The growing importance of the region, mainly due to Russian and Chinese interests, requires NATO to adapt to a new security environment. Strengthening regional bilateral, trilateral and multinational security cooperation will be key, as will a comprehensive approach across all IoPs (not just the military); but evolving relationships in the region must not harm or weaken NATO cohesion.

6. As it has done over the past 20 years, the Arctic Council will continue to be the primary regional intergovernmental and collaboration forum. In May 2021, Russia took over the Chairmanship of the Arctic Council, the Arctic Coast Guard Forum and the Arctic Economic Council. Without question, the international community and NATO will closely observe how Moscow maintains the focus on cooperation and the twin mandates of the Council (environmental protection and sustainable development) and the extent to which it manages its strategic partnership with Beijing and relates to discontent amongst indigenous stakeholders.

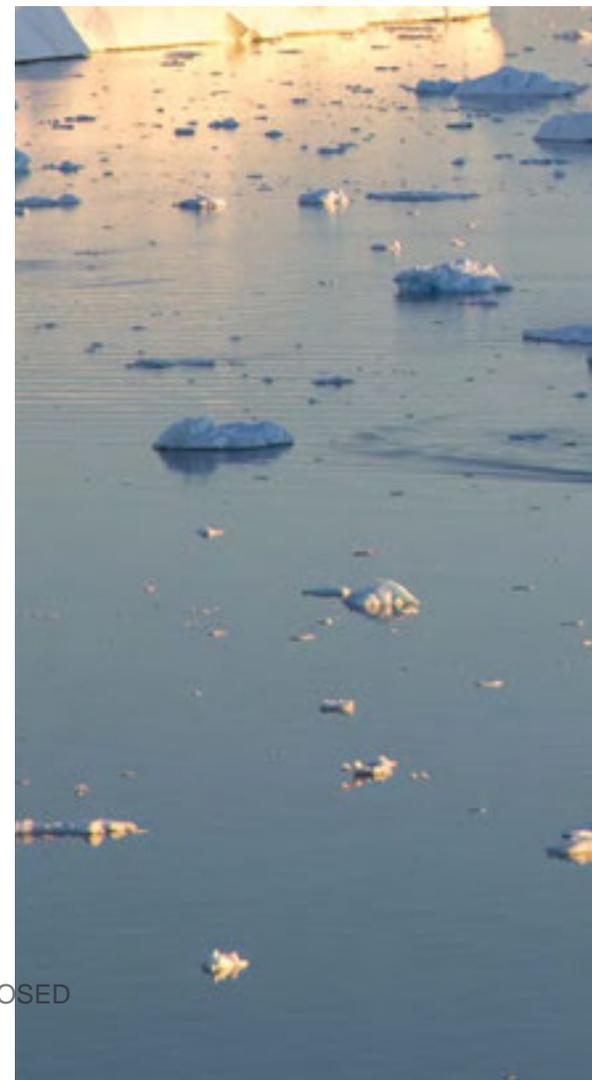
#### **Climate Change and Security: A Threat Multiplier in the Arctic**

7. Climate change is rapidly becoming recognised as a growing global security issue that will have a significant bearing on the Alliance's freedom to operate over the coming decades; impacting equipment, people, operating procedures, and infrastructure. At their core, climate-related threats are global issues that transcend traditional sovereignty roles. Although the full implications of climate change are unclear, there is growing consensus that the time for adequate climate change action is decreasing. Rising global temperatures, changes in precipitation patterns, and the resilience/collapse of ecosystems are likely to have a significant impact upon the stability of societies and systems (gender, socio-economic, infrastructure and security). The consequences from rapidly changing, disruptive and extreme climatic conditions present a future with increased security risks. In turn, stressors on food, water, infrastructure and energy will create instability and in certain locations an existential threat to basic human survival. Societies and regions once considered as distinctly separated will be undeniably interconnected through altered living conditions. Based on current modelling the Arctic will be at the forefront of global changes driven by an increasing rise in temperatures.

8. For this reason, the environment is placed deliberately as the opening chapter to this report. Although not a report on climate change, it recognises that the pace of climate transformation in the region, commonly termed as 'Arctic amplification,' is omnidirectional with far-reaching and potentially irreversible implications beyond its immediate locality. Simply put, if climate

change is viewed as a 'threat multiplier' it can be considered both an exacerbating factor in existing conflicts and a threat to international peace and security in and of itself. In this context, accelerated biological, chemical and meteorological threats from climate change can dramatically impact both environmental security and international stability.

9. When considering the profound impacts of climate change, this report cannot adequately address the Arctic's political, socio-economic and strategic future without first considering the implications derived from changing environmental conditions. In-turn, NATO's approach to maintaining regional stability will need to change. Sole reliance on the spirit of cooperation in the Arctic is unlikely to be sufficient to maintain the status quo, given the vastly increasing size of area and conditions that NATO and competitors will find themselves able to operate in. Climate change directly impacts NATO's ability to deliver its three core tasks of collective defense, crisis management and cooperative security. The Alliance must be able to continue to maintain deterrence, operate freely and maintain its obligations, including under Article 5. Consequently, the amalgamation of effects in the Arctic can now legitimately be considered as a 'threat multiplier,' given climate risk has the ability to influence drivers for future conflict.







# ENVIRONMENT

1. Climate change is forcing strategic perspectives on the Arctic to alter dramatically, demanding new connections be forged between environmental transformation, international trade, social resilience, technological advancements and global security. In turn, new opportunities and challenges will demand greater responsiveness from the geopolitics, economies, and societies of the North. Higher temperatures and diminishing ice cover in the Arctic create global impacts as sea levels rise, weather patterns shift and ecosystems are disrupted. The severe consequences for human life across the world include security issues. Defence planning must compensate accordingly. NATO will not be exempt: security alliances and partnerships will have to evolve to accommodate evolving risks, threats, opportunities, interests and capabilities.

2. As the world warms, the primary environmental concerns in the Arctic include the reduction of Arctic Ocean ice cover, the disruption of ecosystems, loss of biodiversity, shifting weather patterns, melting permafrost, and coastal erosion with resultant risks to the security of food, water, homes, and livelihoods. Infrastructure, maritime activity, resource extraction, and migration patterns (in and out of the Arctic) are being affected already. These concerns are underpinned by the uncertain and non-linear characteristics of the ongoing changes. Yet, there are also likely to be some constants. Weather systems will remain unpredictable and across much of the Arctic the operational environment will remain austere and challenging. Considering the sheer distance, remoteness and geographical separation that isolates large

swathes of the Arctic, human activities will remain expeditionary in most cases, even in the case of significant environmental transformation.

## 1.1 Accelerated Pace of Environmental Change

3. The scale of climate change in the Arctic makes reliable predictions difficult, but accelerating temperatures, rising sea levels, and weather volatility undoubtedly will dominate an increasingly complex and changing Arctic future. Average temperatures will rise between 1° Celsius and 2° Celsius, and in the Arctic even by up to 3° Celsius, over the next two decades. Not only is the rise in sea level accelerated by melting ice and glaciers, but also by regional warming, because forests and other natural carbon stores such as permafrost release these stores into the atmosphere as carbon dioxide (CO<sub>2</sub>). The consequences will include disruptions of the ocean circulation system and global environmental impacts. Near and long-term changes in the Arctic will force NATO to change its operational perspectives in the region.

4. The consequences of Arctic climate change include increased flooding, soil/coastal erosion, pollution of air and water resources, forest and peat fires, changes in sea ice conditions, severe wind, failure of critical infrastructure, and health effects on northern populations. The associated challenges similarly affect all Arctic nations, but mainly Russia, which has the largest Arctic territory and population. Yet the full scale and impact of climate change is difficult to comprehend, predict,



The sheer scale of climate change in the Arctic makes reliable predictions difficult, but accelerating temperatures, rising sea levels, and weather volatility undoubtedly will dominate an increasingly complex and changing Arctic future.



//  
Future security requires a sharper focus on the potential for disruptive actors to seek a competitive advantage in the region.  
//

and reconcile. Regardless of how it is managed or why it is undertaken, any exploitation of Arctic natural or mineral resources can expect resistance from indigenous groups and environmental NGOs. Thus, clear and demonstrated efforts by Arctic and northern nations to protect the region will be critical.

5. The expanding accessibility of the Arctic will attract increased commercial and military operations that alter the surroundings of previously isolated populations. Human resilience measures will need to embrace technology in order to off-set substantial shifts in fisheries, subsistence agricultures, resource extraction, and housing infrastructure. Perhaps most importantly, measures must plan for the influx of external actors and potential migrations from local communities. Without adequate planning, increased commercial and military operations may create a security dilemma, where local populations perceive new developments and outside actors as a threat.

### Implications

a. **Increased impact of climate change.** Predicting future Arctic operating conditions remains extremely difficult due to the variations and volatility of changes to climatic and sea ice conditions. Current modelling efforts struggle to predict and keep up with the actual pace of and fluctuations in the accessibility. Greater situational awareness demands an improved use of space-based technologies to observe and predict changes in the region, which will enhance NATO's operational planning and strategic foresight.

b. **Arctic cooperation remains paramount.** An appreciation for the speed and potential consequences of climate and environmental change is critical to understanding what the future Arctic may hold. Russia will remain a dominant actor by virtue of its regional geography, economic interests and geostrategic ambitions. As climate change rapidly transforms the Arctic, Allies must remain open to cooperating with Russia in areas of common interest, despite being perceived by Russia as a principle threat and competitor.

Russia's Chairmanship of the Arctic Council in 2021 and its evolving partnership with China may provide sign posts for future relationships and possible cooperative efforts.

c. **Enhanced regional security focus.** As climate change accelerates and transforms the Arctic environment, the scope and scale of security concerns for the Alliance will also evolve. Future security requires a sharper focus on the potential for disruptive actors to seek a competitive advantage in the region. The Alliance should expect Russia to take every opportunity to exploit Arctic changes to its advantage. The threat posed by Russia and other actors, and the manifestation of their relationships, will likely become much more complex. NATO must respond by reconsidering its own interests and role in the Arctic and fuse IoPs accordingly.

d. **The Russian response to environmental change can threaten international security.** Russia's security and economic challenges are inextricably linked to climate change. The exposure of their once ice-locked northern border creates new resource and transit opportunities for both Russia and external competitors that Moscow may perceive as threats to its security and political stability. Russia will continue to develop its northern front for both security and commercial purposes. NATO's response planning demands vigilant awareness to rapidly assess whether Russian activities along its north coast impose a threat.

e. **Non-traditional challenges gain importance in NATO planning.** The NATO Crisis Management process will increasingly need to address the conditions created by climate change and other non-traditional threats such as pandemics. As a result, NATO needs to adapt its planning, exercises, and discussions on resilience. NATO must consider environmental change as an impact upon collective defence rather than a separate issue in its own right and be more prepared to address developments in the Arctic.



## 1.2 ACUTE ENVIRONMENTAL TRANSFORMATION

6. The effects of climate change will continue to drive significant changes in the Arctic marine environment. The extent of changes in the region, already impacts environmental alterations elsewhere on the planet, notably as sea level rise. The expected sea-ice loss of over 3 million square kilometres by 2050 is alarming, and the 'new normal' for summer sea ice is now below 5 million square kilometres and diminishing. The Arctic Ocean is transforming from permanently ice-covered to seasonally-ice free. The persistent loss of ice will shift both marine eco-systems and human activities.

7. Decades of continued ice reduction now question the primacy of current global trade routes and future of strategic choke points. Russian waters around the Northern Sea Route could open first, followed by the Northwest Passage (Greenland/Canada) with expanding accessibility. By 2050, the Central Arctic Ocean (CAO) by Greenland conceivably could become navigable, creating a transpolar route that avoids Russian and Canadian EEZs. Choke points may become a greater issue. For example, disruptive ice chunks in the Beaufort Gyre could render the Northwest Passage (NWP) less navigable. Ice chunks may also remain for longer periods due to decreasing wind trends around the CAO. Such factors will influence commercial and military shipping alike, and ice-hardened hulls (not necessarily icebreakers) will likely become more prevalent in the region. Greater cooperation between oceanographic services will help track drastic environmental changes and their impact on navigability.

8. Ice melt in combination with the increasing ocean heat resulting from climate change leads to changed oceanic pH values and increased CO2 levels. Acidification and thermal increase in the Arctic and surrounding seas will likely have far-reaching and long-term impacts not yet fully understood. Changed seawater chemistry also contributes to altering the oceanic circulation system, as evidenced by the saline to fresh water inversion from the melting Greenland ice sheet. The Arctic's altered oceanic chemistry further drives sea-level rise and influences the Gulf Stream with an overarching impact upon marine eco-systems adjacent to the Arctic

9. The impact on ocean services such as fisheries,

aquaculture, and ultimately human sustainment will be significant as non-Arctic nations move further into the region. Fish stocks have begun migrating as far down as the mid-Atlantic and Bay of Biscay, whilst Arctic fish are expected to be highly sensitive to the changing conditions. Concern over these expected ecosystem changes prompted the international community to place a moratorium on commercial fishing. In 2018, Canada, Iceland, the Kingdom of Denmark, Norway, the United States and the Russian Federation, as well as China, Japan, South Korea and the European Union signed the International Agreement to Prevent Unregulated Fishing in the High Seas of the CAO. This binding agreement commits the parties not to authorise any vessel flying its flag to engage in commercial fishing in the high seas portion of the CAO. The agreement is in place for up to sixteen years and renewable in five-year increments.

10. Sea ice reduction and related marine management of the CAO and associated seas will remain a high priority for all users. As such, the Arctic Council has endured as the ideal forum for coordinating and implementing relevant policy. Assisted by the United Nations Convention for the Law of the Sea (UNCLOS) and UN Sustainable Development Goal (SDG14), the Council promotes direct means for improved management of the Arctic Ocean. In 2017 the International Maritime Organisation (IMO) entered into force the Polar Code, which establishes shipping resilience measures in Polar Waters with regard to safety and the environment. The IMO recently approved a ban on ships carrying heavy fuels in the region. The Central Arctic Ocean is governed by a robust international legal regime that includes UNCLOS, international customary law, international treaties, the IMO and others. Current governance structures will need to monitor the evolution of ecosystems, technologies and Arctic accessibilities and be ready to address new gaps.

11. Severe storms, damaging wave action and increasingly disruptive (fragmented) sea ice will likely become more commonplace in the Arctic than elsewhere on the planet. Land and infrastructure will lose the solid ice protection barriers that once protected it from maritime disaster risks. Offshore commercial ventures are also at risk given the volatile currents, wave action, and fragmented sea ice, although they may provide profitable alternatives for resource exploitation. Because the logistical and technical challenges in the harsh Arctic environment are acute, the region demands collaborative maritime and aerospace efforts on research, shipping, offshore oil and gas, fisheries, tourism, and marine biotech. Addressing the problem of limited search and rescue (SAR) resources is a testament of why this collaboration



The region demands collaborative maritime and aerospace efforts on research, shipping, offshore oil and gas, fisheries, tourism, and marine biotech.





is so important.

## Implications

a. **Ice loss disrupting eco-systems.** The combination of dramatic sea ice reduction and the melting of the Greenland ice sheet will cause both the CAO temperature to rise and a fresh/salt water inversion in the North Atlantic, altering the ocean's chemical balance and shifting currents. Increased acidity will also contribute to disruption of the Arctic Ocean ecosystem. Losses of land and sea ice will therefore affect temperatures, weather patterns, sea levels, and ecosystems both regionally and globally.

b. **Unpredictable weather systems.** The combination of a changing oceanic system and continued recession of sea ice will increase oceanic unpredictability in both the North Atlantic and Central Arctic Ocean. In turn, this will escalate the likelihood of severe storms and periods of disruptive ice flows. Warmer oceans, loss of calming surface ice and larger tracks of open oceans will make the CAO more volatile and make overall coastal erosion unpredictable.

c. **Increasing commercial activity.** Persistent loss of sea ice may lead to greater utilisation of the Polar Route or Northern Sea Routes over other global trade routes, due to shorter transits and avoidance of major choke points. Increased tourism activity can be expected. Commercial fishing traffic will expand to reach newly accessible fishing grounds and in pursuit of invasive fish stocks migrating northward. If neglected, uncontrolled resource exploitation, including unregulated and unsustainable fishing, can not only affect the eco system but also create tension across EEZ boundaries. This overall increase in maritime activity heightens the likelihood of international incidents over contested areas. Additional consequences include increased pollution in an already fragile ecosystem and maritime accidents requiring multinational SAR and Humanitarian and Disaster Relief (HADR) capabilities that are not yet in place.

d. **Increasing military activity.** From a strategic standpoint, with the Kola Peninsula gaining year-round access to the Atlantic Ocean, wider security implications for Russia, NATO and the EU will emerge. Current Russian activities create extra pressure to secure sea lines of communications in the North Atlantic and the GIUK-N gaps. With conditions more volatile year-round, NATO nations will need to consider the operational and tactical requirements to that will enable them to operate effectively across all domains. Such considerations are necessary to retaining an advantage over potential adversaries and to providing the

necessary security to local populations and commercial actors. These could include, inter alia, measures to raise NATO's posture including the deployment of Stability Policing assets.

e. **Increasing human and natural disasters.** Maritime shipping, fishing, tourism, military activity, as well as ocean mining or drilling will not only come with high costs, but will set the conditions for potential human and natural environmental disasters in both the CAO and North Atlantic. The remoteness and uncertain weather conditions restrict remedial activities and the ability to contain incidents, conduct SAR, and avoid ecosystem impacts. NATO Allies exercising, patrolling, and operating in the Arctic should prepare for such incidents in testing conditions.

f. **Susceptible Arctic governance cohesion.** The Arctic Council and IMO policy makers may struggle to keep pace with the changing conditions, which could lead to a failure to manage the marine environment effectively. Furthermore, non-Arctic or third-party exploitation and involvement in a natural or human disaster may break the trust between community or population at harm and the national government and Arctic Council members. NATO can support Arctic governance by upholding and adhering to regulations and best practice regarding operations in the Arctic.

## 1.3 Land And Infrastructure Degradation

12. The extreme conditions affecting the Arctic land environment inflict damage and degrade biodiversity, eco-systems, and infrastructure. Even with enhanced human resilience, environmental degradation affects inward and outward migration in northern regions. This may destabilize social and political demographics in exposed communities. A greater frequency of natural disasters demands improved technological adaptation and resilient environmental management (including livestock and crops). A better understanding of 'negative' or 'positive' consequences of climate change could constructively impact agricultural conditions over time. However, perspectives about what constitutes favourable climate change vary between those who are hardest hit and those who can make the most profit.

13. Due to permafrost thaw, the enormous stock of organic material stored in permafrost soil is decomposing at an increased rate and leading to gas-producing microorganisms. The resulting release of CO<sub>2</sub>, methane and other greenhouse gases may reach the region of 110 to 231 billion of tons emitted by 2040, and in conjunction with a growing black carbon footprint marks a significant

increase in global temperature rise. This in turn threatens localised Arctic infrastructure, ecosystems and biodiversity. As permafrost recedes, contagious diseases, including anthrax and bubonic plague, will also pose problems for inhabited areas, potentially forcing the relocation of towns and villages. The potential biological threats will require monitoring and coordination by organisations to enhance early detection and promote an improved response. The rise in temperatures and drier Arctic climate associated with permafrost thaw will also result in wildfires, floods and severe storms that affect peripheral agricultures and living conditions and further threaten eco-systems.

14. Permafrost thaw and eco-system disruptions will cause significant damage to infrastructure, habitats and dependent species. Resultant damages to vulnerable economic and energy infrastructures, including also ice roads and pipelines, can involve substantial costs, especially in urban environments. As the Arctic tundra changes, native Arctic species will be confronted with losses of food and water, changing weather patterns, and invasive species that will push them to the edge of survival or extinction. Despite scientific uncertainty about Arctic permafrost thawing over the next two to three decades, it is clear that where permafrost thaw is prevalent, ecosystem

disruption will pose significant challenges to both ongoing and new human activity.

15. Commercial, scientific and military installations in the permafrost infrastructure, including vital lines of communication, ice airstrips, bridges and roads, make up approximately 70% of the inhabited or developed areas that are prone to thawing. As a result, significant infrastructure degradation and changing demographics in the Arctic are expected. Human-caused disasters such as the oil tank collapse at the Norilsk mining site in Russia (due to permafrost melt) serve as a wake-up call to all Arctic nations. From that event, around 21.000 tonnes leaked into the surrounding Ambarnaya river basin reaching an area of 180.000m2, which may take over one billion dollars and a decade to recover. Failures to account for permafrost thaw will result in future costly incidents.

16. Among Arctic neighbours, Russia in particular can be expected in the near-term to significantly increase infrastructure along its northern coast. The exploitation of Russia's northern resources is necessary to sustain its commercial sale of resources to Europe and Asia. Increased industrial and technological support are required to upgrade infrastructure and enhance resilience, but such upgrades involve great cost at a time when national budgets are under increasing pressure

“  
Ecosystem  
disruption will  
pose significant  
challenges to  
both ongoing  
and new human  
activity.”



**Figure 3: Sea Ice and Maritime Routes**

Jean-Paul Rodrigue. "The Geography of Transport Systems – Polar Shipping Routes." The Spatial Organisation of Transportation and Mobility, 2020. <https://transportgeography.org/contents/chapter1/transportation-and-space/polar-shipping-routes/>. [last assessed 18.02.2021]

in the face of worldwide recession. Chinese infrastructure investment and financial support partly enables Russia's Arctic expansion but at the price of China's increased presence and perceived encroachments upon Russian sovereignty. For Beijing, investment is inspired by the continuation of its Belt and Road Initiative and political-economic ambitions. Unchecked development along the northern coast and resultant ecological damages will attract protest by both environmental groups and the global population, but that may not sufficiently restrain ambitions in the region or inspire the expenditures necessary to prevent environmental disasters related to infrastructure development.

## Implications

a. **Critical infrastructure damage and man-made disaster.** All Arctic states, but especially Canada, Denmark, Russia and the US face significant infrastructure challenges from the impacts of permafrost thawing and coastal erosion. Challenges include improved land management solutions, the relocation of populations, and infrastructure upgrades. Man-made environmental disasters will increase as the impacts of climate change outstrip the ability to upgrade critical industrial infrastructure.

b. **CO<sub>2</sub>/Methane and disease exposure.** As the initial level of permafrost melts and soil becomes decompressed, it will release huge amounts of CO<sub>2</sub> and Methane into the atmosphere, accelerating the pace of global temperature rise. Permafrost thaw may also expose ancient diseases and render many areas uninhabitable.

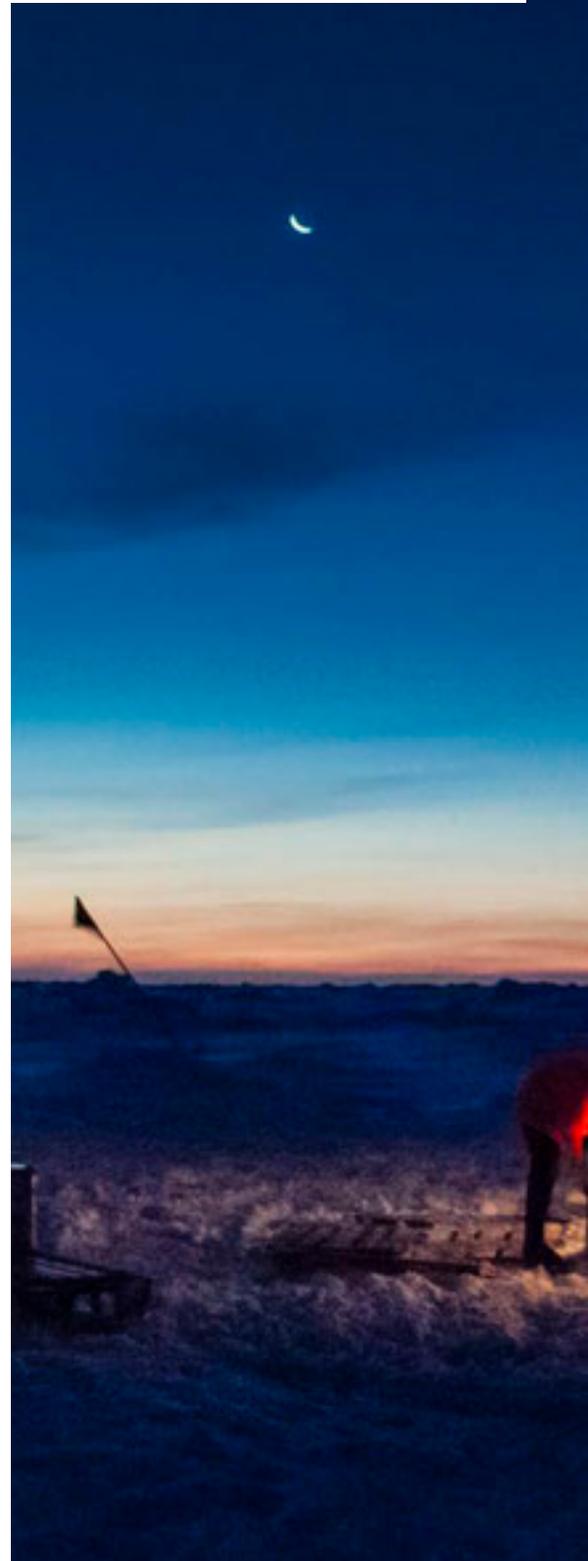
c. **Biodiversity Collapse.** The potential collapse of Arctic biodiversity will force displacement and transformation of Arctic species, threatening extinction and affording invasive species a foothold. Water and food sources will also displace traditional grazing stocks. These anticipated changes impact both indigenous and agricultural land users, potentially forcing migration.

d. **Disruptive weather patterns.** Rising temperatures will influence weather phenomena that are likely to cause more flooding, wildfires and damaging storms. Although indicators of these changes are apparent today, reliable prognoses about the severity and the locality will be problematic over many decades to come. Severe and unpredictable weather is likely to impair both industry and military operations in the Arctic.

e. **Infrastructure investments.** Competition for newly accessible natural resources, such as rare earth materials, will drive increased infrastructure development in the region. Arctic states will need to fund significant investment to overcome both the physical changes in the environment and the logistical challenges associated with the

vast distances and remote locations. Absent external pressures from international laws and organizations, such investment may often not include funding for environmental protective measures.

e. **Chinese investment expected to continue.** Given the recognized costs and difficulties of operating in the Northern territories and the Arctic, NATO members and Northern states can expect offers from China (or other sponsors) to strategically invest. The long-term implications of such investments must be carefully considered.





NATO UNCLASSIFIED - PUBLICLY DISCLOSED

WELCOME  
TERVETULOA

11<sup>TH</sup> MINISTERIAL MEETING OF THE ARCTIC COUNCIL  
7 MAY 2019, ROVANIEMI

#ArcticMinisterial2019  
#Arctic  
#Rovaniemi  
@Arctic\_Council

Channel 1: English  
Channel 2: Russian



## POLITICAL

1. Climate change and renewed great power competition are pushing the Arctic to the forefront of strategic calculations, including within NATO. The Arctic is not immune to the challenges confronting the rule-based international system and geopolitical power struggles. Across the emerging multipolar world, inequality, division, sovereignty, nationalism and authoritarianism, as well as ever-more powerful corporations and new sources of human empowerment, are shaping international relations. Although projections indicate most resources are located within Arctic state maritime zones, the ongoing transformation of the Arctic could lead to greater fragmentation as old and new interests collide over access and resource rights. Conversely, the Arctic can provide a catalyst for renewed international cooperation and lessen fragmentation.

2. The Arctic is not pre-destined to become a region of armed conflict; nor will growing competition necessarily turn the region into a strategic 'hot spot.' For the foreseeable future, the possibility of miscalculation during a period of transforming geopolitical interest creates the greatest concern. In order to mitigate the risk of conflict, NATO first must strive to improve its understanding of both Russia's and China's strategic and economic ambitions. Second, NATO must understand the evolving interests of other stakeholders, including emerging nations like India and Japan, and other actors, like corporations with Arctic ambitions. This also includes key NATO partners like the European Union and individual NATO Allies seeking greater participation in

the region. Understanding the future operating space, the players and their intentions can prevent the accidents and miscalculations that lead to conflict. Consequently, NATO must position itself in such a way as to reinforce the existing Arctic governance architecture and prepare its response to sub-national, national and commercial forces attempting to exploit opportunities to increase access to resources or enable a technological edge to be deployed.

### 2.1 INCREASING GEOSTRATEGIC SIGNIFICANCE

3. The geostrategic significance of the Arctic will continue to increase out to 2040. While the Arctic states and leading international bodies like the Arctic Council will continue to play a pivotal role in defining the region's future, extra-regional actors will also grow their presence and influence. As the Arctic becomes more crowded, especially around resources, infrastructure and transportation routes, coordinated efforts will be required to maintain international law, the rule of law and cooperation. Measures should also advance shared goals of the international community by safeguarding the rights of indigenous peoples, protecting the Arctic environment and ensuring sustainable economic and social development. Protecting scientific research and fisheries in the Arctic Ocean is of particular importance for Arctic states, as both are susceptible to misappropriation through gaps

“  
Ongoing transformation of the Arctic could lead to greater fragmentation as old and new interests collide over access and resource rights.”



not covered by regional or national management protocols. Both Arctic and non-Arctic actors acting outside international norms and consensus could strain pre-existing regional tensions.

4. With regard to the Arctic, national plans and strategies of the A8 or regional institutions will come under far greater scrutiny. Despite the overarching framework of UNCLOS, differences remain in the regional interpretation of key clauses. This includes Article 234, pertaining to national jurisdiction of coastal states in ice-covered areas (including EEZs), and the 1925 Spitsbergen Treaty related to the prohibited use of the Svalbard archipelago for 'war-like purposes.'

5. China is an extra-regional actor in the Arctic focusing on scientific and commercial efforts to enable its rights in the region. Beijing's 2018 Arctic strategy has three goals: access to commercial opportunities, scientific presence and building capabilities. However, the involvement of the People's Liberation Army Navy (PLAN) and China's future maritime presence on the Polar Silk Road may signal future security interests, challenging governance structures in the region.

6. China is pursuing an increased regional presence includes icebreakers, research platforms, shipping vessels (COSCO) and potentially Chinese submarine activity. China funded and built new deep-water port infrastructure in the Russian Arctic, and in 2016 China's attempt to buy an old naval base in Greenland raised concerns about the strategic implications of such investments. China continues to cultivate strong economic relationships with Arctic nations (and sub-national communities).

7. With three Arctic states as EU members (Denmark, Finland and Sweden) and six non-Arctic states as 'Observers,' the EU is gradually building upon its 2016 Arctic Policy to address potential cataclysmic global, social, economic and environmental consequences and to step up engagement with Arctic states and other stakeholders. A European Political Strategy Centre (EPSC) note articulated the requirement for the EU to have its own strategy and narrative for the future of the Arctic. Resistance to the EU's Arctic interests and ambitions primarily derives from Russia, notably whilst sanctions against Russia remain in place. Consensus-based promotion of activities is possible in line with the Arctic Economic Council's mandate, primarily via dialogue, funding of scientific research and investment protocols.

8. The role of the Alliance in the region for many decades focused primarily on deterrence, defence and dialogue, often involving only a limited number of member states. NATO's situational awareness

and presence will only increase, especially given the increasing importance of the Arctic within US strategic thinking and general Alliance attention to all domain awareness.

9. Despite differences in legal opinion within NATO, there is broad agreement that the best way to maintain Arctic peace and stability is to uphold and strengthen multilateral, rules based diplomacy in the Arctic, support sustainable regional and social development, and protect the environment. It appears unlikely that individual nations actively will seek to disrupt the current rules based system. Nevertheless, the Alliance should be cognisant of the potential for hostile actors to exploit differences in international legal opinion, particularly as it relates to UNCLOS and the Spitsbergen Treaty, in an attempt to test Alliance cohesion.

10. A potentially more divisive issue for NATO may be over the level of geostrategic significance to assign to the Arctic. While some non-Western states have clearly demonstrated their Arctic priorities and interests, the Alliance has remained relatively cautious in its approach. NATO needs to develop a comprehensive and inclusive policy for the region that prepares for potential crises and maintains the Alliance-wide cohesion, while upholding and strengthening the regional institutional framework. However, the collective defence burden for potential Arctic operations generally belongs to those Allied nations with regional interests.

11. Arctic states are seeking to exploit Arctic resources on various levels. China, India, Japan and the Republic of Korea have expressed clear ambitions to develop economically in that region; India is entering into energy agreements with Moscow based upon its rapidly increasing reliance upon hydrocarbon energy; Japan is conducting energy, infrastructure and shipping deals with the Russian Federation; and South Korea maintains strong commercial links via the United States in the region. The multinational efforts highlight the complexity of interstate relationships and influence of national commercial sectors regarding the Arctic region.

## Implications

a. **Global interest in the Arctic will continue to rise.** Perceptions of the region as geographically isolated will continue to fade, and the Arctic will play an increasingly significant role in the global economy. The region will attract increased geopolitical interest for both economic and security purposes. The pace of investments and infrastructure development may struggle to keep pace with economic pressures. NATO will need to improve its Arctic situational awareness and

assess any threats emanating from heightened regional activity and increased freedom of navigation.

b. **Russia will maintain its dominance.** The Arctic will retain political, economic and geostrategic significance for Russia regardless of the governing regime. The Alliance can expect Moscow's confrontational approach to continue, likely remaining unchanged even after the Putin regime. Russia will seek to maintain its dominant regional position, buffer against encroachment and exploit commercial and strategic opportunities.

c. **Maritime space challenged.** Melting Arctic conditions invite expanded maritime activity. Maintaining Freedom of Navigation (FoN) for NATO, while respecting the rights and jurisdiction of coastal states, will be critical for maintaining future deterrence. NATO will have to consider how to prepare, operate and respond in a vastly increased area of operations while considering a military Arctic code of conduct that establishes the conditions for legitimate and acceptable military practices.

d. **China's Arctic ambition evolving rapidly.** Increasing Chinese presence as a self-proclaimed near-Arctic state may unbalance Arctic

geopolitics, even absent any official recognition in the RBIO. However, concerns of irritating or straining its relationship with Russia may temper China's ambitions. The two nations' financial and economic goals may overlap, but their ideological goals do not. As pressure from the West drives Russia to become more politically dependant on China, NATO faces the challenge of balancing Russian ambitions without encouraging closer Chinese-Russian military or economic cooperation and a permanent Chinese foothold in the Arctic.

e. **Improvements to governance frameworks needed.** Increased Arctic access and commercial activity may require adjustments to current frameworks to maintain effective governance and security. Significant changes to the Arctic Council seem unlikely, but emphasis on dialogue, coordination and cooperation will be paramount to future regional stability. Promoting support to consensused based international forums like the Arctic Economic Council as well as organisations such as the EU and IMO will contribute to achieving NATO's objectives. At the same time, NATO must be aware that non-Arctic nations with Arctic ambitions are eager to see the Arctic Council engage more and recognise legal access to the Arctic Ocean.

“  
Emphasis on dialogue, coordination and cooperation will be paramount to future regional stability.  
”

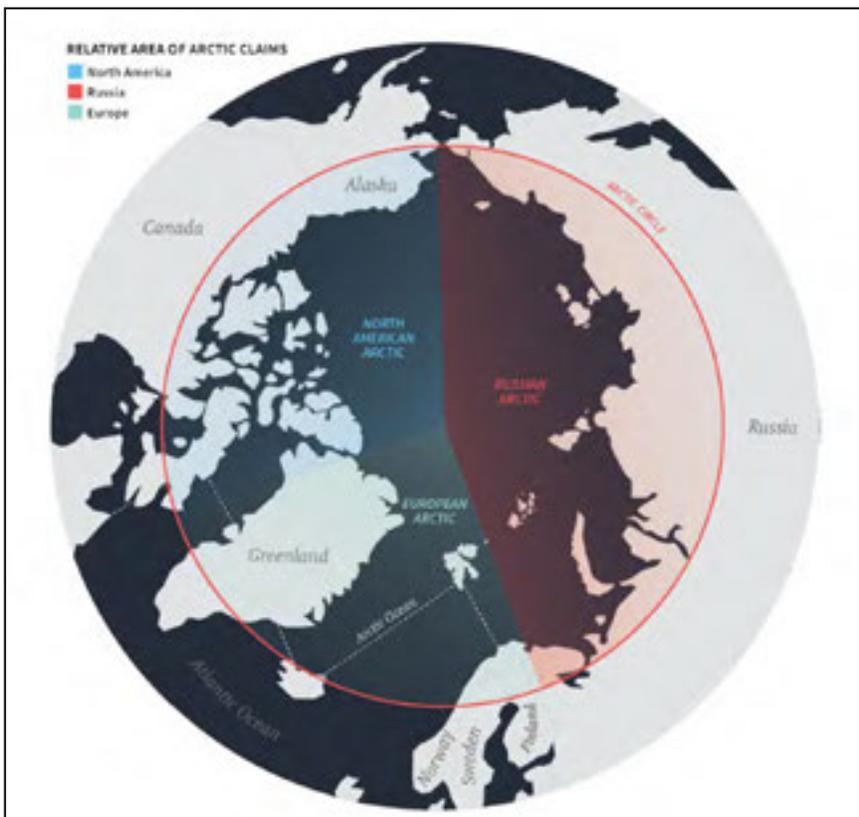


Figure 4: Relative Area of Arctic Claims

Conley, A. Heather et al. "America's Arctic Moment – Great Power Competition in the Arctic to 2050." A Report of the CSIS Europe Program, March, 2020, 8.  
[https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/Conley\\_ArcticMoment\\_layout\\_WEB%20FINAL.pdf?EkVudAIPZnRPLwEdAIPO.GipyEnNzINx](https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/Conley_ArcticMoment_layout_WEB%20FINAL.pdf?EkVudAIPZnRPLwEdAIPO.GipyEnNzINx) [last accessed 18.02.2021]



## 2.2 CHALLENGES TO REGIONAL POWER (PRIMACY OF THE A8)

12. The Arctic states have long occupied a privileged position in regional affairs by virtue of their sovereign territories and legal rights bestowed by UNCLOS and customary international law. Yet pressures from an increasing number of non-Arctic nations and other organisations looking to influence outcomes in the Arctic produce growing challenges to A8 primacy. Already, some states question the strategic relevance of the Arctic Council and whether the existing legal regime is sustainable.

13. Arctic states, as the primary stakeholders in the region, have recognized the potential for governance transformation. Thus, they seek the reinforcement of existing governance structures, especially around navigation rights and access to resources in the Arctic Ocean, in order to maintain sovereign rights. The potential exists for extra-regional actors to exploit newfound access to the Arctic and undermine the authority and sovereignty of existing governance regimes. In order to maintain their collective primacy in the region, Arctic states must actively discourage any 'South China Sea' scenario, wherein a state (Arctic or non-Arctic) attempts to claim maritime territory counter to what other nations may claim or what international law allows.

14. Beijing defines China as a 'near-Arctic' state to portray Arctic governance and development as an 'international' issue. Arctic states should be wary about the potential for such activity to threaten their geopolitical primacy. Through diplomatic influence, China continues to invest actively in Arctic states, communities and businesses in order to secure commercial and scientific footholds in favourable geostrategic positions. Some states have already rebuffed Chinese offers to invest in infrastructure or purchase real estate and mining rights. Arctic states should increase investments in its Arctic peripheries to discourage interest in future Chinese offers. Despite the attractiveness of Chinese investments to certain sectors of the regional economy, Russia already has demonstrated an intent to diversify its commercial partnerships to avoid over-dependence on China.

15. Russia, consistent with the stance of the other A8 nations, supports the ideal of A8 primacy in determining the region's future. The visions of extra-regional actors including China, India, and select international/supranational organisations, do not support such an ideal. For the administration of the Northern Sea Route and its rights under the Spitsbergen Treaty, Moscow imposes its own interpretations. For example, Russia might unilaterally claim an extended continental shelf reaching to the North Pole. Moscow seeks to act from a position of strength by promoting its

responsible behaviour, environmental stewardship, sustainable development and willingness to work with other Arctic stakeholders, while it continues to build its military capability to assert and protect a vast area of national jurisdiction in the region.

16. Moscow argues that increased NATO military activity and economic sanctions imposed by the West discourage regional cooperation and fuels competition. Russia reinforces this narrative to justify industrial-military expenditures. Russia's ability to determine its own foreign policy and manage/influence satellite states or regions legitimises their self-perceived status as a world power alongside the US and China. Russian chairmanship of the Arctic Council could yet stimulate separate conversations over regional security and Moscow's Foreign Affairs department has already indicated the need for a forum to discuss Arctic security affairs between the A8. Therefore, Russia's adherence to regional stability in the Arctic may last for as long as it advances Russian interests.

17. Should Moscow continue to pursue the approach of A8 primacy, it has the potential to bring Russia into conflict with China and other significant extra-regional actors like India. Hence, the foundation for an alternative relationship between Russia and China in the region already is established through formal economic and energy cooperation. This demonstrates mutual support for each other with a common narrative about sovereignty while pushing back against western views of democratic legitimacy, leading to enhanced cooperation in many dimensions ranging from oil and gas resources, military sales, technology investment, and harmonization of EEU and BRI.

### Implications

a. **Pressure on existing Governance mechanisms.** Current Arctic governance frameworks will come under increasing pressure as the geopolitical isolation of the Arctic continues to erode and appetite for access grows. Consequently, Arctic states can expect increased competition from non-Arctic states and commercial enterprises. The character of Russia's chairmanship over the Arctic Council from 2021 to 2023 requires close observation. Above all, cooperation between Alliance and Partner nations (Arctic and non-Arctic) is vital to maintain and strengthen the regional rules-based order.

b. **Sovereignty will remain a central issue.** With accessibility to the CAO, as a 'global commons,' increasing over the next few decades, Arctic states could see their sovereign claims challenged and perceive activity by non-Arctic states or international organisations as encroachment. Reinforcement of legal frameworks, if not done collaboratively, could create tensions and

destabilise relationships between allied Arctic states, non-Arctic actors and NATO members.

c. **Maintaining international law.** Thus far, Moscow has tended to pursue its regional interests through established international governance and legal frameworks, such as the Arctic Economic Forum, albeit whilst seeking to impose its own interpretation of what is allowed under these structures. Although outwardly supporting a cooperative stance, Russia has accelerated the development of its strategic and military ambitions in the Arctic. Russia has adopted a similar approach in its relationship with China. NATO should be open to opportunities for meaningful discussion with Russia on the security architecture of the region, and Russia's 2021 to 2023 chairmanship over the Arctic Council and Arctic Coast Guard Forum may provide such opportunities.

d. **Escalation of tension possible.** Geopolitical competition and tensions may be unavoidable as the region transforms. The character of exploitation activities will determine how competition manifests, but reinforcement of a regional stability framework based on a clear set of political principles and legal norms will be fundamental to avoiding escalation of tension. The drawing of new hard-lines amongst Arctic and non-Arctic states, as well as NATO and non-NATO countries, could undermine regional cooperation. Russia may capitalize on regional issues to distract from domestic issues by leveraging the internal narrative of NATO as a primary threat to justify its military expenditures.

e. **Economic relationships vital.** Nations and the commercial sector will view the region primarily through the lens of economic policies and opportunities. Economic relationships cutting across the Arctic/Non-Arctic divide will be significant as global interest in the region develops. Market forces and resource demands largely will drive

the potential for economic disputes. The Russia-China relationship will evolve around the energy/resource dynamic. Underdeveloped economies will be vulnerable to exploitation by commercial or coercive actors. NATO must account for these economic relationships and demands in its strategic considerations for the Arctic region.

f. **Russia-China co-dependency not guaranteed.** Due to economic and resource dependencies, China will seek to strengthen its relationship with Russia and reinforce its claim as a 'near-Arctic' state. The 'transactional' nature of this strategic association is not a natural partnership. If China becomes a major sponsor in the region, it has the potential to destabilise governance, economic and security sectors at risk to both Russia and Alliance states. Any attempt by China to foster a military presence in the Arctic could meet with Russian opposition and challenge their mutual cooperation in the region.

## 2.3 INCREASING EMPHASIS ON REGIONAL SECURITY

18. Growing geostrategic interest in the Arctic and challenges to the sovereignty and collective primacy of the Arctic states, combined with diverging national interests and the return of great power rivalries, will reshape the Arctic security environment in the decades ahead. Prospects for increased commercial activity also will raise the stakes of geopolitical competition for Arctic and non-Arctic states, rendering regional security of greater interest to all stakeholders, including NATO.

19. The substantial increase in maritime traffic by 2040 will affect security demands in vast areas of empty and unmonitored CAO and associated geographical regions that are difficult to regulate.

//

China will seek to strengthen its relationship with Russia and reinforce its claim as a 'near-Arctic' state.

//





In turn, increased use of the open Arctic Ocean may invite hybrid exploitation, piracy, human trafficking, terrorism (including eco-terrorism and terrorism by CBRN means) and transnational crime by malicious state and non-state actors, such as information and cyber threats. Countermeasures require expensive sovereignty patrols with a police-oriented mindset and special surveillance equipment, ideally achieved through established partnerships and multilateral information sharing. Remote and dependent indigenous populations in the North remain vulnerable to exploitation due to limited access to information.

20. The increasing scale and capability of the Russian military presence in the region signifies the strategic importance of Arctic affairs in Russian military thinking, but it is predicated on a broader and not-Arctic specific threat perception. Deeper nationalist sentiment and its explicit ambition to restore its global power status primarily drive Russia's military force posture. Further military expansion, Arctic or otherwise, will come under pressure from financial constraints, but the impact of climate change on food and water security, resource exploitation/protection and infrastructure remain primary concerns for the Russian Federation. Moscow's current force deployment in the region is primarily defensive. Reflecting the 'Bastion' concept, Russia's strategy appears predicated upon sea denial and interdiction schemes to protect the Kola Peninsula along with greater multi-layered air and coastal defence. To deliver this concept, the Northern Fleet has been upgraded and hardened against sea ice and an Arctic military district re-constituted to increase Arctic capabilities. Russia only outlines its formal Arctic military strategy in broad terms, apparently preferring a non-specific approach

21. Moscow sees the region as part of a strategic whole without differentiating between the Arctic, High North and Baltic regions, as NATO nations often do. The broader approach may indicate that Moscow considers itself in a position of strength, fuelling the perception that the region is a low risk threat. Russian air, surface and sub-surface fleets may not have the scale or sophistication to compete for full superiority, but will likely exercise some aspects of control, access denial, and impingement on sea lines of communication vital for the security of the Alliance. This may explain the development of missile and automated systems, as well as hybrid activity in an attempt to close the competitive gap with NATO. Russia's focus on out-competing regional adversaries may increase in the post-COVID-19 economic era, provided domestic pressures motivate Moscow to use Arctic activities to deflect public discourse or advance military opportunism.

22. Russia will be reluctant to relinquish or share any defense and security role under its purview, particularly to a non-Arctic state such as China. A potential uplift in Chinese security in the region is most likely as direct support to Chinese investments, such as the protection of off-shore fishing (China has the largest fishing fleet in the world measured by tonnage) and on-shore mining interests. These activities provide perhaps the greatest potential for encroachment, exploitation of international law, and incidents or miscalculations. China currently has no military presence in the High North, but has stated publicly aspirations of becoming a top-tier modern military and set reforms to achieve this goal. With increasing economic global ambitions, the presence and activity of the PLA is expected to grow commensurate with Beijing's global reach. This has the potential to



Figure 5 Russia's Military Posture in the Arctic

Conley, A. Heather et al. "America's Arctic Moment – Great Power Competition in the Arctic to 2050." A Report of the CSIS Europe Program, March, 2020, 11.

[https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/Conley\\_ArcticMoment\\_layout\\_WEB%20FINAL.pdf?EkVudAIPZnRPLwEdAIPO.GlpyEnNziNx](https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/Conley_ArcticMoment_layout_WEB%20FINAL.pdf?EkVudAIPZnRPLwEdAIPO.GlpyEnNziNx) [last accessed 18.02.2021]

bring larger numbers of Chinese forces in closer proximity to Russian and NATO forces operating in the Arctic region. China's assertiveness in the region will largely depend upon how NATO and Russia react to its activities as the dynamics of cooperation and conflict continue to evolve.

23. NATO nations' approach towards the Arctic and High North has shifted over the past 3-4 years. Policy steps have been small, but the shift is palpable. The renewed US focus on the Arctic's strategic importance support both defence of the homeland (through NORAD and NORTHCOM) and defence of the North Atlantic SLOCs to reinforce Europe during crisis (which in turn protects the US homeland). The US clearly recognises the rising threat of Russia and China in the North, but regional infrastructure and cold weather capabilities require assessment. Since 2015, US activity focuses on solidifying regional relationships, particularly in the 'Northern Triangle' or Northern Atlantic zone through key military relationships with Norway and the United Kingdom. Canada also demonstrated a noticeable shift in policy rhetoric. Canada is the second largest physical stakeholder in the region and historically promotes cooperation through the Arctic Council as the primary conduit to engage Russia. Canada's recent policy to "support the strengthening of situational awareness and information sharing in the Arctic, including with NATO," serves as a commitment to collective defence while reiterating its willingness to work with allies and partners, including NATO, in support of Arctic security.

24. NORAD is a binational command that joins Canada and the United States in the joint defence of North America via air warning, air control and maritime warning. USNORTHCOM is the geographic combatant command responsible for the command and control of the US Department of Defense's (DOD) homeland defence efforts. Based upon the renewed US focus on the Arctic (evidenced by the increasing number of Arctic strategies for nearly all of the services) and NORAD's history of conducting surveillance of the Arctic, NORAD, USNORTHCOM and NATO increasingly seek opportunities to coordinate activities, exercises and operations in the region. NATO's Arctic decisions should consider the resources available from the NATO Joint Force Command Norfolk and recently stood-up 2nd Fleet under USNORTHCOM.

25. Russia will continuously try to undermine NATO's cohesion, in the Arctic and elsewhere, and China will seek opportunities to achieve its Arctic ambitions. The ability to plan, prepare and secure funds for deterrence infrastructure will be uneven across NATO and highly susceptible to national political priorities. Russia and China will look to exploit any advantage, particularly on the periphery of governance mechanisms or through lack of situational awareness, which lends itself to either miscalculation or inadequate response.

The possibility of Russia taking risks in the Arctic and crossing the Article 5 threshold should not be discounted. The Arctic's remote and sparse population makes military intervention to defend it a harder sell to democratic public opinion. The remoteness to most NATO members would also make an aggression seem less of a direct threat. Consequently, seizing the opportunity of any strong albeit temporary disagreement within the Alliance, China could assert itself in the Arctic and Russia could potentially capture limited, unpopulated and remote territory belonging to a NATO ally.

26. Achieving the right level of deterrence and building a multi-spectrum situational awareness in the region will be vital for NATO. By its very nature, NATO involvement in the region may create a security dilemma with Russia and encourage a revised military strategy. Despite the increasing potential for the Arctic as a source of conflict, it is important to recognize that the Arctic is neither an immediate nor predetermined catalyst for major conflict with Russia (or China). The Arctic should be one component of an integrated NATO deterrence posture in conjunction with NORAD and USNORTHCOM, as a future major conflict with Russia most likely would originate on Eastern Europe's central front. NATO's Arctic military activity has largely involved regional exercises such as TRIDENT JUNCTURE, along with smaller Enhanced Forward Presence (EFP) deployments as part of 'lower key' yet persistent deterrence posture. Although cognisant that these deployments can serve to reinforce Putin's domestic narrative, NATO must maintain consistent and persistent deterrence. This requires developing and maintaining the necessary capabilities to operate in the harsh Arctic environment, as well as a balanced approach that avoids ceding de facto control/authority of the region to Russia.

27. NATO will need to consider an integrated regional approach to the Arctic, considering, at the very least, the evolving significance of Maritime FoN and use of the Arctic airspace. A regional approach must adjust to the increasing access and area of operations whilst adapting to a physically changing future environment. Any regional strategy clearly needs to consider the sensitivities of Arctic member states and ways that non-Arctic states can be active and contribute in the region. A persistent deterrence, similar to NATO's enhanced Forward Presence (eFP) in the Baltic states and Poland, requires consideration of the contributions by strategic geographical location due to the Greenland, Iceland, UK and Norway gap (GIUK&N Gap) and strong bilateral (regional) relationships such as with the US and Norway. Furthermore, initiatives such as the lead Joint Expeditionary Force (JEF) nation and the Northern Group already provide a foundation from which to build a strategy. The JEF continues to support security operations in the High North and Arctic notably through Maritime (including sub-surface), Amphibious and Air Operations as it

//

NATO will need to consider an integrated regional approach to the Arctic, considering, at the very least, the evolving significance of Maritime Freedom of Navigation (FoN) and use of the Arctic airspace.

//



has done so consistently with regional partners for over five decades.

28. NATO's large Arctic exercises are confined to northern Europe and the North Atlantic, which benefit from ice-free waters and relatively warm temperatures due to the effects of the Gulf Stream; however, the region is not, nor will it become, an environment to which personnel or equipment can easily be pitched. Regionally focused interoperability training and joint procurement programmes demonstrate how NATO can improve future deterrence. The joint Norway-UK procurement programme of P-8 maritime patrol aircraft (MPA) to improve GIUK&N Gap situational awareness provides an outstanding example of using geographic proximity and close political ties to improve future defence.

29. Search and Rescue (SAR) and disaster relief support to commercial operations provide a bonding factor through assistance to managing energy and mining efforts, facilitating tourism and policing unregulated or unsustainable fishing practices. Military forces clearly play a role in SAR, disaster relief, fisheries protection and maritime security, and military forums can resolve issues to avoid miscalculation and manage non-Arctic state activity. The Arctic Coast Guard Forum (ACGF) offers one such forum for future maritime cooperation. The ACGF includes representation from all eight Arctic States (A8) to foster safe, secure, and environmentally responsible maritime activity in the Arctic. Tabletop exercises and annual LIVEXs within the A8 agreement have been conducted, demonstrating how the ACGF can foster productive cooperation among Arctic States for issues such as SAR and oil spill preparedness.

30. With increased maritime, air and land activity anticipated in the future, many military observers have called for an Arctic code of conduct. Similar to the Code for Unplanned Encounters at Sea (CUES) established in 2014 for the East and South China Seas, an Arctic code would facilitate communication between actors operating in the region. While CUES is non-binding and breaches have occurred, like CUES, an Arctic code could prevent mishaps and miscalculations from escalating into conflict. A military code of conduct for the Arctic could define and support enforcement of legitimate and acceptable military practices amongst regional stakeholders, and build on existing arrangements such as the OSCE Vienna document and Incident at Sea Agreement. Any formal support by NATO for an Arctic code should clearly reinforce agreed principles and align to the broader Arctic Council narrative.

### Implications

a. **Operating space likely to become increasingly complex and uncertain.** Increased access to the region and competing claims over the maritime Arctic will dramatically change how military forces operate in the region. The

increasing number of actors and potential for misunderstandings could impair NATO's future freedom to operate, as well as the frequently changing operating conditions (particularly during the spring and autumn). The combined impact of increased actors, access to resources and unpredictable meteorological conditions set against a backdrop of changing geopolitical relationships will create strategic uncertainty.

b. **Adaptation to the changing environment.** To out-pace and out-perform adversaries, NATO will need to understand the full range of security implications across all domains (including space) arising from geopolitical and climate-related shifts in the Arctic. Rapid decision-making will inherently require technological advantage and multi-domain situational awareness. The Alliance will need to improve confidence-building measures, ensure continued integration of command and defence systems, and strive to improve interoperability.

c. **Regional approach will need to be developed.** The growing complexity of the Arctic requires a formal regional approach that ensures a credible and balanced deterrence without needlessly antagonizing Russia. NATO should recognise opportunities for cooperation with Russia and evolve the content of its dual track strategy towards Russia to ensure its continued effectiveness. From an Arctic nation's perspective, Alliance activity must not play into Putin's narrative or encourage Russian support for Chinese forces operating in closer proximity to NATO forces in the Arctic region. NATO must avoid any misconception of predetermined conflict arising from Arctic regional dynamics. NATO should consider adopting a comprehensive and inclusive policy towards the region whilst tensions remain low and prior to the anticipated onset of increased activity in the coming decades.

d. **Protection of National interests upheld.** How Arctic states handle renewed interest in the region, protect national interests and potentially cede space for legal Chinese Arctic operations will shape the geostrategic future of the region. Balance will be vital. Economic collaboration with Beijing is not limited to Russia. All Arctic nations may seek to exploit new opportunities in a post COVID-19 financial environment. Keeping the Arctic on political agendas will be critical in a post COVID-19 decade where financial stresses are likely to dominate.

e. **Cooperation & interoperability key to stability.** NATO should apply a twin track approach of dialogue and deterrence with Russia to avoid miscalculations and Russian manipulation of security situations. A commercialised Arctic future, though complex, should not prevent continued cooperation. It will require robust governance strategies, and efforts for SAR, disaster relief and environmental protection may form a baseline for broader security cooperation initiatives and regional stability.





# HUMAN

1. Arctic populations will face many new challenges to their societies and environment. The four million people currently living in Arctic communities endure life in a “total environment of change” impacted by environmental, economic, social, cultural, and governmental pressures. Accelerated Arctic warming is driving changes on the sea and land and disrupting ecosystems. Climate change will affect all aspects of life in the Arctic, especially those where culture and livelihoods depend on traditional knowledge of the Arctic environment and a reliance on nature for food and water security.

2. A rapid increase in economic activities in the Arctic affects both indigenous and non-indigenous societies. New opportunities will also generate new risks. Growing economic interest in the Arctic will create new jobs, attracting an influx of new people and new cultures that could tear apart the social fabric of traditional communities. Arctic inward migration will also fuel urbanisation, altering life-styles as well as relationships between people and places, both of which could encourage the abandonment of traditional communities and cultures.

3. Arctic states have complex relationships with their indigenous peoples. Furthermore, many northern communities feel dislocated from their southerly capitals creating north/south divides. Indigenous groups are members of the Arctic Council, and with the adoption the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), they have attained even better advocacy and a

stronger voice in decisions made about the Arctic. COVID-19 demonstrated how Arctic populations have fewer medical resources and infrastructure to handle a complicated vaccine rollout. Arctic states should prioritize needs such as these in the future and prepare for possible HADR needs. Likewise, as Arctic tourism increases, the establishment of pandemic/disease eradication and screening programs may require Alliance expertise.

## 3.1 SOCIETAL CHANGE

4. *“Of the many indigenous peoples of the Arctic and their many cultures, each profoundly different from another, certain core traditions and practices can be found in all their communities. Passing on ways of doing - the many traditional activities that keep their culture alive and their communities healthy on all levels - are critical.”* (*Arctic Traditional Knowledge and Wisdom: Changes in the North American Arctic.* Arctic Council). Regardless of the geopolitical churn, the Arctic region’s environmental, technological and economic changes will cause societal disruption for all Arctic peoples and their cultures.

5. The cultural wellbeing and vitality of Arctic communities involves three inter-related components: language retention, cultural autonomy, and belonging. Because of the small Arctic indigenous population, any change in population size and composition due to inward and/or outward migration can substantially change the cultural identity, wellbeing and vitality. Lifestyle changes in many cases can lead to



Climate change will affect all aspects of life in the Arctic, especially those where culture and livelihoods depend on traditional knowledge of the Arctic environment and a reliance on nature for food and water security.





negative cultural transformation, including altered family structures, substance abuse, high suicide rates, domestic violence, and a general loss in values and cultural forms of expression. The indigenous population can be resilient and highly adaptive, but an excessive rate and magnitude of change can undermine their current adaptive capacity. Immigration adds yet another layer of diversity, often challenging the ability to integrate the foreign-born migrant population into the Arctic societies. Both indigenous and non-indigenous peoples will need to adapt to disruptions and learn to maintain inclusive societies as the Arctic environment undergoes continued change.

6. The indigenous Arctic population still depends heavily on subsistence provided by their environment. By significantly reducing opportunities to hunt for game and sea mammals, and conduct ice-fishing, climate change is impacting food security in the Arctic, and people are taking greater risks to maintain their subsistence cultures. Globalisation also creates problems, as imported foodstuffs of lesser nutritional value and higher cost gain in popularity and availability. Changing environmental conditions also affect water security, increasing risks to the population. The transition from a traditional diet increases the probability of obesity, diabetes and cardiovascular diseases within indigenous populations.

7. The Arctic's indigenous population pass centuries of developed traditions, practices and knowledge directly from individual to individual, usually from elders to young people in concrete working and life situations. Traditional knowledge incorporates an understanding of ecosystem relationships and a code of ethics governing appropriate use of the environment. Much of the traditional knowledge has already faded, no longer needed among the younger generation working jobs outside their communities. The indigenous youth also increasingly lack opportunities to take part in seasonal subsistence activities.

8. Over the last four decades, indigenous people have become more active in international forums, such as the Inuit Circumpolar Council, with a focus on human rights. Key demands include the right to self-determination, land rights, cultural survival and development, non-discrimination and equality, justice systems, and participation in decision-making at all relevant levels of government. Consequently, most Arctic nations, but especially the Arctic Council, recognise the indigenous people's rights and their inclusion in decision-making. This creates a structure for indigenous people to take responsibility for their own economic, social and cultural determination.

## Implications

a. **Social balance of Arctic societies threatened.** Excessive inward migration and failures to integrate migrants could create social imbalance, resulting in tension, reinforcing differences, and escalating conflicts both within and between groups. Malign actors may leverage that imbalance with competing narratives to further create tensions and make the indigenous population susceptible to foreign interference. NATO's situational awareness of these hybrid activities will allow it to counter any malign narratives and support cohesion within the societies.

b. **Lack or loss of residual knowledge and cultural placement.** Fading local knowledge will contribute to a lack of understanding of the Arctic environment and ecosystems, making it more difficult to use, manage and survive in such an environment. Lacking residual knowledge, the indigenous youth may no longer view themselves as socialized within a value system that emphasizes the importance of mutual cooperation. Facing significant social change, the younger generations will increasingly struggle to find their place between the newly emerging social order and the social order of their ancestors.

c. **Growing divergence between indigenous population and industrial demands.** Commercial competition for subsistence resources (fishing, hunting, herding) and resource extraction (oil, gas, minerals) might further increase food insecurity and financial hardship for indigenous peoples. Such threats to their livelihoods could lead to social disruption and political unrest, possibly stalling or preventing industrial efforts. Integration of indigenous people and traditional knowledge in Arctic enterprises, including military planning, will enhance relationships and cooperation between national governments and Arctic partners.

d. **Increased participation of the indigenous people in local decision-making.** The increasing role and power of indigenous people in Arctic development must be acknowledged. They have the ability and right to participate in shaping the political and economic direction of Arctic development. In the short to mid-term, indigenous people of the Arctic will demand more control over the region. Sharing of power and responsibilities between national governments and regional/municipal authorities will become increasingly complex. Cooperative efforts will spread across different crosscutting social layers and cultural geographies.

## 3.2 SHIFTING DEMOGRAPHICS

9. In 2017, the Arctic population was four million, increasing to slightly over seven million if inhabitants in the wider Arctic were included. The population in the North American Arctic and Iceland, especially in urban areas, has grown significantly in the last 20 years, followed by an overall moderate growth in the Norwegian, Swedish and Finnish Arctic regions, albeit with large variations at the settlement level. Greenland and the Faroe Islands population is near stagnant, while the Arctic Russian population is declining in all but the two regions where a majority of oil and gas extraction occurs. This trend might increase significantly, as the character of in- and out-migration in the Arctic region often follows cycles of booms and busts associated with large-scale industrial projects and military activities. The influx of people from outside the Arctic to work in resource extraction projects has increased in recent decades.

10. Arctic locations with booms in resource extraction are experiencing a large influx of workers, typically young males from outside the Arctic, resulting in a younger population in these regions. Other Arctic regions are losing large numbers of young adults to outward migration due to the lack of economic or educational prospects. Migration from rural areas is commonly selective, involving younger adults with above average aspirations and skills. In 2017, 20.5% of the overall Arctic population was under the age of 14, compared to the global average of 26%.

11. Regions affected by migration have experienced recognisable gender imbalances. The gender ratio among incomers often depends on the nature of economic activity in the region, but the young male population typically dominates. At the same time, a disproportionate number of the out-migrating population is female, as they seek better education, job or life prospects and an escape from the general gender inequality. This trend of gender imbalance is reinforced by an imbalance in sex ratios of babies in Greenland and the Russian Arctic.

12. Almost equal to the global average of 9%, an average 9.7% of the Arctic population consists of people aged 65 or over. The Arctic population may follow the global trend of having almost 16% of people aged 65 or over in 2050. However, although the increasing importance of the Arctic will attract migrants searching for work, they will tend to move south when they retire or reach an age more vulnerable to health problems or physical weakness.

### Implications

a. **Decreasing populations challenge governments.** Population decline in smaller rural communities and the depopulation of sparsely populated areas, especially in Arctic parts of Russia, will challenge governments' ability to manage, govern and control these vast and increasingly empty spaces.

b. **Migration causing brain drain and brain waves.** The out-migration of educated youth lacking appealing job prospects might cause a 'brain drain' in the Arctic, reducing human and social capital as well as ancestral residual knowledge. Rural areas are especially vulnerable. Conversely, in-migration could enrich education levels and social capital, albeit without the social-economic knowledge of the indigenous population. The out-migration of educated and working-age populations could lead to shortages of skilled workers and challenges to economic and infrastructural development.

c. **Gender imbalance on the rise.** Gender imbalances caused by migration trends will affect the social fabric of the indigenous population and change the structure of Arctic communities radically. These gender imbalances may further restrict the ability of communities to adapt successfully to their changing environment.

d. **Endangered social contract in indigenous communities.** Fading residual knowledge contributes to a loss of appreciation for elder populations, which can tragically affect communities where the elderly rely on the younger population for their care. The composition of indigenous populations may change as a more commercialised future Arctic arises. Maintaining social contracts and overall social security become increasingly important for communities experiencing rapid changes due to economic development and opening of the region.

## 3.3 GROWTH IN URBANISATION

13. *"The percent of a country's population residing in urban areas is reflective of the structure of its economy."* (*Arctic Human Development Report: Regional Processes and Global Linkages.*). The growing Arctic economy is fuelling the trend toward the concentration of populations in larger urban centres and declines in smaller settlements. The considerable differences in the social and physical conditions of settlements versus urban areas create notable social and cultural impacts. Although urbanisation occurs at different rates, approximately 75% of the Arctic population live



The growing Arctic economy is fuelling the trend toward the concentration of populations in larger urban centres and declines in smaller settlements.





in urban areas, which is considerably higher than the global average of 55%. Iceland, Greenland, Sweden and the resource extracting regions of the Russian Arctic have the highest rates of urbanisation, while areas of Arctic Canada and the Faroe Islands have the lowest rates.

14. Arctic cities generally offer superior economic and education opportunities than rural areas. The dramatic increase in resource extraction and shipping, and the establishment of military facilities and administration centres, triggers migration from rural regions to urban areas for those seeking better employment, salary, or quality of life. Likewise, the flow of people from outside the Arctic to urban areas has increased in recent decades due to opportunities to work in resource extraction projects. As reflected in the term “Climigration”, climate change impacts to the sustainability of some settlements might also drive shifts from Arctic rural regions to urban centers.

15. The influx of people to Arctic urban areas creates the necessity to provide adequate services and facilities, including affordable housing, effective law enforcement services, healthcare and schools. Services must also address stressors on the environment caused by the resultant increase in pollution from waste and energy production, and they must support the exceptional resource demands caused by the harsh climate, geographical conditions and remoteness of the Arctic.

### Implications

a. **Increased government-spending necessary.** Rising levels of urbanisation will require constant government spending to adapt essential services, such as healthcare and education, to match the changing needs. Failures by local governments to adequately adapt their services will hinder economic development and attract foreign investments. Outside intervention from foreign sources could create multifaceted security issues and invite manipulation of the urban populations

b. **Inequality between urban and rural areas rising.** Rising levels of urbanisation will require constant government spending to adapt essential services, such as healthcare and education, to match the changing needs. Failures by local governments to adequately adapt their services will hinder economic development and attract foreign investments. Outside intervention from foreign sources could create multifaceted security issues and invite manipulation of the urban populations.





# TECHNOLOGY

1. *“Maintaining a technological edge is the foundation upon which NATO’s ability to deter and defend against potential threats ultimately rests. The importance of technological developments to help increase adaptation and resilience of defence capabilities in the Arctic environment, especially in the context of accelerating climate change, will increase in importance. Emerging Disruptive Technologies (EDTs) pose a fundamental challenge but also, if harnessed correctly, an opportunity for the Alliance.”* (*“NATO 2030: United for a New Era.”* NATO Reflection Group). Societies living in or near the Arctic increasingly will be influenced by and dependent upon technology, as will all industrial or military operations undertaken in the area. New technological solutions in such unforgiving conditions and geographically dislocated locations create both opportunities and vulnerabilities. Changing environmental conditions and the exponential rise in earth and space-based sensors create new security challenges for concealment and survivability. Conversely, reduced distances and improved efficiencies from automation, quantum technologies and Artificial Intelligence (AI) may compress the timescale for decision-making. The growing need for Arctic engineering solutions will drive advances in energy storage technology. Competition, be it economic, political or in the security sector, will push the boundaries of technological advancement with a range of associated costs. Within a post COVID-19 economic era, progression may slow until market forces or environmental demands drive accelerated advancement. While greener

and environmentally friendly technologies are increasingly in demand, technology also can threaten traditional ways of life, leading to tensions for nations trying to modernise the region. Uneven rates of technological advancement, lack of critical supporting infrastructure and associated cyber threats will affect Arctic security considerations.

2. Technological advancements can influence societal change and shape regional development, and NATO increasingly must work with the commercial sector to leverage new developments. The evolution of the environment and NATO operations over the next several decades will require enhanced predictions and understanding of Arctic operational conditions, and the Alliance must exploit technological leads in order to out-pace adversaries. Commercial technology companies have demonstrated the ability to become actors in their own right through expansion in sectors such as space, planetary communications, global information services, resource extraction, transport and tourism. Speed of innovation and investment selection will determine future success in the region. Potential asymmetric and peer/near-peer competitors will take differing exploitation paths and may potentially target novel applications in the physical, human or information domains in order to compete with the level of investment made by western Allies. By its very nature, the Arctic will be a region of technological transformation. Failure to grasp EDTs and maintain technological and industrial advantage will heavily influence the ability of actors to compete in the commercial or security sector. China and Russia also may

“  
Changing environmental conditions and the exponential rise in earth and space-based sensors create new security challenges for concealment and survivability.”



capitalize on opportunities for strategic investment via state-owned enterprises even if lagging behind in technological capabilities.

## 4.1 INCREASING DEPENDENCY ON TECHNOLOGY

3. Compared to other dimensions, the Arctic presents unparalleled challenges and demands for technology. The remoteness and hostility of the environment make it largely impossible for non-indigenous people to sustain life without technological support. The most basic operations demand cooperative actions and coordinated efforts. Future utilisation of the remote and sometimes under-governed space offers the opportunity to employ and promote complex and required technological solutions. Technological advancements in fields such as quantum computing, AI and nuclear fusion are likely to mature (or near mature) technologies by 2040 with the potential of Arctic applications. Such advancements will produce benefits for Arctic operability but also give rise to security risks in areas that have a high level of technological dependency or are subject to exploitation by malign actors.

4. The Arctic region has limited infrastructure to support conventional technological methods, and the high cost of any activity in the extreme conditions demands cooperation for capability development. As a result, civilian and military activities increasingly will rely on autonomous systems and niche technologies, especially in the aerospace sector. Nations and companies engaged in the Arctic will heavily depend on systems lacking continuous human control or on-sight maintenance. The use of satellites and ground stations serves as an example, where extensive coverage and signal speed demands typically require high-bandwidth networks and give a geostrategic advantage to nations engaged in satellite programs. The use of UAVs provides another example, where aerial 3D sensory mapping supports oil and gas extraction efforts that otherwise might not be feasible due to the high exploration costs and limited accessibility of inhospitable Arctic areas.

5. Overall, Russia is likely to continue to lag behind Western and Chinese scientific and technological (S&T) investment and development. The Kremlin has adopted a 'good enough' approach without trying to technologically outperform the West. Russia has prioritized their investment in the Arctic, but deterring competitors will prove challenging in an environment that demands

innovative technology. That said, Russian military development in the Arctic will largely be predicated upon traditional A2/AD considerations, designed to provide sea denial and protect the Kola Peninsula via interdiction. Gradual upgrading to an Arctic-capable hardened Northern Fleet along with powerful and multi-layered air and coastal defence capabilities is central to reforming the Russian Arctic defence system. The narrowing of existing gaps via asymmetric tools and selective offensive capabilities demonstrate Russia's 'good enough' mantra. The Russian Arctic Zone serves as a test field for dual use capabilities, such as the use of automated systems in support of both SAR and security surveillance. Environmental challenges and the high costs of offensive, defensive and coast guard operations in the Arctic create a demand for Russian technological transformation, particularly in satellites and radar capabilities, as the nation pursues its interests in the increasingly congested space.

6. Given the S&T gap between Russia and the West, NATO must monitor increased Russian levels of cooperation with China over the coming decades. Cooperation may primarily involve transactional exchanges for resources. However, technology transfer and R&D cooperation is expected across all aspects of civilian and dual-use industry, such as the Russian-Chinese Polar Engineering and Research Centre established in 2016. Joint military activity already occurs, as demonstrated during the VOSTOK-2018 exercise. Despite security concerns, national caveats and operational differences, future bilateral military cooperation is expected. Cooperative efforts may include strategic missiles, hypersonic technologies, and interoperability efforts in areas such as Joint Intelligence, Surveillance and Reconnaissance (JISR), anti-submarine warfare, and military R&D for critical breakthrough technology. NATO maintains an ability to leverage a significantly superior technological and industrial complex, and keeping that edge to out-think, out-pace and out-compete potential adversaries will be vital. Aggressive technological or industrial intelligence gathering and intellectual property theft, either directly or through a third party, represents a major threat to NATO. Such theft is commonplace in certain commercial sectors. NATO must strive to protect technological advantages and enhance cooperative networks in order to maintain superiority.

### Implications

a. **NATO must leverage the industrial and technological complex.** The Alliance has access to a vast industrial and technological complex with the reach and capacity to out-pace and out-

last competition from both Russia and China. To continuously and rapidly adapt to challenges, notably in a region that places a significant burden upon technology, NATO must forge deep and comprehensive relationships with innovation and industrial leaders from the civil sector. At the same time, such relationships must acknowledge risks related to powerful and influential multinational corporations operating beyond the control of any state in Arctic areas dependent upon their technology.

**b. Russia will focus on areas of strength.** With most of their military capabilities designed to operate in cold conditions, Russia's ability to foster S&T innovation for Arctic capabilities should not be underestimated. Russia likely will focus on previously successful areas of expertise with the aim to lead the field in hypersonic missiles, advance delivery mechanisms, Electronic Warfare (EW), and Arctic-capable unmanned and autonomous systems. Moscow's ability to finance and deliver actual scientific breakthrough will continue to be constrained by a highly centralised traditional approach to R&D. Efforts to bridge S&T gaps will likely rely heavily upon future cooperation with Beijing.

**c. NATO must promote integration.** Arctic operations are expensive and technologically demanding. NATO plays an important role in developing a common regional strategy. Such strategy should be grounded in an Alliance-wide EDT threat assessment and an analysis of opportunities in order to exploit advantage and drive interoperability.

**d. Technological protection.** An aggressive approach to industrial espionage and intellectual property theft by adversaries is likely to continue. NATO nations must reinforce protection protocols to maintain an advantage. Technology advancements may reduce the costs and risks of Arctic access in military/security and commercial operations. Space-based, data and high-end technology systems will be key targets, and adversaries will likely exploit mass produced 'good enough' solutions; prevalent in terms of area denial in the Arctic especially near choke points.

## 4.2 TECHNOLOGICAL TRANSFORMATION OF THE REGION

7. Reliance upon autonomous and remote systems in the Arctic will increase. Research and economic development in such a vast region depend upon innovative methods of exploration and transportation to reduce cost, time, and distance constraints. Three factors primarily constrain commercial and scientific efforts in the region: energy source (endurance), distance (time) and economic viability. All three remain essential components when operating in remote

locations with extreme weather conditions. Offshore drilling and mining in the Arctic aptly demonstrate dependence upon technology through automated drilling operations with minimal onsite human intervention. Just as commercial drilling and mining entities focus on technology to make Arctic operations more sustainable and economically viable, the military must do the same. Automated air systems are already commonplace, and although land and maritime systems are less developed, unmanned shipping has been tested successfully with few if any major obstacles. Remote and robotically controlled space functions, using autonomous and AI systems, will increase in the coming decades. However, the support of civil, commercial and military requirements in the Arctic's near future demand an increased human presence.

8. The employment of autonomous, semi-autonomous or remotely controlled systems in the Arctic will remain heavily reliant upon satellite navigation/control and state-of-the-art sensory systems. In the near future, automation costs, including insurance, are likely to remain high and constrained by network infrastructure, but advancing technology could allow systems to become more independent. Highly developed inertial navigation systems and ground differential systems may play a significant role by 2040. New autonomous capabilities and increased activities will necessitate logistical sustainment nodes across the Arctic region to support automated networks. These nodes may bring their own array of sensors and potential launch capabilities, while supporting both defensive networks and commercial operations. Human supervision likely will diminish with improved capabilities. The deployment of cheap mass produced drones raises questions of accountability, should the systems fail to distinguish between sophisticated and basic threats or provide reliable information that forms the basis of high-speed decision-making. Governmental and industrial over-reliance on technological solutions may foster ignorance about developing social, environmental or even political issues. Risks notwithstanding, NATO can expect 'dual-use' capabilities to become increasingly prevalent and must focus on cyber defence to protect newly established platforms and networks

9. Two main developmental priorities for autonomous systems in the Arctic include unmanned aerial vehicles (UAV) and unmanned underwater vehicles (UUV). Maritime surface and over-snow variants, like unmanned combat ground vehicles (UCGV), will develop in time but are more vulnerable to physical conditions. Aerial drones will rapidly become commonplace for military

“  
Reliance upon autonomous and remote systems in the Arctic will increase.  
”



(and commercial) operations; ultimately acting as force multipliers for ISR, logistic sustainment and as weapon systems in their own right. Russia will continue to field robust missile forces from land, sea and air based platforms supported by an array of sensors such as long-range endurance drones. The civilian sector is also pursuing UAV development, mostly for the surveillance of remote energy infrastructure and pipelines, as well as for the protection of critical national infrastructure. Arctic operations, for military or dual-use purposes, will drive the development of autonomous systems and leverage the commercial growth of stand-alone power systems.

10. Modernisation of polar maritime capabilities (e.g. nuclear icebreakers, nuclear bulk carriers, and floating/mobile nuclear power plants) especially by Russia and China will likely accelerate. Remote Arctic areas and extreme conditions will demand increasing endurance and self-sufficiency to achieve a critical advantage. The future applications of micro/mini-nuclear and rapid fusion power plants encourage a departure from hydrocarbons as a credible energy alternative for accessing Arctic resources. Nuclear energy developments provide the potential to reduce carbon emissions, increase endurance, address waste disposal management, and mitigate risks of major pollution events. However, the expansion of nuclear programs creates obvious environmental risks, especially from aging or undersupervised systems. Nuclear environmental incidents recognise no borders, and poor control measures, criminality and lack of corporate responsibility all contribute to a troubling picture for the use of nuclear fuel in the Arctic. Hazardous waste and dumpsites in low-lying areas are susceptible to sea level rise and could accelerate pollution in areas where significant permafrost melt is likely. Given such challenges, and Russia's historical record with disposal and catastrophe, the international community has often expressed concern with nuclear expansion.

11. Past commercial failures, primarily in hydrocarbons, demonstrate how expensive and important technology is in the region. Royal Dutch Shell's six-year, \$7 billion investment to extract crude in the American Alaskan Arctic serves as a stark reminder of the challenges facing even the most resourced; Shell abandoned its venture at a significant loss. Shell is not alone, with similar examples from Norwegian STATOIL and British Petroleum. While these do not signal an end to Arctic commercial exploitation, they demonstrate how advancements may not be uniform. Market forces will drive the demand for Arctic resource extraction in concert with advancing and available technologies.

## Implications

a. **Increased presence of autonomous systems across the region.** NATO should prepare for the increased presence of UAVs and UUVs employed by multiple actors and in multiple forms across the region. The proliferation of unmanned sensors will increase endurance and loiter capabilities, making undetected operations difficult. NATO will need to find innovative ways to contest Russia's increased use of multiple autonomous systems. Conversely, greatly enhanced, automated communication and detection nodes should improve situational awareness and reduce the chances of miscalculation in an increasingly congested space.

b. **Investment in technology will enhance operations in the Arctic.** The commercial sector will continue to lead technology investment in the region, primarily in support of resource exploration/extraction. State governments will seek to exploit the potential of dual-use capabilities, which create opportunities to out-pace and out-perform adversaries in the region. Russia's lack of capital investment in S&T and slow uptake to expand innovation may hinder their ability to bridge technology gaps and compete militarily across all domains. International sanctions also constrain Russian technological advancement and funding. China may provide support with joint development initiatives or financial cooperation further cementing their relationship.

c. **Growth in sustainment nodes.** Automation presents challenges, notably to maintain and operate persistent capabilities at long ranges from established home bases. Logistical sustainment nodes, also equipped with sensors, will likely appear across the region over the coming decades to support autonomous systems. This might also form part of a larger comprehensive defensive network and early warning capabilities. In addition, sustainment nodes contribute to commercial expansion and support a wider SAR network.

d. **Increased risk from nuclear energy use.** Any increase in industrial or military nuclear activity will directly correlate to an increased risk of accidents or disaster. Most pollution incidents result from equipment failure and human error that is symptomatic to any industrial activity. Nuclear activity adds the risk of wide-scale and long-term pollution from catastrophic accidents. Accountability must remain a key focus of regional government to protect ecosystems and prevent environmental catastrophe.

e. **Over-reliance on technology.** A comprehensive approach to the use of technology would encourage appropriate employment, constrain over-dependency and balance government responses. Technological advancement will reshape all instruments of power and society, but reversionary capabilities (skills based) will need to be retained to ensure a resilient force. Cyberspace Resilience will be fundamental and should follow NATO's minimum guidelines for

civil preparedness, notably the baseline requirement for civil communication systems.

## 4.3 IMPORTANCE OF SITUATIONAL AWARENESS

12. Situational awareness will be critical as NATO seeks to achieve the appropriate Indicators and Warning level and a balanced deterrence posture. Traditional, multi-domain situational awareness assets (airborne, surface, and sub-surface) will continue to contribute significantly to sensor networks, but military information gathering in the Arctic will increasingly rely on space-based sensor networks over the coming decades. Arctic states, and NATO, may desire to achieve all domain situational awareness, but the current inadequacy of cyber and satellite based systems and available technologies presents a major weakness for the Alliance. Weather conditions in the region (both atmospheric and space) severely degrade sensor, communication and platform performance. In addition, with operations conducted over vast distances, where few satellites regularly pass, GPS and communication coverage will remain sparse until the expansion of civil, military and commercial space-based capabilities. Situational awareness will improve with the development and deployment of networks and ground launched capabilities, such as nano-satellites. It must also be recognised that weather conditions in the region (both atmospheric and space) will degrade sensor, communication and platform performance.

13. New technologies, such as quantum sensing, and upscaled space-based systems will improve all domain situational awareness and hinder efforts to limit adversary awareness and create deception. An increasing volume of arrays and information-gathering sensors will make traditional manoeuvre operations difficult. Space-based technologies can more easily gather information in the Arctic region, given the absence of human clutter, buildings, trees and objects that afford concealment. Capabilities such as synthetic aperture radar satellites can identify and track ships, even at night and through clouds. Thermal imaging satellites most effectively detect human beings, activity and ships/equipment in cold environments. Conversely, increased situational awareness by adversaries may reduce miscalculations or over-reactions to activities or events in the Arctic. A disjointed awareness by NATO or ignorance of adversarial situational awareness capabilities may yield opportunities for Russia or China.

14. The reliance upon space-based technologies is likely to grow globally and across the Alliance,

increasing the number of sensors and information-gathering capabilities in the Arctic. Innovations in commercial capabilities, manufacturing, sensors, payloads and reusability will dramatically drive down the cost of launching moderate to heavy lift satellites. Coupled with the proliferation of small launch capabilities, unprecedented and flexibly tailored access to satellite systems can be expected. On-orbit propulsion, refuelling, and maintenance advances also promise to increase space usage. As new technologies and reduced costs make space access more attainable, the risks of collision with space debris and other interference will significantly increase (and potentially cause tensions). The Alliance may witness a rapid and unchecked increase in the militarisation of space-faring nations in coming decades. Nations with the military capability to achieve and maintain space superiority during conflict will have a significant advantage in cross-domain warfare.

15. Satellite support for Arctic operations suffers from limited coverage, deficient redundancy in case of failures, and vulnerabilities to targeting. Near-polar satellite orbits are less commonplace than geo-synchronous orbits, which generally are better suited for persistent observation and communications networks. The frequent inability of geo-synchronous satellites to cover all polar regions (due to Earth's curvature) further contributes to limited satellite coverage and system redundancy over the Arctic. Runaway space debris, like the kind produced by kinetic anti-satellite (ASAT) weapons, would severely damage the economy and military capabilities of every Space-faring state. Arctic communications rely heavily on a limited number of satellites in polar orbits for everything from intelligence gathering to disaster relief, and the largest commercial ground station is located in the Arctic. A dependency on space systems for Arctic operations must recognize the exceptional vulnerabilities arising from space debris/ASAT and the lack of alternative systems if the satellite network goes down. NATO countries would need to invest heavily in polar-orbiting satellites to improve Arctic coverage and satellite system resilience.

16. With Russia's enhanced A2/AD defence and China's increasing regional presence, sensors will proliferate significantly from seabed to above the Arctic Circle in the next two decades as all actors strive to create a 360 degree view. The push toward a Cross Domain Command will require integration of information "at the speed of relevance" to platforms/actors along with supporting nodes (permanent or mobile) to maintain a comprehensive network. Yet, networked systems in the Arctic will not be limited to state or military activity, multinational corporations will be

//

Timely and effective situational awareness requires systems and networks that identify threats and enhance intelligence sharing.

//



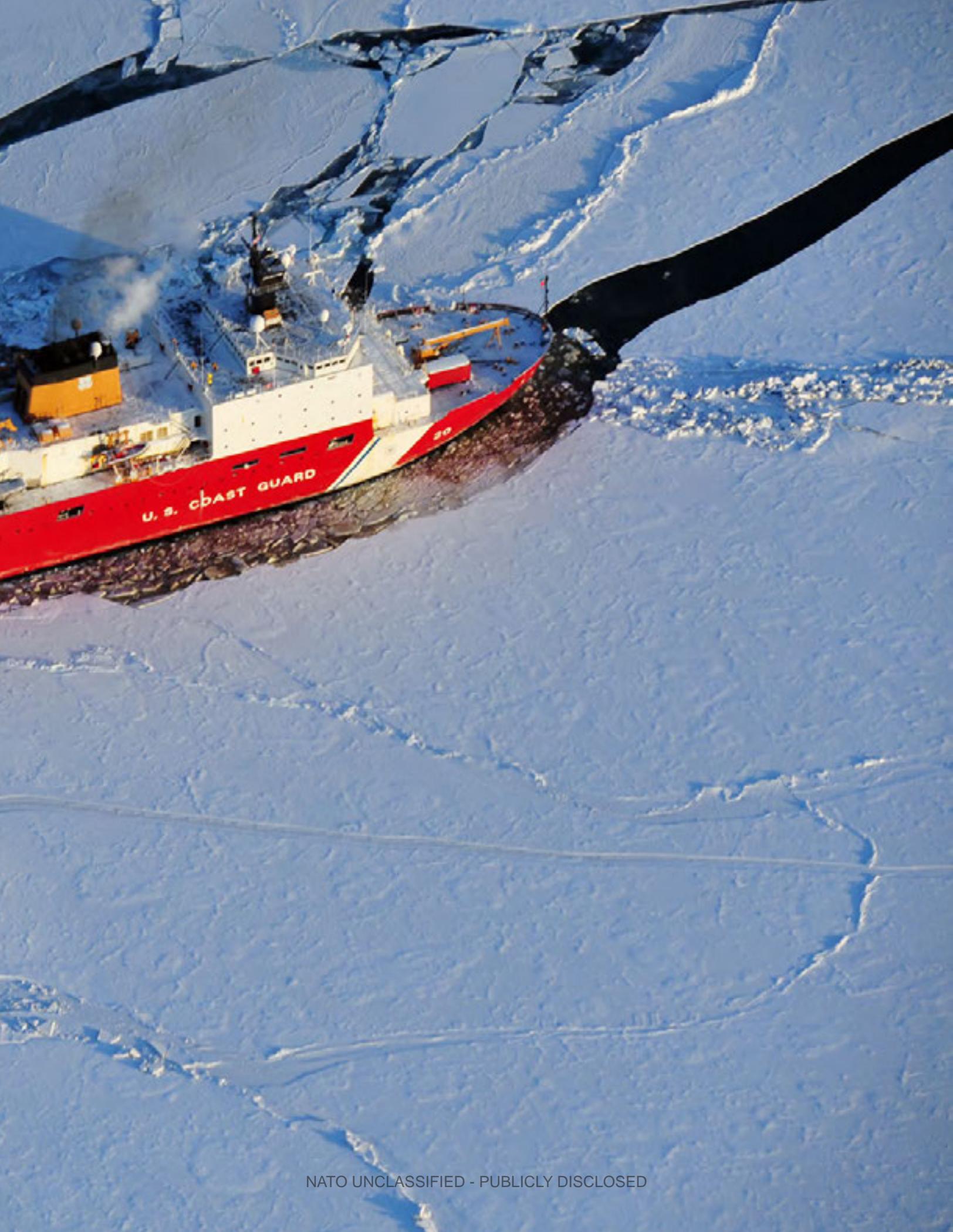
at the forefront of networked awareness, which may serve to increase their power and influence in the region.

## Implications

a. **Arctic Situational Awareness increasingly important.** Timely and effective situational awareness requires systems and networks that identify threats and enhance intelligence sharing. NATO can expect adversaries to modernise their MLoP and incorporate AI, space-based and counter-space capabilities. To prepare for operations in an ever-changing Arctic region, NATO must address these new realities and reconsider the traditional land-based focus of its exercises and scenarios.

b. **Exploitation of technology gaps.** ISR gaps and other interoperability challenges could prevent effective communication or the transmission of critical data to relevant security and defence partners. Once established it is relatively easy to gather information about military activities in the Arctic and Space, which enables Arctic and Space-faring states to avoid unnecessary and ultimately destabilizing arms build-ups in these two regions.

c. **Investment growth in space-based systems; private, commercial and military.** Investments in satellite and communication networks will grow significantly by 2040 to improve access and oversight in the Arctic. Although quick gains are possible by using cheaper, simpler and autonomous land-based solutions, major investments will likely focus on the space domain. Scale, type and vulnerability of space-based platforms determine their ability to operate effectively across all domains. The reliance on space-based systems to maintain superiority demands that NATO develop improved resilience in this domain.





## ECONOMICS/RESOURCES

1. The reduction of sea ice cover to record lows has encouraged states and international corporations with Arctic interests to reassess the potential of the region. However, the realities of operating in such demanding climatic conditions have decelerated talk of a 'race to Arctic resources.' The environmental challenges may delay an Arctic dividend for many decades, resulting in reduced Arctic interests if global demand for fossil fuels decreases. Technological advances and a rising global demand for resources, notably in rare earth minerals, will likely attract substantial investments by both state and commercial actors. The unlocking of considerable economic possibilities, notably energy resources, shipping, and fishing, will remain at the forefront of any conversation involving the region.

2. The economic situation of the circumpolar Arctic is distinct among world regions. The formal economies of Arctic nations rely on a relatively narrow set of commercial resources such as hydrocarbons, minerals, metals, fish, and timber. However, subsistence activities like fishing, hunting, gathering and herding still play an important role in the informal Arctic economy and are culturally important for Arctic populations. Although interdependent, the formal and informal economies share blurred boundaries. Formal structures would be necessary to make the northern economies independent of the Arctic coastal states in the south.

3. Despite potential risks to the environment, business in the region might grow at a pace

commensurate with technological advances. A potential global recession after COVID-19 could accelerate commercial exploitation of the Arctic, for instance by energy heavyweights, such as Royal Dutch Shell and BP. The Polar Code of the International Maritime Organizations and high insurance premiums may incentivise collective regulation of trading companies.

### 5.1 INCREASE IN MARITIME TRANSIT

4. Due to longer summer months, the two most important shipping routes in the Arctic Ocean, the Northeast Passage/Northern Sea Route (NSR) and the Northwest Passage (NWP), recorded a doubling of the total cargo volume in the years 2016 to 2018. This trend will likely increase significantly in coming years due to decreasing Arctic sea ice cover, resulting in increased potential for ship incidents and associated environmental impacts. The shortest route, the Transpolar Sea Route (TSR), could become a reality by mid-century.

5. Reconciling economic interests with the physical conditions and choke points in Arctic waters presents challenges. Complex navigation requirements, insufficient SAR capacities, and seasonally-based accessibility for non-Arctic class ships serve as influencing and limiting factors.

6. Russia understands its regulatory power over the NSR as falling within its EEZ, if not within Russia's contiguous zone. As of 2013, Russia has laid down "rules for shipping in the water areas of



Technological advances and a rising global demand for resources, notably in rare earth minerals, will likely attract substantial investments by both state and commercial actors.





the North Sea” in accordance with UNCLOS of 1982. This includes aircraft passage permissions, application fees and port/navigation costs to navigate in the NSR. The NSR circumvents maritime choke points at the Strait of Malacca and the Suez Canal, and Russia’s policy covers five inevitable choke points within Russia’s 12-mile territorial sea or between territorial islands that Russia could use to restrict shipping on the NSR.

7. The 2018 Beijing White Paper made the Polar Silk Road an integral part of China’s Belt and Road Initiative because of its strategic relevance to energy imports, and Russia has encouraged China to invest. For example, the China Ocean Shipping Company (COSCO) expanded its business activities in 2016 and founded a joint venture with the Russian PAO SOVCOMFLOT Shipping Company to operate liquid natural gas tankers from the Russian LNG project Yamal along the NSR to destinations in Northern Europe, Japan, South Korea and China. Despite seeking investments, Russia aims to maintain full control over the NSR and remains cautious in its joint interactions with China.

8. Japanese and South Korean shipping companies also want to use the NSR to reduce costs towards Europe. Both are dissatisfied with Russia’s practice of charging fees for crossing the NSR, and are equally paying close attention to Russia’s military development throughout the region.

9. Tourist vessels have cruised Arctic waters since the 1970s. Only two cruise companies offered a partial or full transit of the NSR in 2018, but private and commercial shipping related to tourism is on the rise. In contradiction, solitude and lack of human activity attract tourists to the Arctic, but increased tourist cruising could reduce its appeal.

10. The predominant shipping companies seem to be questioning the actual viability of the Arctic sea routes due to cost, unpredictable weather conditions, and strict regulations. Several Western companies have already declared that they will not use the NSR. Substantial usage of the NSR as a shipping route in the near future, at least from west to east, appears doubtful.

### Implications

a. **NSR and NSW transit shipping to increase overtime.** The short to medium term use of NSR for transit shipping could be much less than expected. The challenging Arctic environment and previously discussed circumstances imply a low viability of the NSR for transit as compared to other established shipping lanes. However, a interregional and destination shipping associated

with resource extraction projects will likely rise steadily and require the redesign of shipping ports (and the ships) to accommodate Arctic shipping.

b. **New cooperation required for shipping.** Increasing shipping in the Arctic and the associated risks require greater coordination and cooperation between states. To ensure safe passage and prevent deaths and environmental disasters, new technologies, more SAR resources, navigation infrastructure and the establishment of Arctic-specific safety and environmental standards for shipping are required.

c. **Freedom of Navigation challenged.** While Russia claims its regulatory power over the NSR on UNCLOS, other nations question Russia’s right to do so under international law, leading to geopolitical tensions. The US has a long-standing dispute with Canada over sovereign waters of the Northwest Passage (NWP). Similar freedom of shipping disagreements in the future could weaken NATO cohesion.

d. **Russia-China dominance anticipated.** Should Arctic routes become viable, Western companies may be reluctant to use them due to financial and political obstacles. Through their state-owned companies, China maintains the benefits has considerably more data/experience and benefits together with Russia through their state-owned companies, whereas the West would have to rely more on market forces or signals.

e. **Tourism impacts potentially disruptive.** Tourism could contribute to the growth and prosperity of Arctic communities and provide jobs, personal income, revenue, and financial capital for infrastructure. Transformation capabilities for societies, cultures and the environment require dialogue between the indigenous population, environmental organizations and the planning and operating activities in light of the consequences for the fragile socio-ecological system of the Arctic.

## 5.2 INCREASED INTEREST IN RESOURCE EXTRACTION

11. According to the European Environmental Agency, “receding ice cover will influence accessibility to mineral and energy resources both on land and in the Continental Shelf in the future.” It is projected that more than “\$100 billion could be invested in Arctic resource exploration and extraction over the next decade.”

12. Oil and gas consumption is likely continue to rise until 2040, unless offset by alternatives and renewable energies. Russia is aligning its corresponding production to the Asian markets

with a focus on strengthening its strategic relationship to China. However, environmental hostility, reliance on technology and the volatility of emerging meteorological patterns will continue to restrict the economic viability of the region in support of Russia's geopolitical interests.

13. Approximately 84% of Arctic resources on the edge of the continental shelf. These oil and gas reserves account for about 22% of the world's undiscovered and technically exploitable hydrocarbon resources with Russia claiming almost 80% of it. Canada, the US, and Norway are the other leading claimants. Since many countries are adopting a more environmentally friendly agenda and the extreme environmental conditions in the Arctic make the extraction of resources seem uneconomical, political decisions will increasingly drive future drilling plans.

14. Iron ore, coal, and other precious metals seem to be abundant in the Arctic, with mining in the Russian Arctic accounting for approximately 25% of the world's rough diamond supply. Deposits in Arctic Russia are estimated to have an approximately value of 1.5 to 2 trillion US dollars. Mining in Alaska, Arctic Canada, Svalbard and Greenland does not pose major financial competition to Russia. Deep-sea mining presents a great potential for mineral resources, but inaccessibility and steep development costs limit exploitability.

15. Approximately 50% of Russian federal budget revenues come from oil or gas exports, and Russia invests heavily in exploration and drilling in the Arctic. Sanctions have notably decreased the income generated and support to important infrastructure projects. China has become the largest foreign shareholder with investments in resource extraction efforts favouring Russia. South Korea, Japan and India are also considerably closer trade partners. Renewable energy sources providing an alternative to hydrocarbons will cause a decline in revenues from oil and gas exports within 10 years, likely leading to the dwindling political stability and financial health of Russia.

16. In addition to growing economic ties with Russia, China is making long-term investments in mining projects in Greenland. China is also pursuing various mining or drilling ventures in Canada, the United States and Norway to compensate for the exhaustion of their own rare earth material deposits in the next 20 years.

17. The seas of Barents, Greenland and Bering together produce about 10 percent of the world's sea catch. New Arctic deep-sea fisheries offer access to the world's most productive stocks. Most of these areas lie within the Eurasian Economic Commission (EEC) of the Arctic States. Ice cover currently deters significant commercial fishing in the Central Arctic Ocean (CAO), but fishing will increase as ice-free conditions prevail throughout this century. To prevent over-fishing, ten nations, including all Arctic coastal states, the EU, Iceland,

Japan, the Republic of Korea, Russia and China reached a deal that places the CAO off-limits to commercial fishers until at least 2034. Allies will need to be cautious of any future bilateral agreements that could hamper the enforcement of large-scale policies.

18. Climate change may suggest favourable conditions for growing crops in the Arctic region on a larger scale. However, higher costs, poor soil, short growing seasons, unpredictable climates and drier conditions associated with climate change will likely limit significant agricultural activities.

## Implications

a. **Dependency on technology.** The future of raw material extraction in the Arctic depends heavily on technical capacities in relation to extraction costs. Hence, the Arctic dividend is likely further in the future and more difficult to attain than commonly believed. Challenges to the exploitation of Arctic resources might make resource extraction economically unviable for the near future.

b. **Rise of NATO's resilience.** Improved energy and hydrocarbon supplies from the Arctic and High North could improve national security by reducing dependence on imports from potential global hot spots. On the other hand, development of green technologies and reduced demand for hydrocarbons could cause a shift in global security dynamics.

c. **Continued Russia-China economic relations.** Russia's dependence on hydrocarbon exports coupled with its inability to fund large resource extracting infrastructure projects will drive a stronger and more dynamic economic relationship with China, regardless of Western policies. China holds the upper hand in this relationship with a growing power asymmetry towards Russia. China's financial and maritime influence could cultivate strategic and commercial advantages on shores and in seas that belong to other nations.

d. **Shift of economic powers.** Significant resources in non-Russian areas could destabilise the Russian economic model. Other countries might also prioritise environmental concerns and sustainable development over quick economic gains. These dynamics could create rifts between the nations and shift the current balance of economic power.

e. **China's fishing rights efforts.** China might use its foreign direct investments (FDI) as a soft power to establish bilateral agreements and secure fishing rights within the EEZs of other nations. China might use coast guard vessels accompanying their fishing vessels and protect their fishing interests. Contested fisheries are a potential source of international tensions.

f. **Potential rising tensions between the indigenous population and industry.** Industrial or infrastructural developments may encroach upon lands and waters traditionally relied upon by

//

Approximately 84% of Arctic resources lie on the edge of the continental shelf. These oil and gas reserves account for about 22% of the world's undiscovered and technically exploitable hydrocarbon resources.

//



indigenous populations for subsistence resources. Disruptive commercial and governmental activities may contribute to unrest and protest by indigenous/local populations.

g. **Food security through less dependency.** An increase in Arctic agriculture due to climate change could increase the availability of fresh and cheaper products and foster less dependency for the local population, if cultural acceptance for local agriculture would become part of the traditional cultural livelihood.

## 5.3 INFRASTRUCTURE DEVELOPMENT

19. Multinational coordinated infrastructure projects at both sea and land are necessary to capitalize fully on economic opportunities in the Arctic. The extraction of raw materials in the Arctic necessitates the development of internationally linked roads, ports, railways and other critical infrastructures. Russia is already a major investor with potential interest in multinational efforts.

20. Except for a few railways, such as the Russian Trans-Siberian Railway feeding raw materials to some Arctic seaports, transport connections to the region are quite sparse and mostly serve only local needs. While the boggy terrain in summer makes overland transportation difficult, the frozen tundra in winter offers comparatively simple opportunities to move heavy industrial plants on ice roads.

21. The melting Arctic ice also creates new passageways for underwater cable connections allowing accelerated connections between continents. The idea of an Arctic data highway could attract investors seeking more speedy connections and transform the region into an international traffic node for data communication.

22. China has funded major infrastructure projects, such as the Arkhangelsk deep-water port, the Belkomur Railway and the majority of Russia's Arctic liquefied natural gas projects in the Arctic through FDIs. China's FDIs have improved seaports, roadways and geothermal farming efforts across the region. At the same time, some nations, like Denmark, have decided to postpone direct investments from China for airports, port facilities and roads.

23. Almost 70 percent of the infrastructure in the Arctic, including roads, railways, pipelines and industrial sites, as well as nearly half of the oil and gas drilling sites in the Russian Arctic, are built atop permafrost. Thaw of permafrost will lead to ground instability in the next 30 years. The estimated costs for neighbouring countries in the Arctic to overhaul this infrastructure would total around 100 billion US dollars.

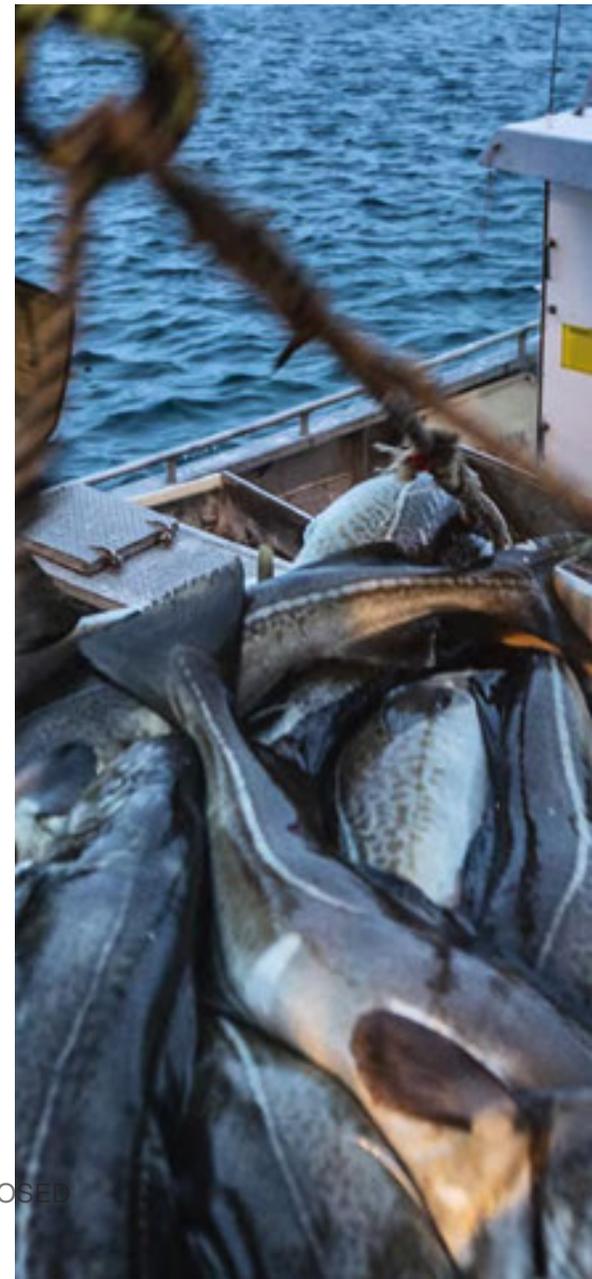
### Implications

a. **Indigenous livelihoods threatened.** Investments in new infrastructure may impact

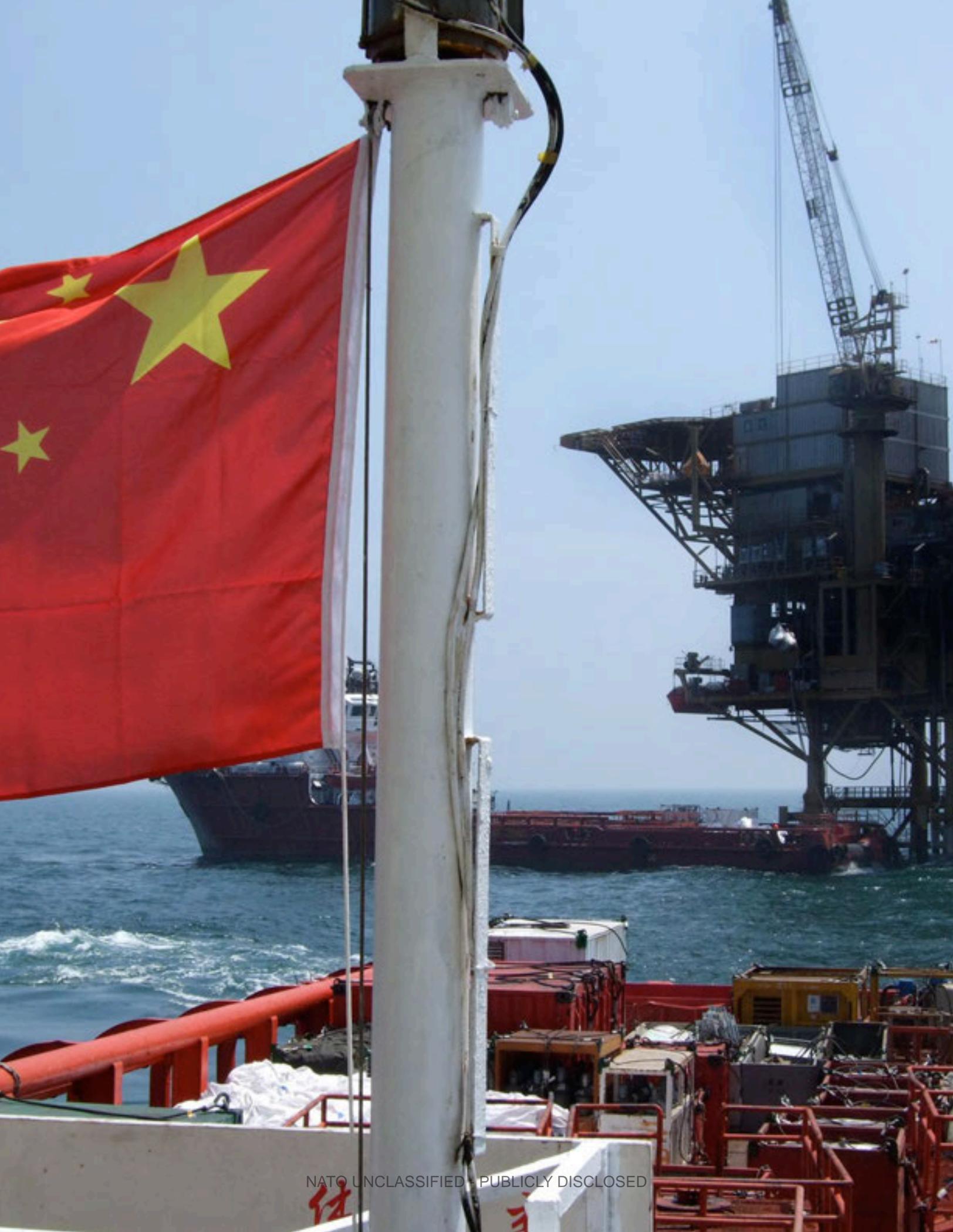
Arctic subsistence livelihoods, such as reindeer herding and seal hunting, tearing at the social fabric of the indigenous population. Indigenous populations should therefore be part of the solution to infrastructure investments.

b. **China's effective investments.** It is hard to predict and quantify when and how China will leverage its soft power through direct investments in Arctic infrastructure projects to influence decisions by Arctic states in favour of China. Recent actions in Greenland have already shown the viability of China leveraging its FDI as a soft power tool and as a potential precursor to introduce hard power in the foreseeable future.

c. **Indigenous livelihoods threatened.** The thawing of permafrost will put a considerable strain on the infrastructure and the population. Cities and towns may no longer have solid land to expand, and their residents may struggle to afford expensive housing or private businesses. Concerns about infrastructure longevity and associated costs will also question the feasibility of economic endeavours in the Arctic.







NATO UNCLASSIFIED - PUBLICLY DISCLOSED

## FUTURE ARCTIC SCENARIOS

1. The future can play out in an infinite number of ways in a region influenced by so many trends, notwithstanding strategic shocks or “black swan” events that cannot be foreseen or anticipated. Within the context of this report, the impacts of climate change driving a growing global interest in the Arctic and renewed geostrategic competition are the main drivers of a rapidly changing security environment in the Arctic region. Therefore, within the scope of this chapter, the nexus between climate change and competition will be given primacy, and all trends and implications will not be addressed or discussed equally. Firstly, in 2040 the average global temperature will be higher and still climbing, so Arctic conditions are certain to evolve. Notwithstanding the Paris Agreement to reduce greenhouse gases, even if all emissions were ceased immediately, global average temperatures would continue to increase for decades even if all emissions ceased immediately. Secondly, the level of Russian and Chinese cooperation, through their collective interests in the region, will have a bearing on how many of the other trends unfold, and to what extent.

2. Variations of the baseline future emerge from numerous signals fluctuating in strength, indicating minor to profound changes in the region. The intent of describing future scenarios is not to attempt to predict the future, but to provide scenarios that can serve to inform NATO policies and plans with respect to the developments in the Arctic and its relations with Russia and China, as well as amongst NATO Allies. Considering the trends laid out in the respective chapters covering

environmental, political, human, technology and economic/resources themes, the following describes the most likely baseline scenario for the Arctic and High North in 2040.

### Baseline Future Scenario: Arctic 2040 Cooperation – Status Quo maintained

3. The pace of climate change increasingly will influence not only the environment, but also political, human and economic/resources trends. Food/water security, maintaining energy systems and infrastructure fragility will pose serious implications for national security in Russia for many years to come. The trends identified in this report forms the baseline of a future in the Arctic up to 2040 and beyond.

4. The baseline future Arctic in 2040 will be one where cooperation remains intact and of paramount importance to both protect the region and maintain sustainability. By the summer of 2040, the Arctic and High North waters are open for international shipping and exploration, bringing about a significant change of perspective from today. Access to the Central Arctic Ocean (CAO) as international waters may lead to a much more global, connected Arctic. Cooperation between China and Russia will likely continue, if not expand, in the areas of exploration and research with a continued growth in militarisation. Allied nations may find opportunities to build upon both

“  
The pace of climate change increasingly will influence not only the environment, but also political, human and economic/resources trends.  
”



military and commercial cooperation, such as SAR response and coordination.

5. The Arctic Council (AC) will likely still act as the primary form of governance, but will not likely operate as the sole guardians of the region. The AC and the A8 will face pressures, regardless of cooperation, from recognised actors and in other forms, such as from changes to the physical environment. Many Arctic nations make up the Region's democratic governance, upholding liberal norms and withstanding challenges from China and Russia. Policing, measuring and limiting resource extraction, and managing shipping will be a key function of Arctic governance in 2040. New Alliances may have formed as dominant actors, notably with the continued rise of the commercial sector, but with management from a larger and more obliging AC.

6. The economic dynamics will determine if/how to maintain an accommodating Arctic. Russia's future has ties to the economic success of the region. Although less so for China, energy, shipping and protein alternatives will play a part in China's Arctic economic involvement. For the US and Canada, environmental protection may outrank energy concerns as an agenda item.

7. NATO cohesion over Arctic policies and engagement with Russia and China will not be without seams and points of tension, but dialogue will likely remain open and miscalculation limited.

## Alternative Scenarios

8. Three variations of the baseline describe potential deviations that might influence the Arctic's future and implications for Euro-Atlantic security. These variations should be viewed somewhat collectively and not in isolation. Considering the trends laid out in the respective chapters covering environmental, political, human, technology and economic/resources themes, the following three scenarios describe plausible alternative scenarios for the Arctic and High North in 2040.

### Alternative Scenario 1. Fragmented Arctic:

9. Arctic Council becomes dysfunctional and governance structures no longer satisfy any Arctic country, international organisation or observers such as China. Arctic countries are concerned with the widespread resource exploitation and increased international tensions throughout the region. Much of the global community perceives the Arctic as a storehouse of natural riches jealously guarded and developed by a handful of wealthy circumpolar nations. Preventing uncontrolled access to these vital resources, especially oil and natural gas, has

become an obsession for all Arctic stakeholders. Russia begins to act unilaterally in the following areas: resource exploration; enforcing control mechanisms through navigation measures over marine and air routes; addressing geopolitical issues, such as boundary disputes and the status of Svalbard; and continental shelf declaration. Due to the collapse of the governance mechanisms and persistent lack of cooperation within the Arctic Council, nations, including members of the Alliance, seek to achieve their national interests unilaterally. This increases the potential for confrontation over disputed areas. Under this non-cooperative environment, great power competition expands and revisionist powers, such as Russia and China, become more assertive in the Arctic.

10. The effects of climate change and global warming continues unabated causing extreme environmental stress in the Arctic. Greenhouse Gas (GHG) emissions have been unleashed globally at unprecedented rates. The result has been massive permafrost thawing (and disappearance), rapid glacial retreat in Greenland and Canada, extensive coastal shore erosion, and a historic retreat of Arctic sea ice in all marginal seas and the Central Arctic Ocean. Increasingly unilateral actions of the largest GHG emitting countries multiply the environmental damage. Lack of cooperation in the region to protect indigenous rights and safety, regulate exploitation of resources and solve environmental challenges leads to disputes. Left unresolved, any crisis could escalate to armed conflict, including hybrid warfare. In such a scenario, without an overarching governing body such as the Arctic Council to provide a forum for Arctic nations to resolve issues, pressures for NATO to respond and take a position challenges Alliance cohesion in the face of illusive and unachievable solutions. Seemingly inadequate or failed responses undermine public perception of the Alliance.

11. A fragmented Arctic may involve both accommodating and competitive aspects. On one side of the 'two Russia's' ledger, as the largest state in the region, it has legitimate sovereignty claims over 50% of the Arctic Ocean frontage and has broadly conducted itself as a responsible guardian of the region. This puts Russia in a position of relative strength by pushing a multipolar agenda while devaluing institutional decision-making. By consistently advocating a cooperation and stewardship agenda, it feeds the narrative that the West is rejecting Moscow's collaborative approach. Subsequently, Moscow can argue that it is the West dragging the region into wider geopolitical competition. On the other hand, the Russian Federation views NATO and the West as its primordial competitor and greatest challenge to

achieving its strategic goals. Therefore, Moscow increasingly seeks opportunistic advantage on multiple levels, as the sea-ice barrier that long secured its northern border slowly recedes and increases perceived security threats.

## Alternative Scenario 2. Enhanced Russia-China cooperation and militarisation

12. Russia-China cooperation traces back to the 1997 Joint Declaration on a Multipolar World and Establishment of a New International Order. This scenario sees that New International Order expand as Russia-China cooperation grows and the two nations progressively increase engagement in the Arctic. Russia supports the Chinese desire to become a near-Arctic stakeholder, using its role as an Arctic power to give China a voice in the Arctic Council concerning their activities in the region. Russia's historical presence in the region, extended coastline and effective ability to monitor and control the entire Northern Sea Route (NSR) permits them to dictate actions and achieve strategic goals on many levels. Russia sees cooperation with China as a means to gain access to Chinese support for greater commercialisation along the NSR, and thus increase Russia's physical presence. This support satisfies China's wishes to legitimise its greater presence in the High North despite being a non-Arctic nation, and it provides Russia with much-needed financial reinforcement of its Arctic endeavours beyond unilateral levels. Together the two nations can push the political agenda and commercial capabilities in their favour by expanding interests beyond what NATO can match. Increased presence and economic investment yield greater returns for each country.

13. With greater economic and research cooperation comes military support to China through combined operations where Chinese forces have access to Russian infrastructure. China replaces its challenger status to Russian military presence in the Arctic to one of supporter or even contributor, enhancing Russian claims to larger territories in the region and vast areas of untapped natural resources. Cooperation sees the Chinese presence expanding beyond current scientific research efforts to include greater military activities. Current Chinese activity in the Arctic consists of annual research vessel scientific explorations. By 2040, Russia shares its expertise with China on how to conduct submarine operations in the region, offers harbours and airfields, conducts joint exercises similar to VOSTOK 2018, and even shares R&D costs for a Russia-China air and missile defence architecture for the Arctic. NATO is forced to carefully

reconsider its deterrence and response postures to such a military build-up in the region in order to outpace and outthink any potential adversaries operating in the region. Excessive focus on the Arctic as a newly emerging region of interest detracts Alliance nations' interest and investment from other priorities, such as meeting goals of the 2015 Paris Agreement.

14. Economically, China and Russia cooperation in the North expands, with Russia supporting the continuation of Chinese Belt and Road Initiative (BRI) into the Arctic. The Chinese Polar Silk Road (PSR) enhances Beijing's soft power in the Region. Natural resource exploitation by both countries soars as the PSR and NSR allows the transport of newly tapped resources back to their respective nations, feeding their GDPs with financial boosts.

## Alternative Scenario 3. Independent China – Disrupting Governance and Control Assertion

15. In this scenario, China met its targets for rejuvenation and ambitions of becoming the predominant global superpower, and it leverages this position in the Arctic. The Chinese BRI achieves success, the PSR is established, and existing BRI partnerships expand. China's huge investments in the region justify its seat as an active member of the Arctic Council, and its claims as a near-Arctic state are accepted. As a result, China can advocate the legitimacy of its interests to other AC members in support of their expanded fishing, transportation, and resource exploitation goals. Their expanded interests accompany massive economic investments in Arctic infrastructure, such as airports or harbours. The China's comprehensive Military-Civil Fusion (MCF) initiative benefits from these investments, as commercial technological advancements interconnect with wide swaths of China's defence industry. The long-term implications pose a substantial challenge to the Alliance.

16. Increased fishing, transportation and oil and gas extraction required extensive power, which China achieved through nuclear energy. Independent power services are provided through nuclear self-contained, low capacity, floating nuclear power plants copied from Russian design. Moscow now regrets selling this capability during previous cooperative investments. These power plants produce massive amounts of electricity to support the growing infrastructure of the region, at the expense of immeasurable long-term harm to the fragile ecosystem. NATO faces the challenge of maintaining popular green energy objectives while

“  
Russia does not want to lose its advantages in the region to another competitor.”

A photograph of a person wearing a bright yellow jacket and dark pants, standing in a narrow, winding passage of a massive ice cave. The ice walls are a deep, translucent blue, with some white snow or ice debris on the floor. The lighting is dramatic, highlighting the textures and curves of the ice.

developing infrastructure or operating in the Arctic, while China self-imposes no such restrictions. China does not limit operations based upon concerns of environmental impacts or violations of established Arctic protection guidelines

17. Russia prefers to cooperate with the Western members of the Arctic Council as Chinese aggressiveness in the region poses a perceived threat to Russian sovereignty. The consequences of Chinese encroachment in Siberia and to the north in the Arctic jeopardise the likelihood of Russian-Chinese cooperation, as Russia does not want to lose its advantages in the region to another competitor. This approach paves the way to a collaborative atmosphere between Russia and the NATO countries that are also the members of the Arctic Council. Cooperation between NATO and Russia over Arctic governance arouses a more positive attitude from other Alliance nations with Russia and reinvigorates the NATO Russia Council (NRC).

18. Lastly, the Alliance struggles to keep pace with Chinese advancement. A lack of NATO unity on the definitions of the Arctic and High North, either as a global commons or as the sovereign property of the respective A8 nations, creates fissures in Alliance cohesion. Disunity paralyses Alliance decision-making with respects to Arctic policy.





NATO UNCLASSIFIED - PUBLICLY DISCLOSED

1. The Arctic has re-emerged as an area of significant **geostrategic interest**. The accelerated pace of climate change has transformed Arctic societies. The prospect of surging commercial activity and rapid technological advancement, combined with growing extra-regional interest and the proliferation of the knowledge, experience and capabilities needed to operate in the Arctic, means that the region is becoming more connected and integral to global life. As this process unfolds, the Arctic will make itself felt in ways that could significantly alter the global balance of power and the terms of great power rivalry and competition. While the trends outlined in this report may unfold peacefully, the potential for sudden and rapid change, as well as unpredictable shocks, do not guarantee stability.

2. This report has also shown that the Arctic **defies easy definition, whether in terms of geography, people, resources or legal regimes**. While it is common to think of the Arctic as a single region defined by its icy expanse, the reality is that there are many Arctic areas. Environmental, political, social, technological and economic/resources transformation will unfold in extremely diverse ways in the North American, European and Russian Arctic. Over-simplistic tropes about the Arctic as a frozen desert, empty frontier or prospective goldmine are damaging not just to the people that live there, but also to NATO's ability to make a clear-eyed assessment of what challenges and opportunities are likely and where they may unfold. Moreover, Allies must be ready for the trends to interact in complex ways. For example,

environmental and commercial transformation in some areas of the Arctic may lead to significant social and cultural disruption within NATO Arctic states, potentially exploited by hostile actors seeking to sow political discord and division within those states, disrupting the overall cohesion of the Alliance.

3. The behaviour of Russia and China in the Arctic is of most immediate concern to NATO. Again, treat cautiously any over-simplistic analogies about Russian military expansionism and the threat of a Russia-China axis in the region. Russian military activity has increased significantly over the past decade. In addition, Moscow sees its interests in the Arctic as achievable within the existing status quo of the rules-based international order, and so retains a preference for resolving challenges through the frameworks created collectively by the Arctic states. There appears to be little appetite in Moscow for inviting China to participate more formally in these arrangements. Regional cooperation among the A8 will continue to provide a buffer to Chinese ambition. A challenge for regional security will come if Russia suddenly decides status quo does not serve its best interests. Under these circumstances, the Alliance should expect Russian behaviour to become more disruptive. Whether that leads to a closer relationship between Moscow and Beijing will depend on the extent to which Chinese prioritises interests in the Russian Arctic over its interests in the wider Arctic. Yet any expansion of Chinese investment in the Arctic beyond Russia will further concerns about China's ambitions to become an

//  
The Arctic will make itself felt in ways that could significantly alter the global balance of power and the terms of great power rivalry and competition.

//



independent commercial and military actor in the region, with significant diplomatic influence of its own.

4. In addition to NATO's concerns about great power competition in the Arctic, the Alliance can no longer ignore that climate change necessitates immediate attention. Through the direct impact of changes to the environment, the geostrategic space has changed within a single generation, and even the present 'new normal' is unlikely to represent how the Arctic will look over the next 25 years.

5. As 'Arctic amplification' accelerates the rate of environmental change far beyond rates in the rest of the world, new infrastructure and transportation needs will emerge. Demands for economic and human security will arise among those who live in the Arctic and have long depended on environmental stability for their livelihoods. This transforming environmental complex is a threat multiplier given that climate change has the potential to accelerate competition, instability and human suffering. Although it will remain difficult to reliably predict gaps in our understanding of Arctic climate change or how science and technology will meet future challenges, governance systems and Instruments of Power must start adapting and preparing now for projected and anticipated changes.

6. The exploitation of technology in the region will enable commercial advancement and disrupt the balance of security. The challenge facing governments is understanding where and how to engage with innovation, as well as how technology may manifest in the hands of adversaries. The Arctic and High North will remain an extremely difficult operating environment, requiring significant investment and reliance on remote and specialised technologies to minimise human risk and maintain freedom of manoeuvre. Deception will become increasingly difficult as the proliferation of sensors increases. Space-based and autonomous technologies will create operational advantages in a region where situational awareness will grow significantly. Societal change and disruption will likely be profound, although it depends greatly on how environmental transformation interacts with economic currents, public opinion and technological advances.

7. The Alliance still needs to decide how much geostrategic significance to assign to the Arctic. While actors like China and the EU have been prolific in communicating their priorities and interests in the region, the Alliance has remained relatively cautious in its approach. Understandably, not all Alliance members will show the same level of geostrategic interest in the region as those

members geographically situated in the Arctic and Northern Europe. Nevertheless, NATO's perceived reticence to adopt an explicit Arctic focus over the past decade is coming under increasing pressure.

8. Activity and collective defence strands will belong primarily to those nations within the region, or with the capability to operate in the extreme, climatic conditions. That should not preclude NATO from adopting a comprehensive and inclusive regional policy that ensures Alliance-wide cohesion over, and support for, potential operations in the region should tensions worsen and a security crisis erupt. NATO needs to decide how and to what extent it will be involved in the Arctic beyond Article 5 commitments. Navigation to strategic goals or a pol/mil position may become increasingly difficult or potentially forced upon the Alliance as the uncertainty of climatic change becomes ever more influential.



# APPENDIX A

SUMMARY OF 5 THEMES, 15 TRENDS, AND 71 IMPLICATIONS

THEMES	TRENDS	IMPLICATIONS
ENVIRONMENT	<p><b>1.1 Accelerated Pace of Environmental change.</b> The Arctic area will become more accessible for both commercial and military operations. Therefore, the population will face an alteration in their surroundings.</p>	<ul style="list-style-type: none"> <li>a. Increased impact of climate change.</li> <li>b. Enhanced regional security focus.</li> <li>c. Arctic cooperation remains paramount.</li> <li>d. Russian response to environment change threatens international security.</li> <li>e. Non-traditional challenges gain importance in NATO planning.</li> </ul>
	<p><b>1.2 Arctic environment transformation.</b> The extent of change in the Arctic is so acute that it already exhibits signals of driving environmental changes elsewhere on the planet, notably as sea level rise.</p>	<ul style="list-style-type: none"> <li>a. Ice loss disrupting eco-systems.</li> <li>b. Unpredictable weather systems.</li> <li>c. Increasing commercial activity.</li> <li>d. Increasing military activity.</li> <li>e. Increasing human and natural disasters.</li> <li>f. Susceptible Arctic governance cohesion.</li> </ul>
	<p><b>1.3. Land and infrastructure degradation.</b> Extreme conditions affecting the Arctic land environment inflicts damage and degrades biodiversity, eco-systems, and infrastructure. Even with enhancing human resilience, environmental degradation affects inward and outward migration in northern regions.</p>	<ul style="list-style-type: none"> <li>a. Critical infrastructure damage and man-made disaster.</li> <li>b. Limited capacity to adapt.</li> <li>c. CO2/Methane and disease exposure.</li> <li>d. Biodiversity Collapse.</li> <li>e. Disruptive weather patterns.</li> <li>f. Infrastructure investments.</li> <li>g. Chinese investment expected to continue.</li> </ul>
POLITICAL	<p><b>2.1. Increasing geostrategic significance.</b> While the Arctic states and leading international bodies like the Arctic Council will continue to play a pivotal role in defining the region's future, extra-regional actors will also grow their presence and influence.</p>	<ul style="list-style-type: none"> <li>a. Interest in the Arctic will continue to increase</li> <li>b. Russia will maintain its dominance.</li> <li>c. Maritime space increasingly challenged.</li> <li>d. China's ambition increasing.</li> <li>e. Improvements to governance frameworks needed.</li> </ul>
	<p><b>2.2. Challenges to regional power (primacy of the A8).</b> With pressure growing from an increasing number of non-Arctic nations and other organizations looking to influence outcomes in the Arctic, challenges to A8 primacy are growing.</p>	<ul style="list-style-type: none"> <li>a. Pressure on existing Governance mechanisms.</li> <li>b. Sovereignty will remain a central issue.</li> <li>c. Maintaining international law.</li> <li>d. Escalation of tension possible.</li> <li>e. Economic relationships vital.</li> <li>f. Russia-China Co-Dependency not guaranteed.</li> </ul>
	<p><b>2.3. Increasing emphasis on regional security.</b> Growing geostrategic interest in the Arctic and challenges to the sovereignty and collective primacy of the Arctic states, combined with diverging national interests and the return of great power rivalries, will reshape the Arctic security environment in the decades ahead.</p>	<ul style="list-style-type: none"> <li>a. Operating space likely to become increasingly complex and uncertain.</li> <li>b. Adaptation and interoperability in a changing environment.</li> <li>c. Regional approach will need to be developed.</li> <li>d. Protection of National interests upheld.</li> <li>e. Adaptation, cooperation &amp; interoperability.</li> </ul>

# APPENDIX A

SUMMARY OF 5 THEMES, 15 TRENDS, AND 71 IMPLICATIONS

THEMES	TRENDS	IMPLICATIONS
HUMAN	<p><b>3.1 Societal change.</b> Regardless of the geopolitical churn, the Arctic region will face environmental, technological and economic changes that will cause societal disruption for all Arctic peoples and cultures.</p>	<ul style="list-style-type: none"> <li>a. Social balance of Arctic societies threatened.</li> <li>b. Lack or lose of residual knowledge and cultural placement.</li> <li>c. Growing divergence between indigenous population and industrial demands.</li> <li>d. Participation of the indigenous people in local decision-making rising.</li> </ul>
	<p><b>3.2 Shifting demographics.</b> Demographically, Arctic regions experiencing booms in resource extraction are experiencing a large inflow of typically young male workforce from outside the Arctic, resulting in a younger population in these regions. On the other hand, other regions in the Arctic are losing large numbers of young adults because of out-migration due to the lack of economic or educational prospects.</p>	<ul style="list-style-type: none"> <li>a. Decreasing populations challenge governments.</li> <li>b. Migration causing brain drain and brain waves.</li> <li>c. Gender imbalance on the rise.</li> <li>d. Endangered social contract in indigenous communities.</li> </ul>
	<p><b>3.3 Growth in urbanisation.</b> The growing Arctic economy is fuelling the trend toward the concentration of populations in larger urban centres and declines in smaller settlements.</p>	<ul style="list-style-type: none"> <li>a. Rising government-spending necessary.</li> <li>b. Inequality between urban and rural areas rising.</li> </ul>
TECHNOLOGY	<p><b>4.1. Increasing dependency on technology.</b> The Arctic has certain characteristics that nearly no other dimension has; the absolute remoteness and hostile environment make it largely impossible to sustain life without experience or technical support; and the need for cooperative actions and coordinated efforts essential to mount the most basic of operations.</p>	<ul style="list-style-type: none"> <li>a. NATO must leverage the industrial and technological complex.</li> <li>b. Russia will focus on areas of strength.</li> <li>c. NATO must promote integration.</li> <li>d. Technological protection.</li> </ul>
	<p><b>4.2. Technological transformation of the region.</b> Reliance upon autonomous and remote systems in the Arctic will increase.</p>	<ul style="list-style-type: none"> <li>a. Increased presence of autonomous systems across the region.</li> <li>b. Investment in technology will enhance operations in the Arctic.</li> <li>c. Growth in sustainment nodes.</li> <li>d. Increased risk from nuclear energy use.</li> <li>e. Over-reliance on technology.</li> </ul>
	<p><b>4.3. Importance of Situational Awareness.</b> Situational awareness will be critical as NATO seeks to provide the appropriate level of Indicators and Warning and balance its deterrence posture accordingly. In the Arctic, spaced-based sensor networks will become a more essential part of military information gathering over the coming decades.</p>	<ul style="list-style-type: none"> <li>a. Arctic Situational Awareness increasingly important.</li> <li>b. Exploitation of technology gaps.</li> <li>c. Investment growth in Space-based systems; private, commercial and military.</li> </ul>
ECONOMICS/RESOURCES	<p><b>5.1 Increase in maritime transit.</b> The two most important shipping routes in the Arctic Ocean, recorded a doubling of the total cargo volume in the years 2016 to 2018, due to longer summer months. This trend is likely to increase significantly in the coming years due to the decreasing sea ice cover in the Arctic.</p>	<ul style="list-style-type: none"> <li>a. Transit shipping.</li> <li>b. Shipping standards.</li> <li>c. Freedom of shipping.</li> <li>d. Tourism proposes change.</li> <li>e. Russia-China dominance.</li> </ul>
	<p><b>5.2 Increased Interest in resource extraction.</b> Receding ice cover will influence accessibility to mineral and energy resources both on land and in the Continental Shelf in the future.</p>	<ul style="list-style-type: none"> <li>a. Dependency on technology.</li> <li>b. Raise of NATO's resilience.</li> <li>c. Continued Russia-China economic relations</li> <li>d. Shift of economic powers.</li> <li>e. China's fishing rights efforts.</li> <li>f. Potential rising tensions between the indigenous population and industry.</li> <li>g. Food security through less dependency.</li> </ul>
	<p><b>5.3. Infrastructure development.</b> Almost 70 percent of the infrastructure in the Arctic, including roads, railways, pipelines and industrial sites, as well as nearly half of the oil and gas drilling sites in the Russian Arctic are built on permafrost which will be affected by thaw related ground instability in the upcoming 30 years.</p>	<ul style="list-style-type: none"> <li>a. Indigenous livelihood threatened.</li> <li>b. China's effective investments.</li> <li>c. Thawing permafrost threatens infrastructure and population.</li> </ul>

# BIBLIOGRAPHY

- Ahlenius, Hugo. "Economy of the Arctic, by Sector." UNEP/GRID-Arendal, 2005. <https://www.grida.no/resources/7001>.
- Alaska Native Science Commission. "What is traditional knowledge? -Traditional knowledge system in the Arctic." [http://www.nativescience.org/html/traditional\\_knowledge.html](http://www.nativescience.org/html/traditional_knowledge.html).
- Aliyev, N. "Why Does Russia Want to Resume Military Dialogue in the Arctic?". The Modern War Institute, West Point USA. July 2021.
- Ambassador Balton, David and Ulmer, Fran. "The Strategic Plan for the Arctic Council: Recommendations for Moving Forward." Belfer Center, Harvard, June 2019.
- American Bureau of Shipping. "Navigating the Northern Sea Route: Status and Guidance." ABS, 2018, 8.
- Arctic Council. "AMAP Assessment Report: Arctic Pollution Issues." AMAP, 1998.
- \_\_\_\_\_. "Together towards a sustainable Arctic: Iceland's Arctic Council chairmanship 2019-2021." May, 2019. <https://www.government.is/lisalib/getfile.aspx?itemid=d743ab8f-7d79-11e9-943f-005056bc530c>.
- Auerswald, David. "China's Multifaceted Arctic Strategy." War on the Rocks, May 24, 2019. <https://warontherocks.com/2019/05/chinas-multifaceted-arctic-strategy/>.
- Baev, Pavel. "Russia's Far North: The Contested Energy Frontier." Routledge, 2018.
- Balton, David and Zagorski, Andrei. "Implementing Marine Management in the Arctic Ocean." Russian International Affairs Council (RIAC) and Wilson Center – Polar Institute, 2020.
- Barents Watch. "What is the Arctic?" January 21, 2016. <https://www.barentswatch.no/en/articles/Hva-er-Arktis/>.
- Bennett, Mia. "South Korea, An Unlikely Polar Pioneer, Hosts Arctic Conference." The Maritime Executive, December 15, 2018. <https://www.maritime-executive.com/editorials/south-korea-an-unlikely-polar-pioneer-hosts-arctic-conference>.
- \_\_\_\_\_. "The Arctic shipping route no one's talking about." The Maritime Executive, May 8, 2019. <https://www.maritime-executive.com/editorials/the-arctic-shipping-route-no-one-s-talking-about>.
- Blake, Emily. "What will a ban on heavy fuel oil mean for Canada's Arctic?" Cabin Radio, November 25, 2020, modified December 1, 2020. <https://cabinradio.ca/50207/news/environment/what-will-a-ban-on-heavy-fuel-oil-mean-for-canadas-arctic/>.
- Borgerson, Scott et al. "The Emerging Arctic." Council On Foreign Relations, 2014. <https://www.cfr.org/interactives/emerging-arctic#!/emerging-arctic>.
- Boulègue et al. "Why we need to talk about Military activity in the Arctic: Towards a Military Code of Conduct." Briefing Note, The Arctic Year Book 2020.
- Boulègue, Mathieu. "Russia's Military Posture in the Arctic - Managing Hard Power in a 'Low Tension'" Chatham House, The Royal Institute of International Affairs, June, 2019.
- Boylan, B. et al. "Increased Maritime Traffic in the Arctic: Implications for International Cooperation and Security," Centre for Arctic Policy Study, University of Alaska Fairbanks, USA, December, 2019.
- Bradford, Nick. "Diminishing Arctic Sea Ice." The National Environment Education Forum, 2019. <https://www.neefusa.org/nature/water/diminishing-arctic-sea-ice>.
- Brady, Anne Marie. "China as a Polar Power." University of Canterbury, Christchurch, New Zealand, 2017.
- \_\_\_\_\_. "Facing up to China's Military Interests in the Arctic." The Jamestown Foundation, December 10, 2019. <https://jamestown.org/program/facing-up-to-chinas-military-interests-in-the-arctic/>.
- Brigham, Lawson et al. "Arctic Maritime Shipping Assessment 2009 Report." Arctic Council, April, 2009.
- Brigham, Lawson W. "Thinking about the Arctic's Future: Scenarios for 2040" The Futurist, September-October 2007.
- [https://www.aspeninstitute.org/wp-content/uploads/files/content/docs/ee/Arctic\\_WSI\\_Thinking\\_About\\_Arctics\\_Future\\_Scenarios.pdf](https://www.aspeninstitute.org/wp-content/uploads/files/content/docs/ee/Arctic_WSI_Thinking_About_Arctics_Future_Scenarios.pdf)

- Burnasheva, Daria et al. "The Arctic Year Book 2020 - Section II: Indigenous, Northern and Gender Perspectives." 2020. <https://arcticyearbook.com/arctic-yearbook/2020>.
- Byers, Michael. "Arctic Security and Outer Space." *Scandinavian Journal of Military Studies*, November 13, 2020. <https://sjms.nu/articles/10.31374/sjms.56/>.
- Cann, Whitney. "Using Big Technology To Achieve Small-Town Success." *Forbes*, Custom, Personal Economy. <https://www.forbes.com/hbscpersonaleconomy/big-tech-small-town.html>.
- Carrington, Damian. "Is deep sea mining vital for a greener future-even if it destroys ecosystems?" *The Guardian*, June 4, 2017. <https://www.theguardian.com/environment/2017/jun/04/is-deep-sea-mining-vital-for-greener-future-even-if-it-means-destroying-precious-ecosystems>.
- Centre for Permafrost (CENPERM). "Fast Facts about Permafrost." University of Copenhagen. <https://cenperm.ku.dk/facts/>.
- Central Committee of the Communist Party of China. "The 13th Five-Year Plan For Economic and Social Development Of The People's Republic of China, 2016-2020." Compilation and Translation Bureau, 2015.
- Centre for Permafrost (CENPERM). "Annual Report, University of Copenhagen, 2019." <https://www.e-pages.dk/ku/1458/>.
- Chalmers, M. "NATO and the North Atlantic: Revitalising Collective Defence." Royal United Services Institute, March 6, 2017. <https://rusi.org/publication/whitehall-papers/nato-and-north-atlantic-revitalising-collective-defence>.
- Charron, Andrea et al. "Breaking the Ice Curtain? Russia, Canada, and Arctic Security in a Changing Circumpolar World - A Tale of Two Russias". Whitney Lackenbauer and Suzanne Lalonde (eds), Canadian Global Affairs Institute (CGAI), 2019. [https://www.cgai.ca/breaking\\_the\\_ice\\_curtain](https://www.cgai.ca/breaking_the_ice_curtain).
- \_\_\_\_\_. "Arctic Security: NATO and the Future of Transatlantic Relations." *Turning the Tide: How to Rescue Transatlantic Relations*, European Institute for Security Studies, 2020.
- \_\_\_\_\_. "NATO and the Geopolitical Future of the Arctic," *The Arctic Yearbook (2020)*, <https://arcticyearbook.com/arctic-yearbook/2020/2020-briefing-notes/363-nato-and-the-geopolitical-future-of-the-arctic>
- Coates, Ken and Holroyd, Carin (Eds.). "The Palgrave Handbook of the Arctic Policy and Politics." Palgrave Macmillan, November 14, 2020.
- Condon, Richard. "Inuit Youth in a Changing World." *Cultural Survival Quarterly Magazine*, June, 1988. <https://www.culturalsurvival.org/publications/cultural-survival-quarterly/inuit-youth-changing-world>.
- Congressional Research Service. "Changes in the Arctic: Background and Issues for Congress." May 22, 2020, updated February 1, 2021.
- Conley, Heather and Melino, Matthew. "America's Arctic Moment: Great Power Competition in the Arctic to 2050." Centre for Strategic and International Studies (CSIS), March 2020.
- \_\_\_\_\_. "U.S. - Sino Relations in the Arctic." Centre for Strategic and International Studies (CSIS), January 2017.
- Council of the European Union. "Council Conclusions on EU Arctic Policy." European Union, 2019.
- Curwood, Steve. "Arctic Gender Imbalance." *The World*, July 28, 2008. <https://www.pri.org/stories/2008-07-28/arctic-gender-imbalance>.
- Danilov, Peter B. "Russia Wants to Resume Meetings Between Arctic Defense Chiefs." *High North News*, January 19, 2021. <https://www.highnorthnews.com/en/russia-wants-resume-meetings-between-arctic-defense-chiefs>
- Denchak, Melissa. "Permafrost: Everything you Need to Know." *Natural Resources Defense Council*, June 26, 2018. <https://www.nrdc.org/stories/permafrost-everything-you-need-know#sec-impacts>.
- Department of Economics and Social Affairs Population Dynamics. "World Population Projections 2019." United Nations, 2019. <https://population.un.org/wpp/>.
- Depledge, Duncan. "NATO and the Arctic, The Need For a New Approach." *The Rusi Journal*, 2020, 89. <https://doi.org/10.1080/03071847.2020.1865831>.
- \_\_\_\_\_. "Train Where you Expect to Fight: Why Military Exercises Have Increased in the High North?." *Scandinavian Journal of Military Studies*, December 16, 2020. <https://sjms.nu/articles/10.31374/sjms.64/>.
- \_\_\_\_\_. "Why we must watch Sino-Russia relations in the Arctic." *SundayGuardianLive*, November 28, 2020. <https://www.sundayguardianlive.com/opinion/must-watch-sino-russia-relations-arctic>.
- Depledge, Duncan and Kennedy-Pipe, Caroline. "The Arctic and The High North." *NATO Strategic Foresight Analysis (SFA)*, Workshop – Opinion Report, Loughborough University, UK, September 2019.
- Depledge, Duncan et al. "Why we need to talk about Military activity in the Arctic: Towards a Military Code of Conduct." *Briefing Note*, *The Arctic Year Book 2019*.
- Devyatkin, Pavel. "Russia's Arctic Strategy: Maritime Shipping (Part IV)." *The Arctic Institute*, March, 27, 2018. <https://www.thearcticinstitute.org/russias-arctic-strategy-maritime-shipping-part-iv/>.
- Digges, Charles. "Russian-Chinese Relations Are Warming the Arctic." *Bellona*, May 24, 2019. <https://bellona.org/news/arctic/2019-05-russian-chinese-relations-are-warming-the-arctic>
- Dodds, Klaus and Nutall, Mark, 'The Arctic: What Everybody Needs to Know,' Oxford University Press, London, 2019.
- Eaton, Daysha. "Rising Temperatures Kick-Start Subarctic Farming in Alaska." *NPR*, November, 1, 2015. <https://www.npr.org/2015/11/01/453337333/rising-temperatures-kick-start-sub-arctic-farming-in-alaska>.

- Eckstein, Megan. "FOGGO: Changing Conditions Require New Arctic Strategy, International Code of Conduct." UNSI News, June 26, 2020. <https://news.usni.org/2020/06/26/foggo-changing-conditions-require-new-arctic-strategy-international-code-of-conduct>
- EEAS10 2011-2021 European Union External Action Service. "EU Arctic Policy - Overview." European Commission, February 20, 2017. [https://eeas.europa.eu/headquarters/headquarters-homepage/20956/arctic-short-introduction\\_en](https://eeas.europa.eu/headquarters/headquarters-homepage/20956/arctic-short-introduction_en).
- Emelyanova, Anastasia. "Population projections of the Arctic by levels of education." University of Oulu, November 2017.
- Encyclopaedia Britannica. "Arctic: Northernmost Region of the World: Economy." 2019. <https://www.britannica.com/place/Arctic/The-economy>.
- Epstein, H.E. et al. "Tundra Greenness." Arctic Report Card, 2016. <https://arctic.noaa.gov/Report-Card/Report-Card-2020/ArtMID/7975/ArticleID/879/Tundra-Greenness>.
- European Commission. "Social and Cultural Changes in the European Arctic." EU Arctic Information Centre, May 2014, 3.
- \_\_\_\_\_. "Walking on Thin Ice: A Balanced Arctic Strategy for the EU." ESPC Strategic Notes, Issue 31, July 2019, 2-3.
- European Environmental Agency. "Arctic Resources." European Environmental Agency, June 07, 2017. <https://www.eea.europa.eu/data-and-maps/figures/arctic-resources>.
- Exner-Pirot, H. et al, "Form and Function: The Future of the Arctic Council." The Arctic Institute, Centre for Circumpolar Security Studies, February 2019.
- Foxhall, Andrew. "Covid-19 is testing Putin's Regime." The Spectator, April 29, 2020. <https://www.spectator.co.uk/article/covid-19-is-testing-putin-s-regime>.
- Frederiksen, Mads Qvist. "4 ways climate change is opening the Arctic for business." World Economic Forum September 27, 2019. <https://www.weforum.org/agenda/2019/09/4-ways-climate-change-is-opening-the-arctic-up-to-business/>.
- Goodman, S. and Kertysova, K. "The Nuclearization of the Russian Arctic: new reactors, new risks." European Leadership Network, June 26, 2020.
- Goodmann, Sherri and Maddox, Marisol. "China's Growing Arctic Presence." The Wilson Center, November 19, 2018. <https://www.wilsoncenter.org/article/chinas-growing-arctic-presence>.
- Gorbachev, Mikhail. S. "The Speech in Murmansk: At the ceremonial meeting on the occasion of the presentation of the Order of Lenin and the Gold Star Medal to the city of Murmansk." Novosti Press Agency Publishing House, October 1, 1987.
- Gorodentsev, Anya. "The Not-So Frozen Conflict: Russia's Ambitions in the Arctic and their Implications for NATO in the Far North." University of Vermont, 2019.
- Government of Canada. "Canada's Arctic and Northern Policy Framework: Forward." Ottawa, November 2019. <https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/156052330587>.
- Government of Northwest Territories. "7.3 Trends in shipping in the Northwest Passage and the Beaufort Sea." Environment and Natural Resources, May 29, 2015. <https://www.enr.gov.nt.ca/en/state-environment/73-trends-shipping-northwest-passage-and-beaufort-sea>.
- Gushin, Arthur. "China, Iceland and the Arctic." The Diplomat, May 20, 2015. <https://thediplomat.com/2015/05/china-iceland-and-the-arctic/>.
- Hamilton, Lawrence et al. "Demographic variation and changes in the Arctic." IOP Publishing Ltd., November 13, 2018.
- Heleniak, Timothy et al. "Cities on Ice: Population change in the Arctic." Nordregio. <https://nordregio.org/nordregio-magazine/issues/arctic-changes-and-challenges/cities-on-ice-population-change-in-the-arctic/>.
- \_\_\_\_\_. "Arctic Yearbook 2014: Migration in the Arctic." 2014.
- Highleyman, Scott. "3 Reasons to keep High Sea Arctic fishing on Ice." PEW, July 20, 2015. <https://www.pewtrusts.org/en/research-and-analysis/articles/2015/07/20/3-reasons-to-keep-high-seas-arctic-fishing-on-ice>.
- Hoag, Hannah. "Nations agree to ban fishing in Arctic Ocean for at least 16 years." American Association for the Advancement of Science, December 1, 2017. <https://www.sciencemag.org/news/2017/12/nations-agree-ban-fishing-arctic-ocean-least-16-years>.
- Hovelsrud, Grete et al. "Arctic Societies, Cultures, and Peoples in a Changing Cryosphere." AMBIO: A Journal of the Human Environment, December 1, 2011. <https://bioone.org/journals/ambio-a-journal-of-the-human-environment/volume-40/issue-sup1/s13280-011-0219-4/Arctic-Societies-Cultures-and-Peoples-in-a-Changing-Cryosphere/10.1007/s13280-011-0219-4.short> [https://publications.parliament.uk/pa/cm201719/cmselect/cmdfence/388/38805.htm#\\_idTextAnchor002](https://publications.parliament.uk/pa/cm201719/cmselect/cmdfence/388/38805.htm#_idTextAnchor002).
- Huebert, Robert. "United States Arctic Policy: The Reluctant Arctic Power," Social Science Research Network, October 2017.
- International Legal Material. "China-Russia: Joint Declaration on a Multipolar World and the Establishment of a New International Order," April 23, 1997. Cambridge University, <https://www.jstor.org/stable/pdf/20698707.pdf?refreqid=excelsior%3A337dcedbb264580e5d1d5051c3099bf8>.

- International Maritime Organization. "International code for ships operating in Polar Waters." Polar Code, 2018.
- Jiang, Yang. "China in Greenland: Companies, Government and Hidden Intentions?" Danish Institute for International Studies, October 23, 2018.
- Johnson, Anne et al. "Arctic Matters: Global Connection to Changes in the Arctic." National Research Council, 2015, 4-28. <https://books.nap.edu/read/21717/chapter/1>.
- Jungsberg, Leneisja et al. "Atlas of population, society and economy in the Arctic." Nordregio, September 18, 2019, 13. <https://nordregio.org/publications/atlas-of-population-society-and-economy-in-the-arctic/>.
- Kilman, Daniel et al. "Grading China's Belt and Road." Center for a New American Security, April 8, 2019. <https://www.cnas.org/publications/reports/beltandroad>.
- Koenig, Ravenna. "Prospect of Commercial Fishing in Central Arctic Ocean Poses Big Questions for Science." KTOO, March 5, 2019. <https://www.ktoo.org/2019/03/05/prospect-of-commercial-fishing-in-central-arctic-ocean-poses-big-questions-for-science/>.
- Lackenbauer, P. Whitney. "Breaking the Ice Curtain? Russia, Canada and Arctic Security in a changing circumpolar world." Canadian Global Affairs Institute, 2019.
- Lackenbauer, P Whitney et al., "China's Arctic Ambitions and What They Mean for Canada." University of Calgary Press, 2018.
- Larsen, J. Nymand and Petrov, Andrey. "The Palgrave Handbook of Arctic Policy and Politics: The Economy of the Arctic." Palgrave Macmillan, Coates, S. Ken and Holroyd, Carin (Eds.), November 14, 2020.
- Larsen, Joan and Fondahl, Gail (Eds.). "Arctic Human Development Report: Regional Processes and Global Linkages." Norden, 2014.
- \_\_\_\_\_. "Arctic Human Development Report: Regional Processes and Global Linkages." Norden, 2014, 24.
- Larsen, Joan and Fondahl, Gail (Eds.). "Arctic Human Development Report: Regional Processes and Global Linkages." Norden, 2014.
- Larsen, Joan et al. (Eds.). "Arctic Social Indicators." Norden, 2014, 74.
- Maeda, Ken and Kimura, Noriaki. "Temporal and spatial change in the relationship between sea-ice motion and wind in the Arctic." Polar Research, November 26, 2020. <https://polarresearch.net/index.php/polar/article/view/3370>.
- MUNIN. "Maritime Unmanned Navigation through Intelligence in Networks." 2016. <http://www.unmanned-ship.org/munin/>.
- McFarland, Kelly and Lide, Vanessa. "The Arctic is Melting. Here's Why Cooperation and Diplomacy Get So Complicated." Washington Post, July 30, 2018. <https://www.washingtonpost.com/news/monkey-cage/wp/2018/07/30/the-arctic-is-melting-heres-why-cooperation-and-diplomacy-get-so-complicated/>.
- Melia, N. et al. "Sea Ice Decline and 21st Century Trans-Arctic Shipping Routes." American Geophysical Union (AGU), August 23, 2016.
- Merculieff, Ilarion et al. "Arctic Traditional Knowledge and Wisdom: Changes in the North American Arctic." Arctic Council, 2018.
- Micallef, Joseph V. "Is the Arctic the Cruise Industry's Newest Frontier." Forbes, September 20, 2018. <https://www.forbes.com/sites/joemicallef/2018/09/20/is-the-arctic-the-cruise-industrys-newest-frontier/#55852a174191>.
- Moynihan, Harriet. "China expands its Global Governance Ambitions in the Arctic." Chatham House, October 15, 2018.
- Nafisa, Yeasmin et al. (Eds.). "Immigration in the Circumpolar North: Integration & Resilience." UArctic, June 3, 2019. <https://www.uarctic.org/news/2019/6/invitation-to-contribute-immigration-in-the-circumpolar-north-integration-resilience/>.
- Nakano, Jane. "China Launches the Polar Silk Road." Center for Strategic and International Studies, February 2, 2018. <https://www.csis.org/analysis/china-launches-polar-silk-road>.
- NASA. "2020 Arctic Sea Ice Minimum at Second Lowest Record." Global Climate Change, Vital Signs of the Planet, September 21, 2020. <https://climate.nasa.gov/news/3023/2020-arctic-sea-ice-minimum-at-second-lowest-record/>.
- National Centers for Environmental Information. "State of the Climate: Global Snow and Ice - April 2020." NOAA, May 2020. <https://www.ncdc.noaa.gov/sotc/global-snow/202004>.
- National Ocean Economics Program. "Arctic Fisheries." NOEP, 2018. <https://oceanomics.org/arctic/fisheries/>.
- National Oceanographic and Atmospheric Administration. "Pacific Marine Environmental Laboratory-Arctic Zone." NOAA, 2019. <https://www.pmel.noaa.gov/arctic-zone/faq.html>.
- National Snow & Ice Data Center. "All About Arctic Climatology and Meteorology – Factors Affecting Arctic Weather and Climate – Patterns in Arctic Weather and Climate." NSIDC, May 4, 2020. <https://nsidc.org/cryosphere/arctic-meteorology/index.html>.
- NATO Office of Secretary General. "NATO 2030: United for a New Era." NATO Reflection Group, Brussels, November 25, 2020.
- NATO Science and Technology Organisation. "Exploring the S&T Edge," Science and Technology Trends 2020-2040, March, 2020. <https://www.sto.nato.int/pages/tech-trends.aspx>.
- NATO Supreme Allied Command Transformation (SACT). "Regional Perspectives Report On Russia." Strategic

- Plan and Policy Strategic Foresight Analysis Team, January, 2021.
- Nobel, Justin. "Farming in the Arctic: It Can Be Done." *Modern Farmer*, October 18, 2013. <https://modernfarmer.com/2013/10/arctic-farming/>.
- North American Aerospace Defence Command (NORAD). "NORAD Agreement." NORAD Public Affairs, 2021. <https://www.norad.mil/About-NORAD/NORAD-Agreement/>.
- North American and Arctic Defence and Security Network (NAADSN). "Understanding the Future Arctic Security Environment: Applying NATO Strategic Foresight Analysis to Canadian Arctic Defence and Security." 2020.
- North Atlantic Treaty Organisation (NATO). "Cyber Defence." September 25, 2020. [https://www.nato.int/cps/en/natohq/topics\\_78170.htm](https://www.nato.int/cps/en/natohq/topics_78170.htm)
- \_\_\_\_\_. "NATO Forward Presence." Supreme Headquarters Allied Powers Europe (SHAPE), 2021. <https://shape.nato.int/operations/enhanced-forward-presence>.
- \_\_\_\_\_. "Collective Defence - Article 5." March 22, 2016. [https://www.nato.int/cps/en/natohq/topics\\_110496.htm](https://www.nato.int/cps/en/natohq/topics_110496.htm).
- \_\_\_\_\_. "SACEUR, JFC Norfolk Sign Memorandum Of Understanding." Supreme Headquarters Allied Powers Europe (SHAPE), October 6, 2020. <https://shape.nato.int/news-archive/2020/saceur-jfc-norfolk-sign-memorandum-of-understanding>.
- Norwegian Ministries. "Norway's Arctic Policy – between geopolitics and social development", Norwegian Ministry of Foreign Affairs and Norwegian Ministry of Local Government and Modernisation, November 2017.
- Nuttall, Mark. "The Arctic is Changing: An Environment at Risk." Stefansson Arctic Institute, 2000. <http://www.thearctic.is/articles/overviews/changing/enska/index.htm>.
- O'Rourke, Ronald et al. "Changes in the Arctic: Background and Issues for Congress." Congressional Research Service, February 1, 2021.
- Oddsóttir, Embla. "Conference Report on Gender Equality in the Arctic-Current Realities and Future Challenges." Icelandic Ministry of Foreign Affairs, 2014.
- Office of the Chief Scientist. "The Future of Space 2060 and Implications for U.S. Strategy: Report on the Space Futures Workshop." United States Air Force Space Command, September, 2019.
- Olsen, John Andreas. "Introduction: Security in Northern Europe." Whitehall Paper 93:1, October 15, 2018, 1-3. <https://doi.org/10.1080/02681307.2018.1508942>.
- Organization for Security and Co-operation in Europe (OSCE). "Vienna Document 2011 on Confidence- and Security- Building Measures." November 30, 2011.
- Pachuan, R.K. et al. (Eds.). "Climate Change 2014: Synthesis Report." Intergovernmental Panel on Climate Change (IPCC), 2014.
- Paris, Costas. "China, Russia's Carriers to ship gas on the Arctic Route." *The Wall Street Journal*, June, 11, 2019. <https://www.wsj.com/articles/china-russia-carriers-to-ship-gas-on-arctic-route-11560284812>.
- Pearce, Fred. "As Climate Change Worsens, a Cascade of Tipping Points Loom." *Yale Environment 360*, December 5, 2019. <https://e360.yale.edu/features/as-climate-changes-worsens-a-cascade-of-tipping-points-looms>.
- Pincus, Rebecca. "NATO North: Building a Role for NATO in the Arctic." *War on the Rocks*, November 6, 2019. <https://warontherocks.com/2019/11/nato-north-building-a-role-for-nato-in-the-arctic/>.
- Quillerou, Emmanuelle et al. "The Arctic Opportunities, Concerns and Challenges." *Ocean-climate.org*, 2018.
- Rinnan, Arne. "GNSS in the Arctic." *Kongsberg*, October 17, 2010.
- Roberts, John. "Russia's gas challenge: the consequences for China, Central Asia, Europe and the USA." *The Journal of World Energy Law & Business*, Volume 9, Issue 2, January 22, 2016.
- Rodman, Lindsay L. "Iceberg Dead Ahead! Deconstructing the Pentagon's Arctic Strategies." *War on the Rocks*, September 25, 2019. <https://warontherocks.com/2019/09/iceberg-dead-ahead-deconstructing-the-pentagons-arctic-strategies/>.
- Rogers, J. "A Comprehensive Approach to Countering Unmanned Aircraft Systems: Future Threats: Military UAS, Terrorist Drones and the Dangers of the Second Drone Age." Joint Air Power Competence Centre, 2020.
- Romanovski, Vladimir. "Melting Permafrost Could Damage Infrastructure for 3.6 Million People." *Yale Environment 360*, December 11, 2018. <https://e360.yale.edu/digest/melting-permafrost-could-damage-infrastructure-for-3-6-million-people>.
- Rosen, Yereth. "Arctic Fish Populations Changing as Ice Dwindles, Report Says." *Eye On the Arctic, Alaska Dispatch News*, August 15, 2016. <https://www.rcinet.ca/eye-on-the-arctic/2016/08/15/arctic-fish-populations-changing-as-ice-dwindles-report-says/>
- Roston, Eric. "How a melting Arctic changes everything – Part III: The Economic Arctic." *Bloomberg*, December 29, 2019. <https://www.bloomberg.com/graphics/2017-arctic/the-economic-arctic/>.

- Russian Federal State Policy. "Arctic: Basic Principles 2035," March 2020.
- Saki, Hayashi. "The Arctic Emerges as a Cooperation Hotspot for Japan and Russia." *Nikkei, Asian Review*, December 20, 2018. <https://asia.nikkei.com/Politics/International-relations/Arctic-emerges-as-collaboration-hot-spot-for-Japan-and-Russia>.
- Schaps, Karolin. "Royal Dutch Shell pulls plug on Arctic exploration." *Reuters*, September 28, 2015. <https://www.reuters.com/article/us-shell-alaska-idUSKCN0RS0EX20150928>.
- Scheiber, Melody. "The Race to Save Arctic Cities as Permafrost Melts." *Bloomberg City Lab*, May 10, 2018. <https://www.citylab.com/environment/2018/05/the-race-to-save-arctic-cities-as-permafrost-melts/559307/>.
- Schwartz, Paul. "Russian Science and Technology: Current State And Implications For Defense." *The Russian Military In Contemporary Perspective*, Stephen J. Blank (editor), U.S. Army War College Press, 2019.
- Segodnya, Rossiya. "The Arctic." *Arctic.ru*, 2021. <https://arctic.ru/population/>
- Sevunts, Levon. "China's Arctic Road and Belt Gambit." *The Barents Observer*, October 3, 2017. <https://thebarentsobserver.com/ru/node/2996>.
- Shapovalova, Dians. "Oil Spill in Siberia: Are we Prepared for Permafrost Thaw?" *The Arctic Institute – Centre for Circumpolar Security Studies*, June 11, 2020. <https://www.thearcticinstitute.org/oil-spill-siberia-prepared-permafrost-thaw/>.
- Shiklomanov, N. I. et al. "Climate Change and Stability of Urban Infrastructure In Russian Permafrost Regions: Prognostic Assessment Based on GCM Climate Predictions." *Geographical Review*, October 04, 2016. <https://doi.org/10.1111/gere.12214>.
- Smelror, Morten. "Geological Survey of Norway: Mining in the Arctic." *Arctic Frontiers*, January 25, 2011.
- Staalesen, Atle. "Russia Has Several Thousand Nuclear Objects Dumped on its Arctic Sea Floor. Now, the Most Dngerous Will Be Removed." *The Barents Observer*, August 04, 2020. <https://thebarentsobserver.com/en/ecology/2020/08/russia-has-several-thousand-nuclear-objects-dumped-its-arctic-sea-floor-now-most>.
- Stephan, Katrin. "Societal Impacts of a Rapidly Changing Arctic." *Springer Links*, July 3, 2018. <https://link.springer.com/article/10.1007/s40641-018-0106-1>
- Stepien, Adam et al. "The Changing Arctic and the European Union." *Brill Nijhoff*, October 15, 2015.
- Stepien, Adam. "Arctic Indigenous Peoples, Climate Change and Impacts, and Adaptation". *E-International Relations*, October 14, 2014. <https://www.e-ir.info/2014/04/10/arctic-indigenous-peoples-climate-change-impacts-and-adaptation/>.
- Stronski, Paul and Ng, Nicole. "Cooperation and Competition: Russia and China in Central Asia, the Russian Far East, and the Arctic." *Carnegie*, February 28, 2018. <https://carnegieendowment.org/2018/02/28/cooperation-and-competition-russia-and-china-in-central-asia-russian-far-east-and-arctic-pub-75673>.
- Tamnes, Rolf. "The High North: A Call for a Competitive Strategy." *RUSI, Whitehall Papers*, Volume 93, Issue 1, 2018, 8-22.
- The Arctic Coast Guard Forum Official Website, <https://www.arcticcoastguardforum.com/about-acgf>.
- The Arctic Council. <https://arctic-council.org/en/about/>.
- The Economist. "A warmer Russia: Why Russia is ambivalent about global warming." *The Economist*, September 19, 2019. <https://www.economist.com/europe/2019/09/19/why-russia-is-ambivalent-about-global-warming>.
- The World Bank. "Population Ages 0-14. (% of total population)." 2019. <https://data.worldbank.org/indicator/sp.pop.0014.to.zs>.
- Ties, Dams et al. "Presence before power: China's Arctic Strategy in Iceland and Greenland." *Clingendael Report*, Netherlands Institute of International Relations, June 2020.
- Trenin, Dimitri. "Russia's Evolving Grand Eurasia Strategy: Will It Work?" *Carnegie Moscow Center*, July 20, 2017. <https://carnegie.ru/2017/07/20/russia-s-evolving-grand-eurasia-strategy-will-it-work-pub-71588>.
- \_\_\_\_\_. "Russia and China in the Arctic: Cooperation, Competition, and Consequences." *Carnegie Moscow Center*, March 31, 2020. <https://carnegie.ru/commentary/81407>. [accessed 18.02.2021]
- Trevithick, Joseph. "The Navy is Building a Network of Drone Submarines and Sensor Buoys in the Arctic." *The War Zone*, October 1, 2020. <https://www.thedrive.com/the-war-zone/36821/the-navy-is-building-a-network-of-drone-submarines-and-sensor-buoys-in-the-arctic>.
- Turunen, Eeva. "Share of elderly population in the Arctic." *Nordregio*, March 21, 2019. <https://www.nordregio.org/maps/share-of-elderly-population-in-the-arctic/>.
- UK Government. "On Thin Ice: Defence in the Arctic: Government Response to the Committee's 12 Report – Chapter 2." *House of Commons Defence Committee*, August 15, 2018.
- UK Ministry of Defence. "Global Strategic Trends, Sixth Edition 2018 – Russia." *Development, Concepts and Doctrine Centre (DCDC)*, October 2018.
- United Nations, Food and Agriculture Organization (FAO). "The Future of Food and Agriculture: Trends and Challenges." *Rome*, 2017.
- \_\_\_\_\_. "United Nations Convention on the Law of the Sea." *Montego Bay, Jamaica*, December 1982, 53.
- \_\_\_\_\_. "Why Methane Matters?" *United Nations Climate Change*, August 7, 2014. <https://unfccc.int/news/new>

methane-signs-underline-urgency-to-reverse-emissions.

- \_\_\_\_\_. "World Population Prospects 2019: Highlights." United Nations-Department of Economic and Social Affairs, June 17, 2019.
- United States of America Department of Defense. "Report to Congress Department of Defense Arctic Strategy: Risks to U.S. National Security Interests." Office of the Under Secretary of Defense for Policy, June 2019.
- University of Lapland. "Arctic Indigenous People: Traditional Knowledge." University of Lapland Arctic Centre, 2019. <https://www.arcticcentre.org/EN/arcticregion/Arctic-Indigenous-Peoples/Traditional-knowledge#>.
- Unwin J. "Nuclear Power: The Pros and Cons of the Energy Source." Power Technology, June 18, 2020. <https://www.power-technology.com/features/nuclear-power-pros-cons/>.
- Wang, Shinan. "Share of young people in 2017 in the Arctic." Nordregio, January 2019. <https://www.nordregio.org/maps/share-of-young-people-in-2017-in-the-arctic/>.
- Watts, Jonathan. "Arctic wildfires spew soot and smoke cloud bigger than EU." The Guardian, August 12, 2019. <https://www.theguardian.com/world/2019/aug/12/arctic-wildfires-smoke-cloud>.
- \_\_\_\_\_. "Melting permafrost in Arctic will have \$70tn climate impact – study." The Guardian, April 23, 2019. <https://www.theguardian.com/environment/2019/apr/23/melting-permafrost-in-arctic-will-have-70tn-climate-impact-study>.
- Wen, Philip. "China unveils vision for Polar Silk Road across Arctic." Reuters, January 26, 2018. <https://www.reuters.com/article/us-china-arctic/china-unveils-vision-for-polar-silk-road-across-arctic-idUSKBN1FF0J8>.
- Western Pacific Naval Symposium. "Document: Code for Unplanned Encounters at Sea." UNSI News, August 22, 2016. <https://news.usni.org/2014/06/17/document-conduct-unplanned-encounters-sea>.
- Wieslander, Anna and Schiffler, Elin. "Securing Northern Europe: Towards A Comprehensive Approach." Atlantic Council, Future Europe Initiative, June 2019.
- Williams, Alex. "The future of Arctic enterprise: Long-term outlook and implications." Smith School of Enterprise and the Environment, November, 2011.
- World Meteorological Organisation (WMO-UN). "Ocean: WMO Statement on the State of the Global Climate in 2019 – Climate Related Risks and Impacts." WMO No.1248, February 2020.
- World Nuclear Association. "Nuclear Power in Russia," January 2021. <https://www.world-nuclear.org/information-library/country-profiles/countries-o-s/russia-nuclear-power.aspx>.
- \_\_\_\_\_. "Safety of Nuclear Reactors." December, 2020. <https://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors.aspx>.
- Zysk, Katarzyna. "Russia's Strategic Underbelly: Military Strategy, Capabilities and Operations in the Arctic." The Russian Military in the Contemporary Environment, Strategic Studies Institute and U.S. Army War College, August 2019.



# SOURCES AND ACKNOWLEDGEMENTS

1. The Strategic Foresight Analysis Regional Perspectives Report on The Arctic and High North is a synthesis of many national, think tank, international organisations and industry future studies. Sources also comprised studies from non-NATO countries, including China and India, and South Asian partners such as Australia. The report is a synthesis of all these findings, which represent a common understanding of the future. Additionally, conferences in NATO and Partner Countries as well as interactions with national future organisations, provided a comprehensive view of the themes, trends, and defence and security implications

2. SACT appreciates the extensive assistance and advice received in developing this SFA Regional Perspectives Report 'The Arctic and High North' and acknowledges the contributions provided by Nations, Partners, think tanks, academia, and representatives from industry.

Strategic Foresight Analysis Team Contact Details Address:

Strategic Foresight Branch  
HQ SACT Strategic Plans and Policy  
7857 Blandy Road Suite 100,  
Norfolk Virginia USA 23551-2490

<http://www.act.nato.int>

<http://www.act.nato.int/futures-work>









2021

# REGIONAL PERSPECTIVES REPORT ON THE ARCTIC

NATO UNCLASSIFIED - PUBLICLY DISCLOSED

