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Changes in the Arctic: Background and Issues for Congress

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Committees of Congress

Summary

The diminishment of Arctic sea ice has led to increased human activities in the Arctic, and has heightened interest in, and concerns about, the region's future. The United States, by virtue of Alaska, is an Arctic country and has substantial interests in the region. The seven other Arctic states are Russia, Canada, Iceland, Denmark (by virtue of Greenland), Norway, Sweden, and Finland. The Arctic Research and Policy Act (ARPA) of 1984 (Title I of P.L. 98-373 of July 31, 1984) "provide[s] for a comprehensive national policy dealing with national research needs and objectives in the Arctic." The National Science Foundation (NSF) is the lead federal agency for implementing Arctic research policy. The Arctic Council, created in 1996, is the leading international forum for addressing issues relating to the Arctic. The United Nations Convention on the Law of the Sea (UNCLOS) sets forth a comprehensive regime of law and order in the world's oceans, including the Arctic Ocean. The United States is not a party to UNCLOS.

An array of climate changes in the Arctic is now documented by observing systems, with more expected with future greenhouse gas-driven climate change. Observed physical changes in the Arctic include warming ocean, soil, and air temperatures; melting permafrost; shifting vegetation and animal abundances; and altered characteristics of Arctic cyclones. A monitoring report of the Arctic Council concluded in 2019 that "the Arctic biophysical system is now clearly trending away from its previous state [in the 20th century] and into a period of unprecedented change, with implications not only within but also beyond the Arctic."

Following the end of the Cold War, the Arctic states sought to maintain the Arctic as a region of cooperation, low tension, peaceful resolution of disputes, and respect for international law. Over the past 10 to 15 years, the emergence of great power competition between the United States, Russia, and China has introduced elements of competition and tension into the Arctic's geopolitical environment. Russia's war in Ukraine beginning on February 24, 2022, has further affected the region's geopolitical environment by prompting the seven Arctic states other than Russia to suspend most forms of Arctic cooperation with Russia, by prompting Finland and Sweden to apply for NATO membership, and in other ways.

The Department of Defense (DOD) and the Coast Guard are devoting increased attention to the Arctic in their planning, budgeting, and operations. Whether DOD and the Coast Guard are taking sufficient actions for defending U.S. interests in the region is a topic of congressional oversight. The Coast Guard has two operational polar icebreakers and through FY2023 has received funding for procuring two of at least three planned new heavy polar icebreakers.

The diminishment of Arctic ice could lead in coming years to increased commercial shipping on two trans-Arctic sea routes—the Northern Sea Route close to Russia, and the Northwest Passage close to Alaska and through the Canadian archipelago—though the rate of increase in the use of these routes might not be as great as sometimes anticipated in press accounts. International guidelines for ships operating in Arctic waters have been updated.

Changes to the Arctic brought about by warming temperatures will likely allow more exploration for oil, gas, and minerals. Warming that causes permafrost to melt could pose challenges to onshore exploration activities. Increased oil and gas exploration and tourism (cruise ships) in the Arctic increase the risk of pollution in the region. Cleaning up oil spills in ice-covered waters will be more difficult than in other areas, primarily because effective strategies for cleaning up oil spills in ice-covered waters have yet to be developed. Large commercial fisheries exist in the Arctic. The United States is working with other countries regarding the management of Arctic fish stocks. Changes in the Arctic could result in migration of fish stocks to new waters, and could affect protected species.

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Introduction

The diminishment of Arctic sea ice has led to increased human activities in the Arctic, and has heightened interest in, and concerns about, the region's future. Issues such as geopolitical competition in the region between the United States, Russia, and China; increased military operations in the region by Russia and other Arctic countries; growth in commercial shipping through the Arctic; and oil, gas, and mineral exploration in the Arctic could affect the region's future.

The United States, by virtue of Alaska, is an Arctic country and has substantial political, economic, energy, environmental, and other interests in the region. Decisions that Congress makes on Arctic-related issues could significantly affect these interests.

This report provides an overview of Arctic-related issues for Congress, and refers readers to more in-depth CRS reports on specific Arctic-related issues. Congressional readers with questions about an issue discussed in this report should contact the author or authors of the section of the report discussing that issue. The authors are identified by footnote at the start of each section.

This report does not track legislation on specific Arctic-related issues. For tracking of legislative activity, see the CRS reports relating to specific Arctic-related issues that are listed at the end of this report.

Background[1]

Definitions of the Arctic

There are multiple definitions of the Arctic that result in differing descriptions of the land and sea areas encompassed by the term. Policy discussions of the Arctic can employ varying definitions of the region, and readers should bear in mind that the definition used in one discussion may differ from that used in another. This CRS report does not rely on any one definition.

Arctic Circle Definition

The most common and basic definition of the Arctic defines the region as the land and sea area north of the Arctic Circle (a circle of latitude at about 66° 34' North).[2] For surface locations within this zone, the sun is generally above the horizon for 24 continuous hours at least once per year (at the summer solstice) and below the horizon for 24 continuous hours at least once per year (at the winter solstice). The land and sea area within the Arctic Circle is about 8.14 million square miles,[3] which is about 4.1% (or between 1/24th and 1/25th) of the Earth's surface, and more than twice the land area of the United States, which is about 3.5 million square miles.

[1] This section was prepared by Ronald O'Rourke, Specialist in Naval Affairs, Foreign Affairs, Defense, and Trade Division.

[2] Sources differ on the precise latitude of the Arctic Circle. One source states: "The position of the Arctic Circle is not fixed and currently runs 66°33′49.4″ north of the Equator. Its latitude depends on the Earth's axial tilt, which fluctuates within a margin of more than 2° over a 41,000-year period, owing to tidal forces resulting from the orbit of the Moon. Consequently, the Arctic Circle is currently drifting northwards at a speed of about 14.5 m (48 ft) per year. ("Arctic Circle," *Wikipedia*, updated February 13, 2023, accessed February 15, 2023.)

[3] Source: Figure provided to CRS by Geography and Map Division of Library of Congress, May 12, 2020, in consultation with the National Geodetic Survey (NGS) of National Oceanic and Atmospheric Administration (NOAA). (continued...)

The Arctic Circle definition of the Arctic includes the northernmost third or so of Alaska, as well as the Chukchi Sea, which separates that part of Alaska from Russia, and U.S. territorial and Exclusive Economic Zone (EEZ) waters north of Alaska. It does not include the lower two-thirds or so of Alaska or the Bering Sea, which separates that lower part of the state from Russia.

The Arctic Ocean, which is roughly at the center of the Arctic region, accounts for much of the region's total area. By one calculation, the Arctic Ocean has an area of about 6.01 million square miles, which is about 4.3% of the Earth's *ocean* area.[4] This figure uses boundaries for the Arctic Ocean that include some waters south of the Arctic Circle.[5] Other sources, using different boundaries for the Arctic Ocean, put the size of the Arctic Ocean at about 5.4 million square miles.[6]

Definition in Arctic Research and Policy Act (ARPA) of 1984

Section 112 of the Arctic Research and Policy Act (ARPA) of 1984 (Title I of P.L. 98-373 of July 31, 1984)[7] defines the Arctic as follows:

> As used in this title, the term "Arctic" means all United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers [in Alaska]; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas; and the Aleutian chain.

This definition, which is codified at 15 U.S.C. 4111,[8] includes certain parts of Alaska below the Arctic Circle, including the Aleutian Islands and portions of central and western mainland Alaska, such as the Seward Peninsula and the Yukon Delta.

The U.S. Coast Guard states that "The U.S. Arctic encompasses some 2,521 miles of shoreline, an international strait adjacent to the Russian Federation, and 647 miles of land border with Canada above the Arctic Circle. The U.S. Exclusive Economic Zone (EEZ) in the Arctic contains approximately 889,000 square miles of ocean."[9] **Figure 1** shows the Arctic area of Alaska as defined by ARPA; **Figure 2** shows the entire Arctic area as defined by ARPA.

Other sources provide different figures for the land and sea area within the Arctic Circle, such as 7.7 million square miles. (See, for example, "Arctic Circle," *Wikipedia*, updated February 13, 2023, accessed February 15, 2023.)

[4] Source: National Oceanic and Atmospheric Administration, National Geophysical Data Center, "World Ocean Volumes," accessed February 15, 2023, at https://www.ncei.noaa.gov/sites/g/files/anmtlf171/files/2023-01/World%20Ocean%20Volumes.pdf. The table presented at that source states that the Arctic Ocean has an area of 15.558 million square kilometers, which converts to about 6.007 million square miles.

[5] See the map posted at National Oceanic and Atmospheric Administration, National Geophysical Data Center, "World Ocean Volumes," accessed February 15, 2023, at https://www.ncei.noaa.gov/sites/g/files/anmtlf171/files/2023-01/World%20Ocean%20Volumes.pdf.

[6] See, for example, "Arctic Ocean," *Britannica (Encyclopedia Britannica)*, accessed February 15, 2023, at https://www.britannica.com/place/Arctic-Ocean; or "Arctic Ocean," *World Atl*as, accessed February 15, 2023, at https://www.worldatlas.com/seas/arctic-ocean.html.

[7] Title II of P.L. 98-373 is the National Critical Materials Act of 1984.

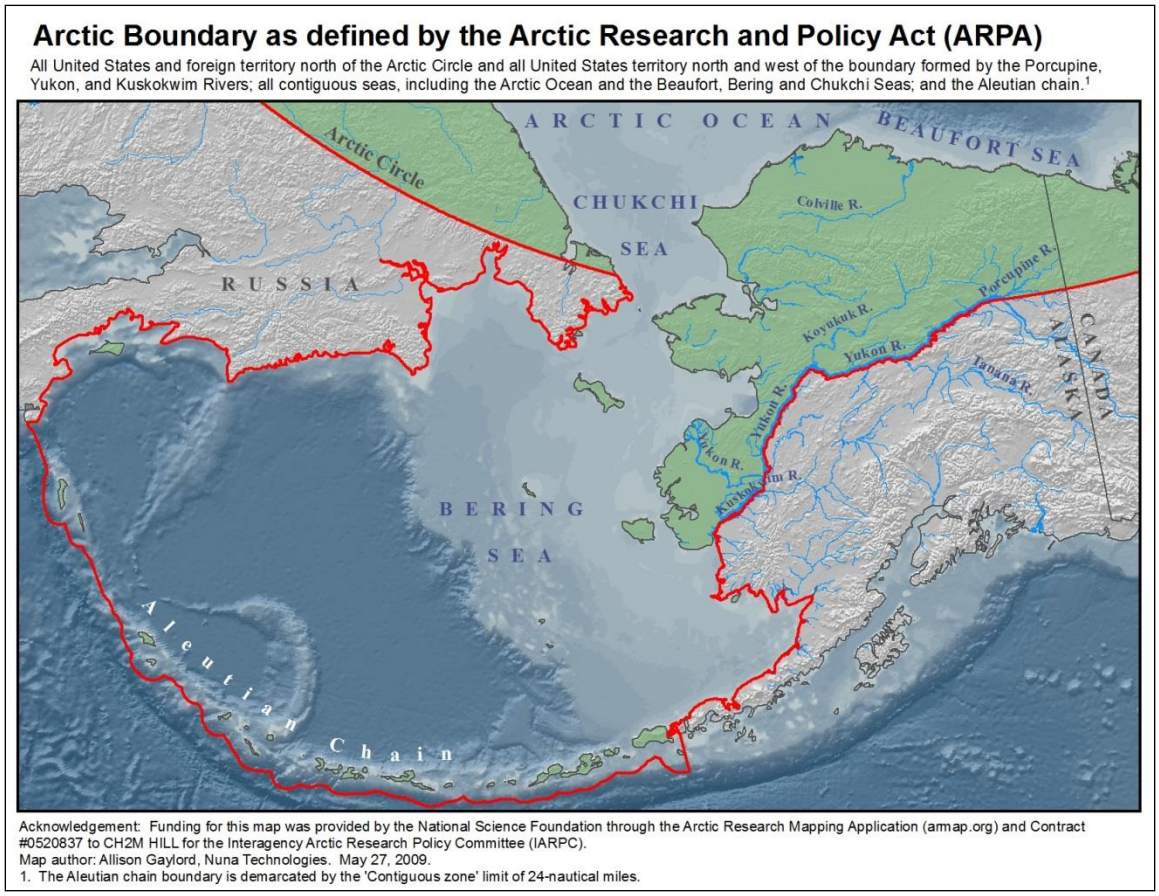
[8] As codified, the definition reads, "As used in this chapter.... "

[9] Coast Guard, *Arctic Strategic Outlook*, April 2019, p. 11.

Other Definitions

Other definitions of the Arctic are based on factors such as average temperature, the northern tree line,[10] the extent of permafrost on land, the extent of sea ice on the ocean, or jurisdictional or administrative boundaries. A definition based on a climate-related factor could circumscribe differing areas over time as a result of climate change.

Figure 1. Arctic Area of Alaska as Defined by ARPA



Source: U.S. Arctic Research Commission (https://www.arctic.gov/uploads/assets/ARPA_Alaska_only_150dpi.jpg, accessed February 15, 2023).

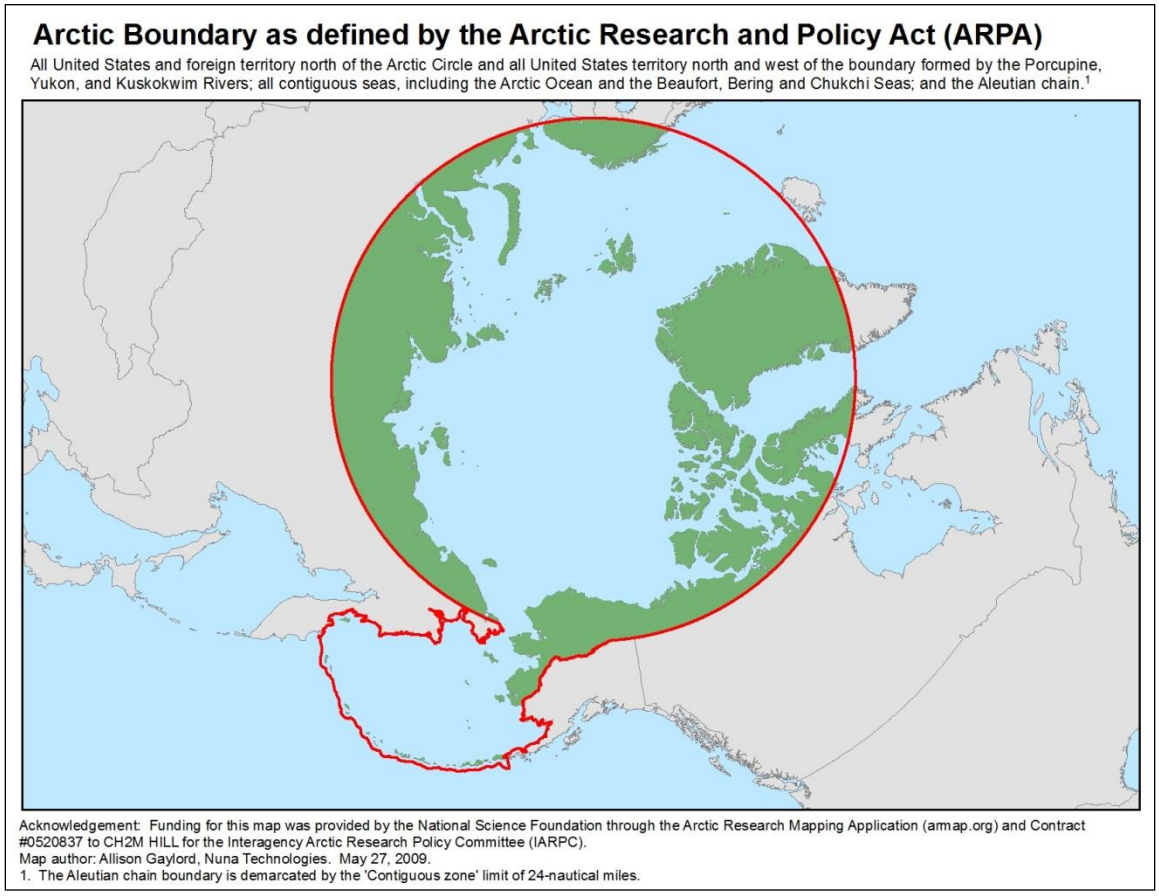
For example, the 10º C isotherm definition of the Arctic—a definition sometimes used in scientific and environmental discussions of the Arctic[11]—defines the region as the land and sea

[10] For a map of the Arctic tree line boundary, see "Arctic Tree Line Boundary," Arctic Portal.org, accessed July 3, 2023, at https://arcticportal.org/maps/download/arctic-definitions/2424-arctic-tree-line-boundary.

[11] See for example, "Boundaries of the Arctic," Climate Policy Watcher, January 7, 2022, accessed February 15, 2023, at https://www.climate-policy-watcher.org/atmospheric-circulation/boundaries-of-the-arctic.html; "What is the Arctic?" National Snow & Ice Data Center, accessed February 15, 2023, at https://nsidc.org/learn/parts-cryosphere/arctic-weather-and-climate; Hobart M. King, "Where is the Arctic? What is its Boundary?" Geology.com, undated, accessed February 15, 2023, at https://geology.com/maps/where-is-the-arctic/; Fabian Baur and Bruno Kothe, "Climate and Climate Change in the Arctic," European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), April 28, 2020, accessed February 15, 2023, at https://www.eumetsat.int/science-blog/climate-and-climate-change-arctic; "The Arctic, as Defined by Summer Temperature," GRID-Arendal, accessed February 15, 2023, at https://www.grida.no/resources/7743; *Arctic Pollution Issues: A State of the Arctic Environment Report*, Arctic (continued...)

area in the northern hemisphere where the average temperature for the warmest month (July) is below 10º Celsius, or 50º Fahrenheit. This definition results in an irregularly shaped Arctic region that excludes some land and sea areas north of the Arctic Circle but includes some land and sea areas south of the Arctic Circle. This definition currently excludes all of Finland and Sweden, as well as some of Alaska above the Arctic Circle, while including virtually all of the Bering Sea and Alaska's Aleutian Islands.

Figure 2. Entire Arctic Area as Defined by ARPA



Source: U.S. Arctic Research Commission (https://www.arctic.gov/uploads/assets/ARPA_Polar_150dpi.jpg, accessed February 15, 2023).

As another example, the definition of the Arctic adopted by the Arctic Monitoring and Assessment Programme (AMAP)—a working group of the Arctic Council—"essentially includes the terrestrial and marine areas north of the Arctic Circle (66°32' N),[12] and 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, including the Labrador Sea."[13]

Monitoring and Assessment Programme, Oslo, 1997, p. 6, accessed February 15, 2023, at https://www.amap.no/documents/download/79/inline (cover page and front section) and https://www.amap.no/documents/download/68/inline (section that includes page 6).

[12] Regarding the precise latitude of the Arctic Circle, see footnote 2.

[13] For examples of maps of the Arctic reflecting various definitions of the Arctic, see

(continued...)

Some observers use the term "high north" as a way of referring to the Arctic, or make a distinction between the "high Arctic"—meaning, in general, the colder portions of the Arctic that are closer to the North Pole—and other areas of the Arctic that are generally less cold and further away from the North Pole, which are sometimes described as the low Arctic or the subarctic.

Population of the Arctic

According to one estimate, about 4 million people, or about 0.05% of the world's population, live in the Arctic, of which roughly half (roughly 2 million) live in Russia's part of the Arctic,[14] and roughly 500,000 belong to Indigenous peoples.[15] Another source states: "Approximately two and a half million of Russia's inhabitants live in Arctic territory, accounting for nearly half of the population living in the Arctic worldwide."[16] Another source, using a broader definition of the Arctic, concluded that just over 10 million people live in the Arctic, including 7 million in Russia's Arctic.[17]

Eight Arctic States, Including Five Arctic Coastal States

Eight countries have territory north of the Arctic Circle: the United States (Alaska), Russia, Canada, Iceland,[18] Denmark (by virtue of Greenland, a self-governing part of the Kingdom of

- the map of the geographic areas described in Annex 1 of the May 2017 Agreement on Enhancing International Arctic Scientific Cooperation, accessed February 15, 2023, at both "Arctic Region," U.S. Department of State, https://www.state.gov/key-topics-office-of-ocean-and-polar-affairs/arctic/, and "Maps," U.S. Arctic Research Commission, https://www.arctic.gov/uploads/assets/arctic-sci-agree-150dpi-color.jpg.
- "Definitions of the Arctic," UN Environment Programme, accessed February 15, 2023, at https://www.grida.no/resources/7010;
- the collection of maps posted at "Arctic Definitions," Arctic Portal, accessed February 15, 2023, at https://arcticportal.org/maps/download/arctic-definitions;
- "Arctic Definition Map," Arctic Portal Library, accessed February 15, 2023, at http://library.arcticportal.org/1492/; and
- the maps posted by the Arctic Centre of the University of Lapland, accessed February 15, 2023, at https://www.arcticcentre.org/EN/arcticregion/Maps/definitions and https://www.arcticcentre.org/EN/arcticregion/Maps/permafrost.

[14] Sources: "Arctic Peoples," Arctic Council, accessed February 15, 2023, at https://arctic-council.org/en/explore/topics/arctic-peoples/; National Snow & Ice Data Center, "Arctic People," accessed February 15, 2023, at https://web.archive.org/web/20220702084552/https://nsidc.org/cryosphere/arctic-meteorology/arctic-people.html; United Kingdom, House of Commons, Defence Committee, On Thin Ice: UK Defence in the Arctic, Twelfth Report of Session 2017–19, August 15, 2018 (Ordered by the House of Commons to be printed 19 July 2018), p. 6; "Arctic Indigenous Peoples," Arctic Centre, accessed February 15, 2023, at https://www.arcticcentre.org/EN/arcticregion/Arctic-Indigenous-Peoples.

[15] Source: "Permanent Participants," Arctic Council, accessed February 15, 2023, at https://arctic-council.org/en/about/permanent-participants/.

[16] "The Russian Federation," Arctic Council, accessed February 15, 2023, at https://arctic-council.org/en/about/states/russian-federation/.

[17] Timothy Heleniak, "The Future of Arctic Populations," *Polar Geography*, January 3, 2020. Another source states that "using more broad definition, according to the University of the Arctic Atlas, there are approximately 13.1 million people living in the area of the circumpolar North" ("Arctic Indigenous Peoples," Arctic Centre, accessed February 15, 2023, at https://www.arcticcentre.org/EN/arcticregion/Arctic-Indigenous-Peoples).

[18] The northern coast of mainland Iceland is just south of the Arctic Circle, but the Arctic Circle passes through Grimsey Island, a small offshore island of Iceland that is about 25 miles north of the northern coast of mainland Iceland. The northern part of Grimsey Island is Iceland's territory north of the Arctic Circle. See, for example, "Grímsey," *Wikipedia*, updated October 11, 2022, accessed February 15, 2023; "Is Iceland in the Arctic Circle?" Iceland Unlimited, January 2017, accessed February 15, 2023, at https://icelandunlimited.is/blog/is-iceland-in-the-arctic-circle/.

Denmark), Norway, Sweden, and Finland. These eight countries are often referred to as the Arctic countries or Arctic States, and they are the member states of the Arctic Council, which is discussed further below.

A subset of the eight Arctic countries are the five countries that are considered Arctic coastal states because they have mainland coasts that front onto waters north of the Arctic Circle: the United States, Canada, Denmark (by virtue of Greenland), Norway, and Russia.

U.S. Identity as an Arctic Nation

As mentioned earlier, the United States, by virtue of Alaska, is an Arctic country and has substantial political, economic, energy, environmental, and other interests in the region. Even so, Alaska is geographically separated and somewhat distant from the other 49 states, and relatively few Americans—fewer than 68,000 as of July 1, 2017—live in the Arctic part of Alaska as shown in **Figure 2**.[19] A March 6, 2020, research paper on the Arctic in U.S. national identity, based on data collected in online surveys conducted in October-December 2019, stated: "We found that Americans continue to mildly disagree with the assertion that the United States is an Arctic nation with broad and fundamental interests in the region."[20]

U.S. Arctic Research

Arctic Research and Policy Act (ARPA) of 1984, As Amended

The Arctic Research and Policy Act (ARPA) of 1984 (Title I of P.L. 98-373 of July 31, 1984)[21] "provide[s] for a comprehensive national policy dealing with national research needs and objectives in the Arctic."[22] The act, among other things

- made a series of findings concerning the importance of the Arctic and Arctic research;
- established the U.S. Arctic Research Commission (USARC) to promote Arctic research and recommend Arctic research policy;
- designated the National Science Foundation (NSF) as the lead federal agency for implementing Arctic research policy;
- established the Interagency Arctic Research Policy Committee (IARPC) to develop a national Arctic research policy and a five-year plan to implement that

[19] Source for figure of fewer than 68,000: CRS analysis of data presented in Table 3.1, entitled Alaska Population by Region, Borough, and Census Area, 2017 to 2045, in Alaska Department of Labor and Workforce Development, Research and Analysis Section, *Alaska Population Projections: 2017 to 2045*, June 2018, p. 26. The table shows that of Alaska's estimated population as of July 1, 2017 of 737,080, a total of 589,680, of about 80%, resided in the Anchorage/Matanuska-Susitna region (401,649), the Fairbanks North Star Borough (97,738), the Kenai Peninsula Borough (58,024), and Juneau (32,269).

[20] Zachary D. Hamilla, *The Arctic in U.S. National Identity (2019)*, Arctic Studio, March 6, 2020, p. 1. See also Rodger Baker, "Remapping the American Arctic," *Stratfor*, July 28, 2020.

[21] Title II of P.L. 98-373 is the National Critical Materials Act of 1984.

[22] These words are taken from the official title of P.L. 98-373. (Arctic Research and Policy Act of 1984 is the short title of Title I of P.L. 98-373.) The remainder of P.L. 98-373's official title relates to Title II of the act, the short title of which is the National Critical Materials Act of 1984.

policy, and designated the NSF representative on the IARPC as its chairperson;[23] and

- defined the term "Arctic" for purposes of the act.

The Arctic Research and Policy Act of 1984 was amended by P.L. 101-609 of November 16, 1990.

FY2024 NSF Budget Request for Arctic Research

NSF, which is the lead federal agency for implementing Arctic research policy, carries out Arctic and Antarctic research activities through its Office of Polar Programs (OPP). NSF states that "OPP is the primary U.S. supporter of fundamental research in the polar regions. In the Arctic, NSF helps coordinate research planning as directed by the Arctic Research Policy Act of 1984, and the NSF Director chairs the Interagency Arctic Research Policy Committee (IARPC) created for this purpose."[24] NSF is requesting $565.60 million for OPP for FY2024, which is about 3.7% more than the estimated figure of $545.16 million for FY2023.[25]

Major U.S. Policy Documents Relating to Arctic

The executive branch has issued a number of policy documents concerning the Arctic, including those mentioned below.

January 2009 Arctic Policy Directive (NSPD 66/HSPD 25)

On January 12, 2009 (i.e., eight days before its final day in office), the George W. Bush Administration released a presidential directive establishing a new U.S. policy for the Arctic region. The directive, dated January 9, 2009, was issued as National Security Presidential Directive 66/Homeland Security Presidential Directive 25 (NSPD 66/HSPD 25).[26] The directive was the result of an interagency review, and it superseded for the Arctic (but not the Antarctic) a 1994 presidential directive on Arctic and Antarctic policy. The directive, among other things

- states that the United States is an Arctic nation, with varied and compelling interests in the region;
- sets forth a six-element overall U.S. policy for the region;
- describes U.S. national security and homeland security interests in the Arctic; and
- discusses a number of issues as they relate to the Arctic, including international governance; the extended continental shelf and boundary issues; promotion of international scientific cooperation; maritime transportation; economic issues, including energy; and environmental protection and conservation of natural resources.

[23] The IARPC currently includes more than a dozen federal agencies, departments, and offices. Additional information on the IARPC is available at https://www.nsf.gov/geo/opp/arctic/iarpc/start.jsp.

[24] National Science Foundation, *FY 2024 Budget Request to Congress*, March 13, 2023, p. OPP-1 (PDF page 341 of 591).

[25] National Science Foundation, *FY 2024 Budget Request to Congress*, March 13, 2023, p. OPP-1 (PDF page 341 of 591). The document does not divide the total requested amount for OPP for FY2024 into subtotals for the Arctic and Antarctic.

[26] The text of NSPD 66/HSPD 25 is posted at the Homeland Security Digital Library at https://www.hsdl.org/?abstract&did=750476.

May 2013 National Strategy for Arctic Region

On May 10, 2013, the Obama Administration released a document entitled *National Strategy for the Arctic Region*.[27] The document appears to supplement rather than supersede the January 2009 Arctic policy directive (NSPD 66/HSPD 25) discussed above.[28] The document states that the strategy is built on three lines of effort:

- advancing U.S. security interests,
- pursuing responsible Arctic region stewardship, and
- strengthening international cooperation.

Actions taken under the strategy, the document states, will be informed by four guiding principles:

- safeguarding peace and stability,
- making decisions using the best available information,
- pursuing innovative arrangements, and
- consulting and coordinating with Alaska natives.

On January 30, 2014, the Obama Administration released an implementation plan for the May 2013 national strategy for the Arctic region.[29] The plan outlines about 36 specific initiatives.

January 2015 Executive Order on Enhancing Coordination of Arctic Efforts

On January 21, 2015, then-President Obama issued Executive Order 13689, entitled "Enhancing Coordination of National Efforts in the Arctic." The order established an Arctic Executive Steering Committee is to "provide guidance to executive departments and agencies and enhance coordination of Federal Arctic policies across agencies and offices, and, where applicable, with State, local, and Alaska Native tribal governments and similar Alaska Native organizations, academic and research institutions, and the private and nonprofit sectors."

October 2022 National Security Strategy Document

A national security strategy document released by the Biden Administration in October 2022 includes a section on the Arctic, entitled "Maintain a Peaceful Arctic," which states:

> The United States seeks an Arctic region that is peaceful, stable, prosperous, and cooperative. Climate change is making the Arctic more accessible than ever, threatening Arctic communities and vital ecosystems, creating new potential economic opportunities. and intensifying competition to shape the region's future. Russia has invested significantly in its presence in the Arctic over the last decade, modernizing its military infrastructure and increasing the pace of exercises and training operations. Its aggressive behavior has raised geopolitical tensions in the Arctic, creating new risks of unintended conflict and

[27] *National Strategy for the Arctic Region*, May 2013, 11 pp.

[28] *National Strategy for the Arctic Region* states on page 6 that the "lines of effort" it describes are to be undertaken "[t]o meet the challenges and opportunities in the Arctic region, and in furtherance of established Arctic Region Policy," at which point there is a footnote referencing the January 2009 Arctic policy directive.

[29] *Implementation Plan for The National Strategy for the Arctic Region*, January 2014, 32 pp. The news release announcing the implementation plan is posted at https://obamawhitehouse.archives.gov/blog/2014/01/30/white-house-releases-implementation-plan-national-strategy-arctic-region. The document itself is posted at https://obamawhitehouse.archives.gov/sites/default/files/docs/ implementation_plan_for_the_national_strategy_for_the_arctic_region_-_fi.... pdf.

> hindering cooperation. The PRC has also sought to increase its influence in the Arctic by rapidly increased its Arctic investments, pursuing new scientific activities, and using these scientific engagements to conduct dual-use research with intelligence or military applications.
>
> We will uphold U.S. security in the region by improving our maritime domain awareness, communications, disaster response capabilities, and icebreaking capacity to prepare for increased international activity in the region. We will exercise U.S. Government presence in the region as required, while reducing risk and preventing unnecessary escalation. Arctic nations have the primary responsibility for addressing regional challenges, and we will deepen our cooperation with our Arctic allies and partners and work with them to sustain the Arctic Council and other Arctic institutions despite the challenges to Arctic cooperation posed by Russia's war in Ukraine. We will continue to protect freedom of navigation and determine the U.S. extended continental shelf in accordance with international rules. We must build resilience to and mitigate climate change in the region, including through agreements to reduce emissions and more cross-Arctic research collaboration. As economic activity in the Arctic increases, we will invest in infrastructure, improve livelihoods, and encourage responsible private sector investment by the United States, our allies, and our partners, including in critical minerals, and improve investment screening for national security purposes. Across these efforts, we will uphold our commitment to honor Tribal sovereignty and self-governance through regular, meaningful, and robust consultation and collaboration with Alaska Native communities.[30]

October 2022 National Strategy for the Arctic Region

A national strategy for the Arctic region that was also released by the Biden Administration in October 2022, and which states that it is an update of the above-noted May 2013 national strategy for the Arctic region, states the following in its executive summary:

> The United States seeks an Arctic region that is peaceful, stable, prosperous, and cooperative. The National Strategy for the Arctic Region articulates an affirmative U.S. agenda over the next ten years, from 2022 to 2032, to realize this vision. This strategy, an update of its 2013 predecessor, addresses the climate crisis with greater urgency and directs new investments in sustainable development to improve livelihoods for Arctic residents, while conserving the environment. It also acknowledges increasing strategic competition in the Arctic since 2013, exacerbated by Russia's unprovoked war in Ukraine, and seeks to position the United States to both effectively compete and manage tensions.
>
> Realizing our vision during this dynamic and challenging period will require U.S. leadership at home and abroad. We will advance U.S. interests across four mutually reinforcing pillars spanning both domestic and international issues.
>
> • **Pillar 1—Security**: We will deter threats to the U.S. homeland and our allies by enhancing the capabilities required to defend our interests in the Arctic, while coordinating shared approaches with allies and partners and mitigating risks of unintended escalation. We will exercise U.S. government presence in the Arctic region as required to protect the American people and defend our sovereign territory.
>
> • **Pillar 2—Climate Change and Environmental Protection**: The U.S. government will partner with Alaskan communities and the State of Alaska to build resilience to the impacts of climate change, while working to reduce emissions from the Arctic as part of broader global mitigation efforts, to improve scientific understanding, and to conserve Arctic ecosystems.

[30] White House, *National Security Strategy*, October 2022, pp. 44-45.

> • **Pillar 3—Sustainable Economic Development**: We will pursue sustainable development and improve livelihoods in Alaska, including for Alaska Native communities, by investing in infrastructure, improving access to services, and supporting growing economic sectors. We will also work with allies and partners to expand high-standard investment and sustainable development across the Arctic region.
>
> • **Pillar 4—International Cooperation and Governance**: Despite the challenges to Arctic cooperation resulting from Russia's aggression in Ukraine, the United States will work to sustain institutions for Arctic cooperation, including the Arctic Council, and position these institutions to manage the impacts of increasing activity in the region. We also seek to uphold international law, rules, norms, and standards in the Arctic.

This strategy is intended to serve as a framework to guide the U.S. government's approach to tackling emerging challenges and opportunities in the Arctic. Our work will be guided by five principles that will be applied across all four pillars.

> • **Consult, Coordinate, and Co-Manage with Alaska Native Tribes and Communities**: The United States is committed to regular, meaningful, and robust consultation, coordination, and co-management with Alaska Native Tribes, communities, corporations, and other organizations and to ensuring equitable inclusion of Indigenous Peoples and their knowledge.
>
> • **Deepen Relationships with Allies and Partners**: We will deepen our cooperation with Arctic Allies and partners: Canada, the Kingdom of Denmark (including Greenland), Finland, Iceland, Norway, and Sweden. We will also expand Arctic cooperation with other countries that uphold international law, rules, norms, and standards in the region.
>
> • **Plan for Long-Lead Time Investments**: Many of the investments prioritized in this strategy will require long lead times. We will be proactive, anticipating changes coming to the Arctic over the next several decades and making new investments now to be prepared.
>
> • **Cultivate Cross-Sectoral Coalitions and Innovative Ideas**: The challenges and opportunities in the Arctic cannot be solved by national governments alone. The United States will strengthen and build on coalitions of private sector; academia; civil society; and state, local, and Tribal actors to encourage and harness innovative ideas to tackle these challenges.
>
> • **Commit to a Whole of Government, Evidence-Based Approach**: The Arctic extends beyond the responsibility of any single region or government agency. U.S. Federal departments and agencies will work together to implement this strategy. We will deploy evidence-based decision-making and carry out our work in close partnership with the State of Alaska; Alaska Native Tribes, communities, corporations, and other organizations; and local communities, as well as with the U.S. Congress.[31]

Ambassador at Large for Arctic Affairs

On July 16, 2014, then-Secretary of State John Kerry announced the appointment of retired Coast Guard Admiral Robert J. Papp Jr., who served as Commandant of the Coast Guard from May 2010 to May 2014, as the first U.S. Special Representative for the Arctic.[32] Papp served as the

[31] White House, *National Strategy for the Arctic Region*, October 2022, pp. 3-4.

[32] See "Retired Admiral Robert Papp to Serve as U.S. Special Representative for the Arctic," Press Statement, John Kerry, Secretary of State, Washington, DC, July 16, 2014.

U.S. Special Representative until January 20, 2017, the final day of the Obama Administration and the first day of the Trump Administration.

The position of U.S. Special Representative for the Arctic remained unfilled from January 20, 2017, through July 29, 2020, when it was effectively replaced by the newly created position of the U.S. coordinator for the Arctic region. On July 29, 2020, the Trump Administration announced that career diplomat James (Jim) DeHart would be the first U.S. coordinator for the Arctic region; DeHart began his work in the position that day.[33]

In the 117th Congress, H.R. 3361, the United States Ambassador at Large for Arctic Affairs Act of 2021, and H.R. 3433, the Arctic Diplomacy Act of 2021, each would have established a position of United States Ambassador at Large for Arctic Affairs,[34] while S. 2967, the Arctic Diplomacy Act of 2021, would have established the position of Assistant Secretary of State for Arctic Affairs.[35]

On August 26, 2022, the Biden Administration announced that it was planning to appoint an Ambassador-at-Large for the Arctic Region.[36] On February 13, 2023, the Biden Administration announced that it was nominating Mike Sfraga, Chair of the U.S. Arctic Research Commission (USARC), for the position of Ambassador at Large for Arctic Affairs.[37]

Arctic Executive Steering Committee (AESC)

On September 24, 2021, the Biden Administration announced that it was "[r]eactivating the Arctic Executive Steering Committee (AESC), a mechanism to advance U.S. Arctic interests and coordinate Federal actions in the Arctic. The AESC will also facilitate the implementation of the Northern Bering Sea Climate Resilience Area, including by standing up the Northern Bering Sea Task Force and Tribal Advisory Council. These structures reinforce collaborative partnerships—particularly with Alaska Native communities—and harness science and Indigenous Knowledge to inform management and policy." The Administration also announced that it was hiring Ambassador David Balton as AESC Executive Director and Raychelle Aluaq Daniel as AESC

[33] See Department of State, "Appointment of U.S. Coordinator for the Arctic Region," Media Note, Office of the Spokesperson, July 29, 2020. See also Matthew Lee, "US Names New Arctic Envoy in Push to Expand Reach in Region," *Associated Press*, July 29, 2020; Timothy Gardner, "U.S. Appoints Coordinator for Arctic Policy As Mineral Race Heats Up," *Reuters*, July 29, 2020; Courtney McBride, "New Cold War: U.S. Names Arctic Policy Czar to Keep Tabs on China, Russia," *Wall Street Journal*, July 29, 2020; Melody Schreiber, "The Trump Administration Appoints a New State Department Arctic Coordinator," *ArcticToday*, July 29, 2020; Levon Sevunts (Radio Canada International), "Appointment of U.S. Arctic Co-ordinator May Signal More Muscular American Policy," *CBC*, July 31, 2020.

[34] For a press report discussing legislative proposals for establishing a U.S. Ambassador at Large for Arctic Affairs, see Hilde-Gunn Bye, "Top Lawmakers Want to Establish a US Ambassador-at-Large for Arctic Affairs," *High North News*, May 28, 2021.

[35] For a press report discussing S. 2967, see Melody Schreiber, "A New Bill Aims to Create the US's First High-Level Arctic Diplomatic Office," *ArcticToday*, October 8, 2021.

[36] Department of State, "Establishing an Ambassador-at-Large for the Arctic Region," press statement, August 26, 2022. See also Melody Schreiber, "US to Create New Arctic Ambassador Position," *ArcticToday*, August 26, 2022.

[37] White House, "President Biden Announces Key Nominees," February 13, 2023. See also https://www.congress.gov/nomination/118th-congress/358; Melody Schreiber, "Sfraga Named New Arctic Ambassador," *ArcticToday*, February 13, 2023; Riley Rogerson, "Biden Nominates Alaskan as 1st Arctic Ambassador," *Anchorage Daily News*, February 14, 2023.

Deputy Director.[38] The AESC was initially established by the above-mentioned January 2015 Executive Order 13689 on enhancing coordination of Arctic efforts.[39]

Arctic Council

The Arctic Council, created in 1996, is the leading international forum for addressing issues relating to the Arctic. Its founding document is the Ottawa Declaration of September 19, 1996, a joint declaration (not a treaty) signed by representatives of the eight Arctic states. The State Department describes the council as "the preeminent intergovernmental forum for addressing issues related to the Arctic Region. …The Arctic Council is not a treaty-based international organization but rather an international forum that operates on the basis of consensus, echoing the peaceful and cooperative nature of the Arctic Region."[40]

The Arctic Council's membership consists of the eight Arctic states. All decisions of the Arctic Council and its subsidiary bodies are by consensus of the eight Arctic states. In addition to the eight member states, six organizations representing Arctic indigenous peoples have status as Permanent Participants. Thirteen non-Arctic states, 13 intergovernmental and interparliamentary organizations, and 12 nongovernmental organizations have been approved as observers, making for a total of 38 observer states and organizations.[41]

The council has a two-year chairmanship that rotates among the eight member states. The United States held the chairmanship from April 24, 2015, to May 11, 2017, and is scheduled to next hold it in 2031-2033. On May 11, 2023, the chairmanship was transferred from Russia to Norway.

Thematic areas of work addressed by the council include environment and climate, biodiversity, oceans, Arctic peoples, and agreements on Arctic scientific cooperation, cooperation on marine oil pollution preparedness and response in the Arctic, and cooperation on aeronautical and maritime search and rescue in the Arctic. The Ottawa Declaration states explicitly that "The Arctic Council should not deal with matters related to military security."

The eight Arctic states have signed three legally binding agreements negotiated under the auspices of the Arctic Council: a May 2011 agreement on cooperation on aeronautical and maritime search and rescue (SAR) in the Arctic, a May 2013 agreement on cooperation on marine oil pollution preparedness and response in the Arctic, and a May 2017 agreement on enhancing international Arctic scientific cooperation.[42]

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[38] White House press release, "Biden-Harris Administration Brings Arctic Policy to the Forefront with Reactivated Steering Committee & New Slate of Research Commissioners," September 24, 2021.

[39] A September 24, 2021, press report stated: "The steering committee had been moribund for the past four years, not meeting at a high level, said David Balton, appointed to direct it. He said 'it will step up and do more in the Arctic.' The revamped committee will try to figure out what 'needs to be done to get a better handle on addressing the changes in the Arctic,' Balton said." (Seth Borenstein, "White House Steps Up Work on What to Do About Thawing Arctic," *Associated Press*, September 24, 2021. See also Melody Schreiber, "Biden Appoints New U.S. Arctic Research, Leadership Officials in Science-Based approach," *ArcticToday*, September 24, 2021.)

[40] "Arctic Region," U.S. Department of State, accessed February 15, 2023, at https://www.state.gov/key-topics-office-of-ocean-and-polar-affairs/arctic/.

[41] For list of the 38 observers and when they were approved for observer status, see "Who We Are" in Arctic Council, "Arctic Council," accessed February 15, 2023, at https://arctic-council.org/en/. For a discussion of the non-Arctic observer states, see Evan T. Bloom, "The Rising Importance of Non-Arctic States in the Arctic," *Wilson Quarterly*, Winter 2022.

[42] For brief summaries of these three agreements and links to the texts of these agreements, see "Arctic Region," U.S. Department of State, accessed February 15, 2023, at https://www.state.gov/key-topics-office-of-ocean-and-polar-affairs/arctic/. For additional information on the Arctic Council's organization and operations, see the Arctic Council's website at https://arctic-council.org/.

Arctic and U.N. Convention on Law of the Sea (UNCLOS)

The United Nations Convention on the Law of the Sea (UNCLOS) "lays down a comprehensive regime of law and order in the world's oceans and seas[,] establishing rules governing all uses of the oceans and their resources."[43] UNCLOS was adopted in 1982, and modified in 1994 by an agreement relating to the implementation of Part XI of the treaty, which relates to the seabed and ocean floor and subsoil thereof that are beyond the limits of national jurisdiction. UNCLOS entered into force in November 1994. As of May 23, 2023, 169 parties (168 states and the European Union) were party to the treaty.[44]

The United States is not a party to UNCLOS.[45] The 1982 treaty and the 1994 agreement were transmitted to the Senate on October 6, 1994, during the 103rd Congress, becoming Treaty Document 103-39. The full Senate to date has not voted on the question of whether to give its advice and consent to ratification of Treaty Document 103-39. Although the United States is not a party to UNCLOS, the United States accepts and acts in accordance with the non-seabed mining provisions of the treaty, such as those relating to navigation and overflight, which the United States views as reflecting customary international law of the sea.[46]

Part VI of UNCLOS (consisting of Articles 76 through 85), which covers the continental shelf, and Annex II to the treaty, which established a Commission on the Limits of the Continental Shelf, are particularly pertinent to the Arctic, because Article 77 states that "The coastal State exercises over the continental shelf sovereign rights for the purpose of exploring it and exploiting its natural resources," and that these natural resources include, among other things, "mineral and other nonliving resources of the seabed and subsoil," including oil and gas deposits.[47]

Article 76 states that "the coastal State shall establish the outer edge of the continental margin wherever the margin extends beyond 200 nautical miles," and that "Information on the limits of the continental shelf beyond 200 nautical miles... shall be submitted by the coastal State to the Commission on the Limits of the Continental Shelf set up under Annex II.... The Commission shall make recommendations to coastal States on matters related to the establishment of the outer limits of their continental shelf. The limits of the shelf established by a coastal State on the basis of these recommendations shall be final and binding."

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[43] United Nations, "United Nations Convention on the Law of the Sea of 10 December 1982, Overview and full text," updated July 13, 2022, accessed February 15, 2023, at https://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm.

[44] Chronological lists of ratifications of, accessions and successions to the Convention and the related Agreements as of May 23, 2023, accessed June 6, 2023, at http://www.un.org/Depts/los/reference_files/chronological_lists_of_ratifications.htm. The list shows that most recent state to become a party to the treaty is Rwanda, which became a party on May 18, 2023.

[45] The United States is not a signatory to the treaty. On July 29, 1994, the United States became a signatory to the 1994 agreement relating to the implementation of Part XI of the treaty. The United States has not ratified either the treaty or the 1994 agreement.

[46] In a March 10, 1983, statement on U.S. oceans policy, President Reagan stated that "the United States is prepared to accept and act in accordance with the [treaty's] balance of interests relating to traditional uses of the oceans—such as navigation and overflight. In this respect, the United States will recognize the rights of other states in the waters off their coasts, as reflected in the Convention, so long as the rights and freedoms of the United States and others under international law are recognized by such coastal states." (Statement on United States Oceans Policy, March 10, 1983, accessed February 15, 2023, at https://www.jag.navy.mil/organization/documents/Reagan%20Ocean%20Policy%20Statement.pdf, and https://www.reaganlibrary.gov/archives/speech/statement-united-states-oceans-policy, and https://2009-2017.state.gov/documents/organization/143224.pdf..)

[47] Other parts of UNCLOS relevant to the Arctic include those relating to navigation and high-seas freedoms, fisheries, and exclusive economic zones.

House and Senate Arctic Member Organizations

In the House, a Congressional Arctic Working Group is co-chaired by Representative Mary Sattler Peltola and Representative Rick Larsen. The group has been listed as a Congressional Member Organization (CMO) since the 114th Congress (2015-2017).[48]

In the Senate, Senator Lisa Murkowski and Senator Angus King announced on March 4 and 5, 2015, the formation of a Senate Arctic Caucus.[49]

Issues for Congress

Climate Change, with Biophysical and Economic Impacts[50]

An array of climate changes in the Arctic is now documented by observing systems, with more expected with future greenhouse gas-driven climate change. Observed physical changes in the Arctic include warming ocean, soil, and air temperatures; melting permafrost; shifting vegetation and animal abundances; and altered characteristics of Arctic cyclones. These changes continue to affect traditional livelihoods and cultures in the region, infrastructure, and the economy, as well as the distribution and health of animal populations and vegetation. The changes raise risks of pollution, food supply, safety, cultural losses, and national security. The state government of Alaska concluded that observed climate changes "have resulted in a reduction of subsistence harvests, an increase in flooding and erosion, concerns about water and food safety and major impacts to infrastructure: including damage to buildings, roads and airports."[51]

A monitoring report of the Arctic Council concluded in 2019 that

> the Arctic biophysical system is now clearly trending away from its previous state [in the 20th century] and into a period of unprecedented change, with implications not only within but also beyond the Arctic.[52]

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[48] Committee on House Administration, "Congressional Member And Staff Organizations," Congressional Member Organizations (CMOs) for 107th through 118th Congresses, accessed June 15, 2023, at https://cha.house.gov/congressional-member-and-staff-organizations. In the 116th Congress, the group was listed as the Arctic Working Group Caucus; in the 117th Congress, it was listed as the Arctic Working Group.

[49] Press release from the office of Senator Angus King, "King, Murkowski Announce U.S. Senate Arctic Caucus," March 4, 2015, accessed February 15, 2023, at http://www.king.senate.gov/newsroom/press-releases/king-murkowski-announce-us-senate-arctic-caucus. See also press release from the office of Senator Lisa Murkowski, "Senators Murkowski, King Announce U.S. Senate Arctic Caucus," March 5, 2015, accessed February 15, 2023, at http://www.murkowski.senate.gov/public/index.cfm/pressreleases?ID=1ce5edcb-540d-4c43-b264-56bdbb570755, which includes a similar phrase.

Senator Murkowski states: "In April 2015, Senator Murkowski and Senator Angus King of Maine joined forces to establish the Senate Arctic Caucus. The Arctic Caucus is the first entity in Congress to bring attention to the laws and policies at stake in the Far North. The purpose of the Caucus is to convene members of Congress, subject matter experts, federal agency heads, and the public to confront policy questions and advance a coordinated investment in arenas such as national security, scientific research, commerce, global trade, the environment, maritime affairs, and other relevant issues impacting the Arctic region." (Senator Lisa Murkowski, "Arctic," accessed June 14, 2023, at https://www.murkowski.senate.gov/issues/issues-and-priorities/arctic.)

[50] This section prepared by Jane Leggett, Specialist in Energy and Environmental Policy, Resources, Science, and Industry Division.

[51] Department of Commerce, Community, and Economic Development, "Climate Change in Alaska." The Great State of Alaska. Accessed February 15, 2023, at https://www.commerce.alaska.gov/web/dcra/ClimateChange.aspx.

[52] Jason E Box et al., "Key Indicators of Arctic Climate Change: 1971–2017," *Environmental Research Letters* 14, no. 4, April 2019.

A few broad points raise particular concerns about changes in the Arctic:

- Long lag times between cause and full effects: Changes once set in motion prompt further and often slow effects in different components of the Arctic system, such as the influence of rising atmospheric temperatures on ocean and permafrost temperatures. Scientists expect the full effects of near-term climate changes to play out over a period of decades to many centuries.
- Feedbacks that mostly further increase warming: GHG-induced warming leads to positive (enhancing) and some negative (dampening) feedbacks within the Arctic system, which scientists expect in net to amplify warming and pursuant effects. For example, temperature-driven melting sea ice reduces reflection of incoming solar energy, leading to absorption by the Arctic Ocean and further warming of the ocean and the planet.
- Abrupt change risks: The freezing point for water, including permafrost, is one example of thresholds that certain Arctic systems may cross, leading to rapid state changes.
- Risks of irreversibilities: Some Arctic climate impacts, such as loss of sea ice and glaciers, may lead to system changes that scientists expect would be irreversible on a human timescale, even if temperatures stabilize (at a higher level than today).

Understanding remains incomplete regarding future Arctic climate changes and their implications for human and natural systems. With current knowledge, projections point to growing risks, as well as some opportunities.

The Arctic is interconnected to the rest of the globe through circulation of water, energy (e.g., heat), and carbon, including through the atmosphere and oceans. It is also connected through human systems of transport, energy and mineral production, tourism, and security. Consequently, Arctic changes are of import to both Arctic and non-Arctic regions of United States and the rest of the globe.

This section summarizes a variety of observed and projected climate changes in the Arctic and identifies some of their impacts on human and ecological systems.[53] Other sections in this report provide further discussion of implications for, for example, national security and energy production.

Warming Temperatures and a More Intense Water Cycle

The Arctic warmed at approximately three times the global average rate from 1971 to 2019, with the region's surface temperature increasing by more than 3°C (5.5°F).[54] Summers have warmed more than winters. In tandem are trends of fewer cold days, cold nights, frost days, and ice days in the North American Arctic.[55] Researchers found that warming trends as well as climate cycles, including the North Atlantic Oscillation and the Arctic Oscillation, influence observed extreme temperatures, ice distribution, and other facets of the Arctic system.[56] In addition, positive

[53] Although much of Greenland is above the Arctic Circle, and many of the changes and implications apply also to Greenland, this section emphasizes other parts of the Arctic and does not attempt to summarize the often large and complex change in Greenland.

[54] T.J. Ballinger et al., "Surface Air Temperature," Arctic Program, Arctic Report Card 2021.

[55] Alvaro Avila-Diaz et al., "Climate Extremes across the North American Arctic in Modern Reanalyses," *Journal of Climate* 34, no. 7, April 1, 2021.

[56] Ibid.

feedbacks from the loss of summer sea ice and spring snow cover on land have amplified warming in the Arctic.[57]

With warming, the water cycle has become more intense. The Arctic has experienced increasing precipitation and an increasing share of precipitation falling as rain. The first recorded rainfall at Greenland's 10,500-foot Summit Station was on August 14, 2021.[58]

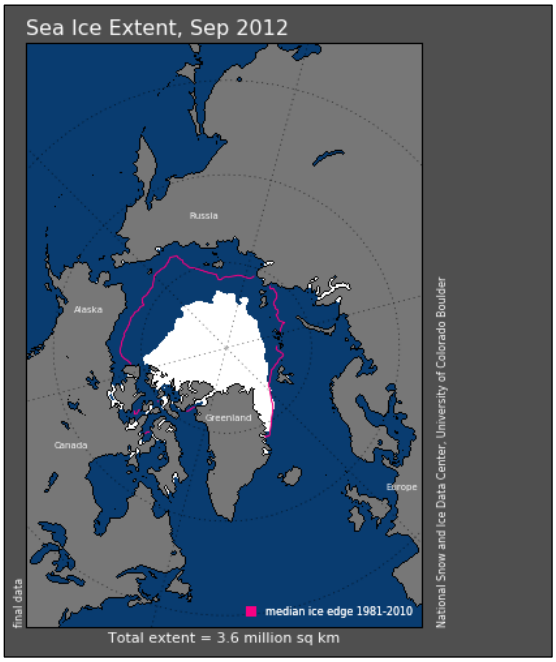
Warming and increasing rainfall have led to permafrost thaw, glacier melt, and sea ice decline, leading to greater flows of organic matter and nutrients to Arctic near-coastal zones, with implications for algae, ecosystems, fisheries and other systems.

Sea Ice Decline and Mobility

Arctic sea ice has declined in extent, area, and thickness over recent decades; it has become more mobile and its spatial distribution has shifted. The record low extents of Arctic sea ice in 2012 and 2007 (**Figure 3** and **Figure 4**), as recorded by U.S. National Snow and Ice Data Center, increased scientific and policy attention on climate changes in the high north, and on the implications of projected ice-free[59] seasons in the Arctic Ocean within decades. Recent late summer minima may be unprecedented over the past 1,000 years.[60] (Some implications are discussed in sections of this report on Commercial Sea Transportation; Oil, Gas, and Mineral Exploration; and others.) The 2021 Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) concluded that "human influence is *very likely* the main driver of ... the decrease in Arctic sea ice area between 1979–1988 and 2010–2019 (about 40% in September and about 10% in March)."[61]

Figure 3. 2012 Record-Low Sea Ice Extent

compared with long-term median



Source: National Snow and Ice Data Center, Sea Ice Index, accessed February 28, 2022.

Simulations under a wide range of future climate change scenarios indicate that the Arctic could be ice-free in late summers in the second half of this century in model simulations of low to very

[57] Intergovernmental Panel on Climate Change, "Summary for Policymakers," *Special Report on the Ocean and Cryosphere in a Changing Climate*, 2019, https://www.ipcc.ch/srocc/chapter/summary-for-policymakers/. (Hereinafter, SROCC SPM 2019.)

[58] National Snow and Ice Data Center, "Rain at the Summit of Greenland," August 18, 2021.

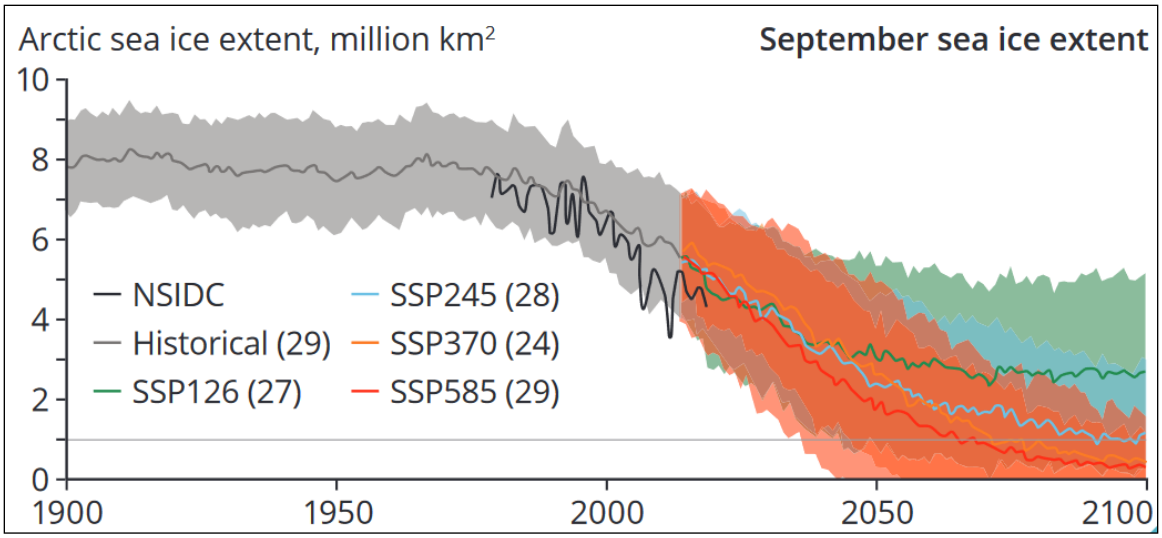
[59] In scientific analyses, "ice-free" does not necessarily mean "no ice." The definition of "ice-free" or sea ice "extent" or "area" varies across studies. Sea ice "extent" is one common measure, equal to the sum of the area of grid cells that have ice concentration of less than a set percentage—frequently 15%. For more information, see the National Snow and Ice Data Center, http://nsidc.org/seaice/data/terminology.html.

[60] SROCC SPM 2019.

[61] Intergovernmental Panel on Climate Change, "AR6 Climate Change 2021: The Physical Science Basis - Summary for Policy Makers," August 9, 2021. https://www.ipcc.ch/report/ar6/wg1/.

high greenhouse gas scenarios (**Figure 4**).[62] The first instances of an ice-free Arctic in late summers could occur by mid-century in all scenarios, although model simulations provide a wide range of results.[63] The mean results of model simulations reach ice-free seasons in the 2070s in the highest and low warming scenarios, and later in the very low scenarios. In an analysis of the most recent modeling, a selection of those models that "reasonably" simulate historical sea ice extent indicated that practically ice-free conditions may occur at global temperature increases of 1.3°C to 2.9°C above preindustrial levels.[64] Although sea ice would remain variable in extent and distribution, modeling of future sea ice conditions indicate opportunities for transport through the Northwest Passage and the Northern Sea Route, extraction of potential oil and gas resources, and expanded fishing and tourism, though also increasing competition and potential security risks and of oil spills and maritime accidents.

Figure 4. Estimated Historical, Observed, and Projected September Arctic Sea Ice Extent



Source: Arctic Monitoring and Assessment Programme (AMAP), "Arctic Climate Change Update 2021: Key Trends and Impacts. Summary for Policy-Makers," Arctic Council, May 21, 2021.

Notes: NSIDC is the U.S. National Snow and Ice Data Center, the source that synthesized the satellite observation data (the bold black line) in this figure. The "historical" values result from model simulations, showing the modeled mean and the ranges. The projections (in colors) are for a range of greenhouse gas scenarios and associated climate changes, with the means of results represented by lines. SSP means "Shared Socioeconomic Pathway" scenarios produced in support of the International Panel on Climate Change depicting high (SSP585), medium high (SSP30), low (SSP245) and very low (SSP126) scenarios. The shaded areas represent the ranges of numerical model estimates (number), either historical and projected. The horizontal line

[62] Arctic Monitoring and Assessment Programme (AMAP), "Arctic Climate Change Update 2021: Key Trends and Impacts. Summary for Policy-Makers," Arctic Council, May 21, 2021; Marika Holland, Cecilia M. Bitz, and Bruno Tremblay, "Future abrupt reductions in the summer Arctic sea ice," *Geophysical Research Letters* 33, no. L23503 (2006). But see also Julien Boé, Alex Hall, and Xin Qu, "Sources of spread in simulations of Arctic sea ice loss over the twenty-first century," *Climatic Change* 99, no. 3 (April 1, 2010): 637-645; I. Eisenman and J. S. Wettlaufer, "Nonlinear threshold behavior during the loss of Arctic sea ice," *Proceedings of the National Academy of Sciences* 106, no. 1 (January 6, 2009): 28-32; Dirk Notz, "The Future of Ice Sheets and Sea Ice: Between Reversible Retreat and Unstoppable Loss," *Proceedings of the National Academy of Sciences* 106, no. 49 (December 8, 2009): 20590-20595.

[63] Global climate models do not, in general, simulate past sea ice change realistically and tend to produce less decline in sea ice extent than the latest 15-year trend.

[64] The current temperature increase above the 1850-1900 average is about 1.1°C.

represents sea-ice areal extent of 1 million square kilometers, below which scientists consider the Arctic to be practically ice-free.

The U.S. Arctic Report Card 2021 noted, in addition, the importance of melting of Arctic land-based ice to experienced sea level rise globally:

> In the 47-year period (1971–2017), the Arctic was the largest global source of sea-level rise contribution, 48% of the global land ice contribution 2003–2010 and 30% of the total sea-level rise since 1992. Temperature effects are dominant in land ice mass balance.

A special report of the IPCC stated that "for Arctic glaciers, different regional studies consistently indicate that in many places glaciers are now smaller than they have been in millennia."[65]

The Arctic Ocean has been undergoing additional changes: It has been acidifying—with some parts acidifying more rapidly than the Atlantic or Pacific Oceans.[66] Some scientists estimate that acidification of the Arctic Ocean may increase enough by the 2030s to significantly influence coastal ecosystems.[67] Primary production in the ocean has increased, due to decreases in sea ice and increases in nutrient supply.

Land-Based changes

Climate changes in the Arctic have important implications for human and natural land-based systems, through permafrost thawing, erosion, instability, and ecosystem shifts.

The U.S. Geological Survey (USGS) concluded that an increase in coastal erosion on the North Slope of Alaska was "likely the result of several changing Arctic conditions, including declining sea-ice extent, increasing summertime sea-surface temperature, rising sea level, and possible increases in storm power and corresponding wave action."[68] The USGS found that erosion has been occurring at an average rate of 1.4 meters annually and that, while some areas are accreting, others are eroding at rates as high as 20 meters per year. Coastal erosion poses risks for native communities, oil and gas infrastructure, and wildlife; adaptations to mitigate and manage adverse impacts can be costly and risky.

Warming temperatures have increased thawing of near-surface permafrost. "The majority of Arctic infrastructure is located in regions where permafrost thaw is projected to intensify by mid-century," according to the IPCC special report on the cryosphere.[69] Existing infrastructure was not generally placed or engineered for the instability, posing risks to human safety and property, and potentially disruption. The IPCC report assessed that "about 20% of Arctic land permafrost is vulnerable to *abrupt* permafrost thaw and ground subsidence,"[70] increasing risks of sudden failures. According to one study, 30%–50% of critical circumpolar infrastructure may be at high risk by 2050. "Accordingly, permafrost degradation-related infrastructure costs could rise to tens of billions of U.S. dollars by the second half of the century."[71] Other costs could be incurred for

[65] SROCC SPM 2019.

[66] Di Qi et al., "Increase in Acidifying Water in the Western Arctic Ocean," *Nature Climate Change* 7, no. 3, March 2017.

[67] U.S. Global Change Research Program, "Climate Science Special Report," Fourth National Climate Assessment, Volume 1, October 2017, https://science2017.globalchange.gov/.

[68] Pacific Coastal and Marine Science Center, "Climate Impacts to Arctic Coasts," U.S. Geological Survey, October 15, 2021.

[69] SROCC SPM 2019.

[70] SROCC SPM 2019.

[71] Hjort, Jan, Dmitry Streletskiy, Guy Doré, Qingbai Wu, Kevin Bjella, and Miska Luoto, "Impacts of Permafrost (continued...)

relocation of infrastructure and villages, and to manage habitat for subsistence wildlife and endangered and threatened species.

Impacts of climate change on species have been positive and negative. Longer growing seasons have resulted in vegetation growth around the Arctic with overall "greening," though also some "browning" in some regions in some years. Woody shrubs and trees are projected to expand to cover 24%–52% of Arctic tundra by 2050.[72] Vegetation changes can provide amplifying feedbacks that increase temperature and permafrost instability. In particular, scientists have assessed significant methane emissions from some thawing peat bogs.

Potential area burned by wildfire could increase by 25% to 53% by 2100. This could affect, for example, forage for caribou and shifting competition between caribou and moose, with likely detriments to subsistence users of caribou.[73]

The IPCC special report on the cryosphere also found that

> On Arctic land, a loss of globally unique biodiversity is projected as limited refugia exist for some High-Arctic species and hence they are outcompeted by more temperate species (medium confidence).[74]

It identified negative impacts also on food and water security in the Arctic, "disrupt[ing] access to, and food availability within, herding, hunting, fishing, and gathering areas, harming the livelihoods and cultural identity of Arctic residents including Indigenous populations."[75] More broadly, warming and ecosystem shifts have "increased risk of food- and waterborne diseases, malnutrition, injury, and mental health challenges especially among Indigenous peoples."[76]

Few studies have investigated the potential economic effects of the array of physical impacts. A report for the state of Alaska on the economic effects of climate change

> estimated that five relatively certain, large effects that could be readily quantified would impose an annual net cost of $340–$700 million, or 0.6%–1.3% of Alaska's GDP. This significant, but relatively modest, net economic effect for Alaska as a whole obscures large regional disparities, as rural communities face large projected costs while more southerly urban residents experience net gains.[77]

The research did not consider "nonuse" impacts, such as on culture, subsistence harvests, or other nonmarket values, as well as additional sectors, such as military installations, housing, and others.

Another study estimating the effects of climate change on Alaskan infrastructure found "cumulative estimated expenses from climate-related damage to infrastructure without adaptation measures (hereafter damages) from 2015 to 2099 totaled $5.5 billion (2015 dollars, 3% discount) for RCP8.5 [a high climate scenario] and $4.2 billion for RCP4.5 [a moderate climate scenario],

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Degradation on Infrastructure," *Nature Reviews Earth & Environment* 3, no. 1 (January 2022): 24–38, https://doi.org/10.1038/s43017-021-00247-8.

[72] SROCC SPM 2019.

[73] SROCC SPM 2019.

[74] SROCC SPM 2019.

[75] SROCC SPM 2019.

[76] SROCC SPM 2019.

[77] Berman, Matthew, and Jennifer I. Schmidt, "Economic Effects of Climate Change in Alaska." *Weather, Climate, and Society* 11, no. 2 (April 1, 2019): 245–58, https://doi.org/10.1175/WCAS-D-18-0056.1. The five effects evaluated were change in value added in Alaska (value of shipments less cost of inputs purchased from outside Alaska) for specific industries; change in household cost of living; change in purchased input costs for businesses and governments; change in nonwage benefit flows to households, including subsistence benefits; and change in value of buildings and infrastructure.

suggesting that reducing greenhouse gas emissions could lessen damages by $1.3 billion this century."[78] Costs were mostly due to road flooding and permafrost instability, and mostly in the interior and southcentral Alaska. It also concluded that adaptation measures could mostly reduce or entirely avoid the estimated economic losses for this land-based infrastructure.

Geopolitical Environment[79]

Overview

Following the end of the Cold War in the late 1980s and early 1990s, and particularly after the founding of the Arctic Council in 1996, the Arctic states sought to maintain the Arctic as a region of cooperation, low tension, peaceful resolution of disputes, and respect for international law—an approach sometimes referred to as the "Arctic spirit" or "High North, low tension." The Nordic countries in particular were committed to this approach.

Over the past 10 to 15 years, the emergence of great power competition (also called strategic competition) between the United States, Russia, and China has introduced elements of competition and tension into the Arctic's geopolitical environment. Russia's increased military presence and operations in the Arctic—and responding actions by other Arctic states—are one source of competition and tension. China's increased diplomatic and economic activities in the Arctic are another.

Some observers view the Arctic as having become an arena for geopolitical competition among the United States, Russia, and China,[80] or argue that the diminishment of Arctic ice and potentially increased maritime access to the region's resources has prompted or could prompt a race for Arctic resources (or words to that effect) among Russia, China, the United States, and other countries.[81] Other observers argue that competitive aspects of the region's geopolitical environment and the notion of a race for Arctic resources are sometimes overstated, particularly given the high costs and technical challenges of Arctic oil and gas operations.[82] As discussed further in the next section, Russia's war in Ukraine beginning on February 24, 2022, has

[78] Melvin, April M., Peter Larsen, Brent Boehlert, James E. Neumann, Paul Chinowsky, Xavier Espinet, Jeremy Martinich, et al., "Climate Change Damages to Alaska Public Infrastructure and the Economics of Proactive Adaptation," *Proceedings of the National Academy of Sciences* 114, no. 2 (January 10, 2017): E122–31, https://doi.org/10.1073/pnas.1611056113.

[79] This section was prepared by Ronald O'Rourke, Specialist in Naval Affairs, Foreign Affairs, Defense, and Trade Division. It incorporates material prepared by Kristin Archick, Specialist in European Affairs, Foreign Affairs, Defense, and Trade Division, and Derek E. Mix, Analyst in European Affairs, Foreign Affairs, Defense, and Trade Division.

[80] See, for example, Joel Mathis, "The New Cold War in the Arctic, Explained," *The Week*, June 22, 2023; Jim Garamone, "Arctic Heating Up Literally and as Scene of Strategic Competition," *DOD News*, April 5, 2023; Abbie Tingstad and Yuliya Shokh, "Great Power Competition Is on the Arctic Agenda," *The Hill*, February 16, 2023; Jeremy Greenwood, "Great Power Competition and Overseas Basing in the Arctic," Brookings Institution, February 2023, 9 pp.

[81] See, for example, The Week Staff, "Under the Melting Ice: The Race for the Arctic's Riches," *The Week*, May 11, 2023; Margaret Sutherlin, "Who Owns the North Pole? A Race Is Underway to Decide," *Bloomberg*, May 5, 2023; Elizabeth Buchanan, "Russia's Gains in the Great Arctic Race," *War on the Rocks*, May 4, 2023; Lisa Desjardins, Andrew Corkery, and Azhar Merchant, "Tensions Rise as Nations Race for Valuable Resources in the Arctic," *PBS*, April 23, 2023; "Arctic Resources Race," *Wikipedia*, updated April 8, 2023.

[82] See, for example, P. Whitney Lackenbauer, Adam Lajeunesse, and Ryan Dean, "Why China Is Not a Peer Competitor in the Arctic," *Journal of Indo-Pacific Affairs*, October 3, 2022; Thomas Graham and Amy Myers Jaffe, "There Is No Scramble for the Arctic," *Foreign Affairs*, July 276, 2020; Jeremy Tasch, "Why the Talk of an 'Artic Cold War' Is Exaggeration," Valdai Discussion Club, July 7, 2020; Danita Catherine Burke, "Why the New Arctic 'Cold War' is a Dangerous Myth," *The Conversation*, December 13, 2018.

substantially affected the Arctic's geopolitical environment in a number of ways, some of which have added to tensions in the region.

Impact of Russia's War in Ukraine

Russia's war in Ukraine beginning on February 24, 2022, has substantially affected the Arctic's geopolitical environment in a number of ways, including but not necessarily limited to the following, some of which have added to tensions in the region:

- On March 3, 2022, in response to Russia's invasion, the seven Arctic states other than Russia—who are sometimes referred to as the Arctic 7 or A7—announced that they would be "temporarily pausing participation in all meetings of the [Arctic] Council and its subsidiary bodies."[83] (The Nordic Council of Ministers similarly stated that it was suspending its cooperation with Russia and Belarus.[84]) The suspension of Arctic Council meetings ruptured the normal operations of the council, but did not prevent the chairmanship of the council from being transferred from Russia to Norway on May 11, 2023. In October 2022, China's special envoy to the Arctic reportedly stated that China would not recognize the legitimacy of an Arctic Council that does not include Russia. He also reportedly stated that China would continue to cooperate in the Arctic with both the A7 states and Russia.[85] On February 21, 2023 (i.e., almost a year after the start of Russia's war in Ukraine), Russia published amendments to its Arctic policy statement that removed mentions of the Arctic Council.[86] In May and June 2023, it was reported that while all cooperation with Russia will remain suspended, other activities of the Council and its working groups would resume in mid-June 2023.[87] A June 2023 press report stated: "At the end of his tenure as chair of the Arctic Council's senior officials committee in May, Russia's Nikolai Korchunov said Moscow could withdraw from the organisation if it was not invited to participate in events during the Norwegian presidency."[88] These developments

[83] U.S. Department of State, "Joint Statement on Arctic Council Cooperation Following Russia's Invasion of Ukraine," March 3, 2022.

[84] See, for example, Niina Aagaard, "Nordic Council of Ministers Suspends All Co-operation with Russia," *Nordic Co-operation*, March 3, 2022; Atle Staalesen, "Nordic Countries Halt All Regional Cooperation with Russia," *Barents Observer*, March 6, 2022. For a press report on separate developments, see David Lochead, "Russian Invasion of Ukraine Creates Strain for Arctic Organization," *Nunatsiaq News*, March 1, 2022; Eilís Quinn, "Sweden, Finland Pull Out of Arctic360 Conference in Toronto Where Russian Diplomats Scheduled to Attend," *Eye on the Arctic (Radio Canada International)*, February 25, 2022. See also Eye on the Arctic, "Russia High on Agenda at Nordic Council Meeting," *Eye on the Arctic (Radio Canada International)*, November 1, 2022.

[85] Melody Schreiber, "China Will Not Recognize an Arctic Council Without Russia, Envoy Says," *ArcticToday*, October 17, 2022; Trine Jonassen, "China: 'Will Not Acknowledge Arctic Council Without Russia,'" *High North News*, October 15 (updated October 18), 2022. See also Astri Edvardsen, "China Wants to Support Norway in Restoring the Arctic Council," *High North News*, April 28, 2023.

[86] See, for example, Malte Humpert, "Russia Amends Arctic Policy Prioritizing 'National Interest' and Removing Cooperation Within Arctic Council," *High North News*, February 23, 2023.

[87] Trine Jonassen, "The Arctic Council Resumes Some Activities in Mid-June," *High North News*, May 16 (updated May 19), 2023; Eilís Quinn, "Seven Western Countries on Arctic Council to Resume Limited Work in Forum," *Eye on the Arctic*, June 8, 2022; Melody Schreiber, "Arctic Council Nations to Resume Limited Cooperation—Without Russia," *ArcticToday*, June 8, 2022. Nikolaj Skydsgaard, "Arctic Council Countries to Resume Limited Work Excluding Russia," *Reuters*, June 8, 2022.

[88] Richard Milne, "Arctic Chill: Western Nations Fear China and Russia Will Exploit Regional Tensions," *Financial Times*, June 5, 2023. See also Astri Edvardsen, "Lavrov: 'The Arctic Council's Future Depends on Whether a Civilized Dialogue Can Continue,'" *High North News*, May 15, 2023; Astri Edvardsen, "Russia: 'The Risk of Weakening the (continued...)

have prompted new or heightened questions about the future of the Arctic Council, Arctic governance, and cooperation in general among the eight Arctic states.[89]

- For the A7 states, Russia's war in Ukraine has heightened concerns about the purpose behind Russia's military modernization in the Arctic and reinforced cooperative security links among the seven countries.[90] Some press reports state that Russia has withdrawn military personnel and equipment from its Arctic bases to help provide reinforcements for its war in Ukraine, and that some of these forces have been destroyed in combat.[91] Another press report states that Russia's military modernization in the Arctic has continued during the war in Ukraine.[92]
- Russia's war in Ukraine prompted Finland and Sweden to apply for NATO membership, and on April 4, 2023, Finland became a member of NATO,[93] which converted Finland's 833-mile border with Russia[94] into a NATO-Russia frontier.

Arctic Council Should Not Be Underestimated,'" *High North News*, May 12, 2023; Trine Jonassen, "'Russia Will Stay in The Arctic Council as Long as it Serves Our Interests,'" *High North News*, May 11 (updated May 12), 2023; Astri Edvardsen, "Russia's Top Arctic Diplomat: Long-Term Cooperation in the Arctic Requires Conditions Now Lost," *High North News*, May 3, 2023.

[89] See, for example, Emilie Canova and Pauline Pic, "The Arctic Council in Transition: Challenges and Perspectives for the New Norwegian Chairship," Arctic Institute, June 13 2023; Brett Simpson, "The Rise and Sudden Fall of the Arctic Council," *Foreign Policy*, May 31, 2023; Abbie Tingstad and Stephanie Pezard, "What Is Next for the Arctic Council in the Wake of Russian Rule?" *The Hill*, May 14, 2023; Humeyra Pamuk, Gloria Dickie, and Gwladys Fouche, "Fears mount for the Arctic as cooperation with Russia stalls," *Reuters*, May 9, 2023; Atle Staalesen, "'Barents and Arctic Cooperation Can Continue without Russia,'" *Barents Observer*, March 7, 2023, Nong Hong, "As War in Ukraine Freezes the Arctic Council, How Will Asia Break the Ice?" *South China Morning Post*, February 25, 2023; Malte Humpert, "Cooperation with Russia in the Arctic is Virtually Impossible Says US Official," *High North News*, February 16, 2023; Kai Kornhuber et al., *The Disruption of Arctic Exceptionalism, Managing Environmental Change in Light of Russian Aggression*, German Council on Foreign Relations (DGAP), February 2023, 18 pp.; Trine Jonassen, "Arctic Council Chairmanship: 'Norway Knows How to Do It,'" *High North News*, January 31 (updated February 3), 2023; Benjamin J. Sacks, Marigold Black, and Peter Dortmans, "Arctic Governance Is in Trouble. The Antarctic Could Be Next," *RAND Blog*, December 7, 2023; Karsten Friis, Elana Wilson Rowe, Mike Sfraga, and Ulf Sverdrup, editors, *Navigating Breakup: Security Realities of Freezing Politics and Thawing Landscapes in the Arctic*, Norwegian Institute of International Affairs, January 2023, 63 pp.; Nima Khorrami and Andreas Raspotnik, "Forced to Look East? Russia, China, India, and the Future of Arctic Governance," *Georgetown Journal of International Affairs*, September 16, 2022.

[90] See, for example, Barry Gardiner, "As the Ice Melts, a Perilous Russian Threat Is Emerging in the Arctic," *Guardian*, June 13, 2023.

[91] See, for example, Atle Staalesen, "Anniversary Celebrations in Arctic Spetsnaz Base Sputnik as Number of Marines Killed in Ukraine Rises," *Barents Observer*, May 5, 2023; Atle Staalesen, "Russia's Arctic Brigade in Alakurtti Is Counting Its Many Dead," *Barents Observer*, February 22, 2023; Malte Humpert, "Ukraine War Taking Toll on Arctic Material and Personnel," *High North News*, February 17, 2023; Thomas Nilsen, "Land Forces at Kola Reduced to One-Fifth, Norwegian Intelligence Says," *Barents Observer*, February 13, 2023; David Axe, "Russia Built A Dozen Air-Defense Vehicles For War In The Arctic. Then Sent Them To Ukraine To Get Blown Up." *Forbes*, February 4, 2023. See also Colin Wall and Njord Wegge, *The Russian Arctic Threat, Consequences of the Ukraine War*, Center for Strategic and International Studies (CSIS), January 2023, 16 pp. See also Malte Humpert, "From Ukraine to the Arctic: Russia's Capabilities in the Region and the War's Impact on the North," *High North News*, September 22 (updated September 28), 2022.

[92] Nick Paton Walsh and Sarah Dean, "Russia's Militarization of the Arctic Shows No Sign of Slowing Down," *CNN*, December 22, 2022.

[93] CRS Insight IN11949, *NATO: Finland Joins as Sweden's Accession Faces Delay*, by Kristin Archick, Paul Belkin, and Andrew S. Bowen.

[94] Finland's border with Russia is usually said to have a length of 1,340 kilometers, or 832.6 miles. (See, for example, U.K Parliament, House of Lords, European Union Committee, 9th Report of Session 2007–08, *FRONTEX: the EU External Borders Agency, Report with Evidence*, Ordered to be printed 26 February 2008 and published 5 March 2008, (continued...)

More than 300 miles of this border (i.e., more than 36% of the border's length) is north of the Arctic Circle.[95] (By way of comparisons, Norway's border with Russia, all of which is above the Arctic Circle, is about 123 miles in length.[96]) Almost one-third of Finland's territory is north of the Arctic Circle.[97] In these ways, Finland becoming a member of NATO has increased the Arctic as an area of focus for NATO.[98] If Sweden were to also become a member of NATO, it would further increase the Arctic as an area of focus for NATO,[99] given that about 15% of Sweden's land area is north of the Arctic Circle.[100] Russia's defense minister reportedly stated in December 2022 that in response to Finland and Sweden seeking to join NATO, Russia would reorganize some of its military forces near the Nordic countries.[101]

- Russia's diplomatic isolation from the A7 states in the Arctic has led to increased Russian cooperation with China in the Arctic[102]—a development that could

Tables 1, 2, and 3 [pages 13 and 14]); Salla Korpela, "A Border That Once Divided Now Unites," *This Is Finland*, June 2008; Henry Ridgwell, "Will Finland's 1,300-Kilometer Border Become NATO-Russia Frontier?" *Voice of America*, May 12, 2022; James Frater and Xiaofei Xu, "Finland Plans to Start Building a Fence on Russian Border Next Year," *CNN*, November 18, 2022; Jari Tanner, "Finland to Start Building Fence on Russian Border Next Year," *Associated Press*, November 18, 2022.

[95] Source: CRS measurement, February 27, 2023.

[96] Source: Norway's border with Russia, which was previously said to have a length of 195.7 kilometers, was resurveyed and in 2018 was determined to have a length of 197.7 kilometers (or about 122.8 miles), with the difference attributed to changes in the flow of a river and improvements in measuring devices. (See Thomas Nilsen, "Russia Just Got a "Longer" Border to Norway," *Barents Observer*, September 26, 2018. See also, for example, Nina Berglund, "Norway Tightens Russian Border Control," *NewsinEnglish.no*, October 2, 2022; Astri Edvardsen, "Norway To Strengthen Control on the Border With Russia–And Is Ready to Close It At Short Notice," *High North News*, October 3 [updated October 4], 2022.)

[97] See, for example, "Finland," Arctic Council, undated, accessed February 27, 2023, at https://arctic-council.org/about/states/finland/; "Finland," Arctic Institute, updated on August 1, 2022; "Finland," *Britannica*, updated February 21, 2023.

[98] See, for example, Anne Kauranen and Johan Ahlander, "In NATO's New North, Fresh Chances to Contain Moscow," *Reuters*, July 3, 2023; Ruby Mellen and Dylan Moriarty, "Four Maps Explain How Finland Could Alter NATO's Security," *Washington Post*, May 19, 2022 (updated April 3, 2023).

[99] See, for example, Ellen Knickmeyer, "Finland, Sweden Offer NATO an Edge as Rivalry Warms Up North," *Associated Press*, August 20, 2022; Jonathan Masters, "How NATO Will Change if Finland and Sweden Become Members," Council on Foreign Relations, updated June 29, 2022; Jan Kallberg, "Defending NATO in the High North," Center for European Policy Analysis (CEPA), July 1, 2022; Joe Gould, "How Sweden and Finland Could Reshape NATO's Northern Security," *Defense News*, June 2, 2022; Svetlana Shkolnikova, "Addition of Finland and Sweden to NATO Would Strengthen Arctic Security, Improve US Training, Military Officials Say," *Stars and Stripes*, May 18, 2022.

[100] Source for 15% figure: "Sweden," Artic Institute, updated August 1, 2022; "Climate of Sweden," *Britannica*, undated, accessed February 28, 2023. Another source states: "The two northernmost counties [of Sweden], Västerbotten and Norrbotten, are defined as Sweden's Arctic territory. This region represents about one-third of Sweden's territory, but is populated with just over half of a million inhabitants – more sparsely populated than the southern parts of the country." (Sweden, Arctic Council, undated, accessed February 28, 2023.)

[101] See Thomas Nilsen, "Shoigu Vows More Troops Near Nordic Countries," *Barents Observer*, December 21, 2022.

[102] See, for example, Richard Milne, "Arctic Chill: Western Nations Fear China and Russia Will Exploit Regional Tensions," *Financial Times*, June 5, 2023; Elisabeth Braw, "Arctic Harmony Is Falling Apart, An Isolated Russia Is Turning to China for Help in the North," *Foreign Policy*, May 15, 2023; Eilís Quinn, "Russia's Growing Dependence on China Altering Dynamics in Arctic, UK Committee Hears," *Eye on the Arctic*, May 9, 2023; Thomas Nilsen, "Russia's Coast Guard Cooperation with China Is a Big Step, Arctic Security Expert Says," *Barents Observer*, April 28, 2023; Malte Humpert, "Putin and Xi Discuss Further Deepening of Arctic Partnership," *High North News*, March 23, 2023; Yu Cao, "Implications for Sino-Russian Cooperation on the Polar Silk Road," *Arctic Yearbook 2022*; Atle Staalesen, "Putin's Top Oilman Praises Xi Jinping, Invites China to the Arctic," *Barents Observer*, November 29, 2022; (continued...)

strengthen China's presence and activities in the region and affect views among observers in the A7 states and elsewhere regarding China's motivations and goals for its Arctic activities and China's ability to work with the A7 states on matters relating to the Arctic.[103]

- Actions taken by governments in response to Russia's war in Ukraine substantially disrupted international scientific research projects in the Arctic that involved Russian participation.[104]
- Soon after the start of result of Russia's war in Ukraine, several major oil companies and investors announced that they were withdrawing from Russian resource development or not pursuing new projects with Russia, including in the Arctic.[105] Western sanctions reportedly have impeded Russian energy projects in the Arctic.[106] At the same time, exports of Russian oil to India and China reportedly have increased.[107]

Larissa Stünkel, "China's Polar Silk Road Revisited," Institute for Security & Development Policy, October 2022; Elizabeth Buchanan, "The Punishment Paradox: Understanding the Unintended Consequences of Suspending Arctic Cooperation with Russia," Modern War Institute, October 22, 2022; John Grady, "China, Russia Quietly Expanding Arctic Partnership, Says Panel," *USNI News*, October 11, 2022; Maria Rehman, "Changing Contours of Arctic Politics and the Prospects for Cooperation between Russia and China," *Arctic Institute*, August 23, 2022; Agence France-Presse, "Russia and China Eye NATO's 'Arctic Achilles Heel,'" *France 24*, June 23, 2022 (regarding Svalbard).

[103] See, for example, Faustine Ngila, "China Is Cementing Its Position as an Arctic Superpower through Russia," *Quartz*, April 20, 2023; Matthew P. Funaiole, Brian Hart, Joseph S. Bermudez Jr., and Aidan Powers-Riggs, "Frozen Frontiers, China's Great Power Ambitions in the Polar Regions," Center for Strategic and International Studies (CSIS), April 18, 2023; Paul Goble, "Amid Russia's Problems, China Assumes a Larger Role in the Arctic," *Eurasia Daily Monitor*, March 28, 2023; Matti Puranen and Sanna Kopra, "Finland and the Demise of China's Polar Silk Road," *China Brief*, December 30, 2022; Marc Lanteigne, "China and the 'Two Arctics,'" *Diplomat*, October 18, 2022; Danielle Bochove, "NATO-China Tension Over Ukraine Flares at Conference in Iceland," *Bloomberg*, October 15, 2022; Kristin Huang, "Warm Russian Ties Are Key to China's Arctic Aspirations: Report," *South China Morning Post*, October 2, 2022.

[104] See, for example, Warren Cornwall, "'We are cut off.' Tensions with Russia Are Hobbling Arctic Research," *Science*, May 3, 2023; Dino Grandoni, "Why Russia's War in Ukraine Is Bad News for Polar Bears, Too," *Washington Post*, April 15, 2023; Karen van Loon, "The Like-Minded, The Willing... and The Belgians: Arctic Scientific Cooperation after February 24 2022," Arctic Institute, March 21, 2023; Ed Struzik, "How Tensions With Russia Are Jeopardizing Key Arctic Research," Yale Environment 360, February 7, 2023; Lori Valigra, "Arctic Researchers Forced to Modify Projects amid Geopolitical Tensions with Russia," *Science Business*, November 21, 2022; Gastautor, "Political Tensions Lead to 'Gaps' in Scientific Data in the Arctic Region, *Polar Journal*," September 10, 2022.

[105] Melody Schreiber, "Major Oil Companies and Investors Pull Back from Russian Arctic Oil and Gas," *ArcticToday*, March 5, 2022.

[106] Seth Stevenson and Matt Jones, "Sanctions Delay Chinese Equipment to Russian Arctic Energy Projects," Tearline.mil, October 25, 2022; Lee Ferran, "Arctic Chill: Sanctions Biting Chinese-Russian Energy Initiatives, IC-Sponsored Report Says," *Breaking Defense*, October 26, 2022; Georgi Kantchev, "Sanctions Threaten Russia's Next Huge Oil Field," *Wall Street Journal*, July 5, 2022; Atle Staalesen, "American Engineers Deal Blow to Russian Arctic Oligarch," *Barents Observer*, June 16, 2022; Sergey Sukhankin, "Russia's Arctic Strategy Melting Under the Scorch of Sanctions (Part One)," *Eurasia Daily Monitor*, June 1, 2022; Atle Staalesen, "Russian Arctic Oil Export Moves Towards Collapse," *Barents Observer*, June 1, 2022; Atle Staalesen, "Biggest Arctic Construction Sites Could Turn into Ghost Towns," *Barents Observer*, May 17, 2022; Atle Staalesen, "Big Collapse Looms over Russian Arctic Policy," *Barents Observer*, March 30, 2022.

[107] See, for example, Lazaro Gamio, Leanne Abraham, Ana Swanson, and Alex Travelli, "How India Profits From Its Neutrality in the Ukraine War," *New York Times*, June 22, 2023; Grant W. Turner, "Russia's Arctic Crude Exports to China and India Increase," *Eurasia Daily Monitor*, February 21, 2023; Malte Humpert, "Russia Reroutes Arctic Oil To China and India as Result of EU Sanctions," *High North News*, January 16, 2023. See also Sergey Sukhankin, "Russo-Indian Economic Ties During Wartime: Oil, Currency and the Arctic," *Eurasian Daily Monitor*, January 31, 2023; Florence Tan and Nidhi Verma, "Russia Sends More Arctic Oil To China, India after Sanctions," *Reuters*, January 5, 2023.

October 2021 National Intelligence Estimate

A National Intelligence Estimate by the National Intelligence Council on climate change and international responses that are increasing challenges to U.S. national security that was released in October 2021 (i.e., a few months before the start of Russia's war in Ukraine) states the following about the Arctic (emphasis as in original):

> ***Key Judgment 2*: The increasing physical effects of climate change are likely to exacerbate cross-border geopolitical flashpoints as states take steps to secure their interests.** The reduction in sea ice already is amplifying strategic competition in the Arctic over access to its natural resources....
>
> **We assess that Arctic and non-Arctic states almost certainly will increase their competitive activities as the region becomes more accessible because of warming temperatures and reduced ice. Competition will be largely economic but the risk of miscalculation will increase modestly by 2040 as commercial and military activity grows and opportunities are more contested.**
>
> • Diminishing sea ice probably will increase access to shipping routes that can reduce trade times between Europe and Asia by about 40 percent for some vessels. In addition, onshore oil and natural gas deposits, as well as an estimated $1 trillion worth of precious metals and minerals will become more available, but some high-cost offshore oil and gas projects could become unprofitable if the energy transition speeds up.
>
> • Warming ocean temperatures probably will push Bering Sea fish stocks northward into the Arctic Ocean, according to a NOAA study, which could increase commercial and illegal fishing activity in the region and exacerbate regional disputes between Arctic and non-Arctic states over fishing rights.
>
> • Coastal erosion and thawing permafrost will damage critical infrastructure. Massive investment in infrastructure would be needed to maximize the economic potential of the region, ranging from new ports to mining, offering foreign powers an opportunity to gain a foothold by investing in new infrastructure and rebuilding and hardening existing infrastructure.
>
> **Military activity is likely to increase as Arctic and non-Arctic states seek to protect their investments, exploit new maritime routes, and gain strategic advantages over rivals.**
>
> **The increased presence of China and other non-Arctic states very likely will amplify concerns among Arctic states as they perceive a challenge to their respective security and economic interests.** China, France, India, Japan, South Korea, and the United Kingdom have released Arctic strategies mostly focused on economic opportunities, but some address security issues, which has prompted Russian policymakers to repeatedly state since 2018 that non-Arctic countries do not have a military role in the region.
>
> **Contested economic and military activities will increase the risk of miscalculation, and deescalating tensions is likely to require the adaptation of existing or creation of new forums to address bilateral or multilateral security concerns among Arctic states.** Although the scope of the Arctic Council—the leading intergovernmental forum promoting cooperation among Arctic states—specifically excludes military security, Russia intends to broach security concerns with the other Arctic states while chairing the council from 2021 to 2023, according to Russian officials' public statements, and may propose alternate forums to discuss those issues....
>
> ***Overt military action, especially by a non-Arctic state, that significantly escalates tension in the region and results in a sidelining of Arctic diplomacy*** *would challenge our judgment that increased activity in the Arctic, while raising the possibility of miscalculation, is unlikely to result in outright conflict because of the harsh operating*

> *environment and existing mechanisms for cooperation.* Persistent challenges to Russia's supremacy of the Northern Sea Route [NSR][108] by a non-Arctic state's military could result in armed conflict with Russia if diplomatic negotiations had stalled and foreign militaries continued to operate in what Moscow views as its territorial waters. Alternatively, if a non-Arctic state, especially China, were to begin regular, large-scale military operations in the area to protect an economic foothold in the region, the risk of conflict with Arctic states could increase and contribute to a buildup of forces.[109]

Arctic Governance

Prior to Russia's war in Ukraine, great power competition and increased human activities in the Arctic resulting from the diminishment of Arctic ice put a spotlight on the issue of Arctic governance and the limits of the Arctic Council as a governing body.[110] As noted earlier, Russia's war in Ukraine has prompted new or heightened questions about the future of the Arctic Council and Arctic governance.

Regarding the limits of the council as a governing body, the council states that it "does not and cannot implement or enforce its guidelines, assessments or recommendations. That responsibility belongs to each individual Arctic State. The Arctic Council's mandate, as articulated in the Ottawa Declaration, explicitly excludes military security."[111] Arctic security issues currently can be addressed, to some degree at least, through other existing mechanisms, such as the Arctic Security Forces Roundtable (ASFR) and the Arctic Chiefs of Defense (ACHOD) Forum.

Prior to Russia's war in Ukraine, China raised questions as to whether the Arctic Council as currently constituted and the current broader legal framework for the Arctic should continue to be the principal means for addressing issues relating to the Arctic, and had begun to use other approaches for influencing Arctic governance.[112]

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[108] The NSR is an Arctic sea route connecting Europe to East Asia that runs generally along Russia's Arctic coast.

[109] Office of the Director of National Intelligence, National Intelligence Council, *Climate Change and International Responses Increasing Challenges to US National Security Through 2040*, National Intelligence Estimate, NIC-NIE-2021-10030-A, pp. 7, 8, 16. For a discussion of the intelligence community's approach to covering the Arctic, see Marisol Maddox and Lyston Lea, *The Intelligence Community Must Evolve To Meet the Reality of Arctic Change*, Wilson Center Polar Institute, Polar Perspectives, No. 13, May 2023, 11 pp.

[110] See, for example, Benjamin J. Sacks et al., *Exploring Gaps in Arctic Governance, Identifying Potential Sources of Conflict and Mitigating Measures*, RAND, 2021, 29 pp. (report RRA1007.1); Ebru Caymaz, "Rethinking Governance in Time of Pandemics in the Arctic," Arctic Institute, January 14, 2021; Ian Birdwell, "Arctic Governance: Keeping The Arctic Council On Target," Center for International Maritime Security (CIMSEC), July 29, 2020; Benjamin Chiacchia, "The Case for an Arctic Treaty," *U.S. Naval Institute Proceedings*, May 2020; Rashmi Ramesh, "Changing Geopolitics of the Arctic: Challenges for Governance," *IndraStra*, April 9, 2020; Angus Parker, "Looking North: How Should the Arctic Be Governed?" *Geographical (UK)*, March 17, 2020; Kevin McGwin, "An Arctic Treaty Has Been Rejected by the Region's Leaders. Again; Academics Will Tell You the Idea of an Arctic Treaty Sounds Terribly Exciting. Diplomats Think It Is Just Terrible," *ArcticToday*, February 12, 2020; Marc Lanteigne, "So You Want to Write an Arctic Treaty?" *Over the Circle*, February 10, 2020; Heather Exner-Pirot et al., "Form and Function: The Future of the Arctic Council," *Arctic Institute*, February 5, 2019.

[111] Arctic Council, "About the Arctic Council," accessed February 15, 2023, at https://arctic-council.org/en/about/.

[112] See, for example, Pan Yixuan, "Global Governance Needed for Arctic Affairs," *China Daily*, May 10, 2019; Zhang Yao, "Ice Silk Road Framework Welcomed by Countries, Sets New Direction for Arctic Cooperation," *Global Times*, April 7, 2019; Liu Caiyu, "China's Role in Arctic Governance 'Cannot Be Ignored,'" *Global Times*, November 22, 2018; Harriet Moynihan, "China Expands Its Global Governance Ambitions in the Arctic," Chatham House, October 15, 2018; Sydney J. Freedberg Jr., "China & Russia In The Arctic: Axis Of Ambivalence," *Breaking Defense*, July 6, 2018; Nengye Liu and Michelle Lim, "How Arctic Governance Could Become a Testing Ground for Sino-US Relations," *The Conversation*, March 29, 2017.

Relative Priority of Arctic in U.S. Policymaking

In light of great power competition and increased human activities in the Arctic resulting from the diminishment of Arctic ice, some observers argue that there is a need to devote more U.S. attention and resources to the region.[113] On the other hand, great power competition is also being expressed in Europe, the Middle East, the Indo-Pacific, Africa, and Latin America. In a situation of finite U.S. policymaker attention and resources, the Arctic competes for attention and resources against these other regions. Some observers argue that the United States is not allocating sufficient attention or resources to defend and promote its interests in the Arctic.[114]

Russia in the Arctic

Overview

In considering Russia's role in the Arctic's geopolitical environment, points that can be noted include but are not limited to the following:

- Geographically, Russia is the most prominent of the eight Arctic states. According to one assessment, Russia "has at least half of the Arctic in terms of area, coastline, population and probably mineral wealth."[115] About 20% of Russia's land mass is north of the Arctic Circle,[116] and Russia has numerous cities and towns there. As of 2019-2020, 80% of Russia's natural gas and 17% per cent of its oil production took place in its Arctic.[117]
- Russia has identified the Arctic as a high-priority region critical to the country's prosperity and security. Starting in 2008, the Russian government has adopted a series of strategy documents outlining plans to bolster the country's Arctic military capabilities, strengthen territorial sovereignty, and develop the region's

[113] See, for example, Kenneth R. Rosen, "A Battle for the Arctic Is Underway. And the U.S. Is Already Behind," *Politico*, December 17 (updated December 18), 2022; Daniel Kochis and Johnathan Little, "As Russia Invests in Arctic, America Falls Behind," Heritage Foundation, November 3, 2021; Heather A. Conley and Matthew Melino, *The Implications of U.S. Policy Stagnation toward the Arctic Region*, Center for Strategic and International Studies (CSIS), May 2019, 5 pp.

[114] See, for example, Kenneth R. Rosen, "A Battle for the Arctic Is Underway. And the U.S. Is Already Behind," *Politico*, December 17 (updated December 18), 2022; Mir Sadat, "The US Is Unprepared to Face the Challenge in the Arctic. Here's What It Should Do," Atlantic Council, January 31, 2022; Tyler Olson, "Biden Admin Faces Lack of Icebreakers, Increasing Russian and Chinese Threats in Arctic," *Fox News*, May 9, 2021; Rockford Weitz, "Competition Heats Up in the Melting Arctic, and the US Isn't Prepared to Counter Russia," *The Conversation*, April 19 (updated June 11), 2021; John Rossomando, "Will Joe Biden Lose the Arctic to Russia or China?" *National Interest*, April 18, 2021.

[115] "The Arctic: Special Report," *The Economist*, June 16, 2012, p. 11. The Arctic Council states that "Russia stretches over 53 percent of the Arctic Ocean coastline. Approximately two and a half million of Russia's inhabitants live in Arctic territory, accounting for nearly half of the population living in the Arctic worldwide." ("The Russian Federation," Arctic Council, accessed February 15, 2023, at https://arctic-council.org/en/about/states/russian-federation/.)

[116] Testimony of Admiral Charles W. Ray, Coast Guard Vice Commandant, on "Expanding Opportunities, Challenges, and Threats in the Arctic: a Focus on the U.S. Coast Guard Arctic Strategic Outlook" before the Senate Commerce, Science, & Transportation Security Subcommittee, December 12, 2019, p. 3.

[117] Ian Anthony, Ekaterina Klimenko, and Fei Su, *A Strategic Triangle in the Arctic? Implications of China–Russia–United States Power Dynamics for Regional Security*, SIPRI Insights on Peace and Security, No. 2021/3, March 2021, p. 3, which cites the following as its source [brackets as in the citation]: "President of Russia, [The strategy for the development of the Arctic Zone of the Russian Federation and national security until 2035], 26 Oct. 2020 (in Russian); and Novyye Izvestiya, [Russia invests 86 billion USD into the Arctic], 28 Mar. 2019 (in Russian)."

resources and infrastructure. Russia is keen to capitalize on natural resource development in the region, both onshore and offshore.

- Over the least 10 to 15 years, Russia has invested in the construction of Arctic ports and search-and-rescue facilities, some of which are referred to as dual-use (civilian-military) facilities. Russia also has reactivated and modernized Arctic military bases that fell into disuse with the end of the Cold War, assigned upgraded forces to those bases, and increased military exercises and training operations in the Arctic.
- Russia uses its coastal Arctic waters as a maritime highway for supporting its Arctic communities. As noted later in this report (see "Commercial Sea Transportation"), the Northern Sea Route (NSR) that runs along Russia's Arctic coast accounts for the vast majority of large cargo ship transits in the Arctic. Russia is promoting the NSR for use by others seeking to transport goods between Europe and Asia.[118]
- In light of the above points, of all the Arctic states, Russia might have the most at stake in the Arctic in absolute terms.[119]

Cooperation with Russia

Prior to Russia's war in Ukraine, the A7 states cooperated with Russia on a range of issues in the Arctic. One example is cooperation on Arctic search and rescue (SAR) under the May 2011 Arctic Council agreement on Arctic SAR that is discussed later in this report. The A7 states also cooperated with Russia through the Arctic Coast Guard Forum (ACGF), an organization intended to "foster safe, secure, and environmentally responsible maritime activity in the Arctic."[120] The United States and Russia in 2018 cooperated in creating a scheme for managing two-way shipping traffic through the Bering Strait and Bering Sea,[121] and in February 2021, the U.S. Coast Guard and Russia's Marine Rescue Service signed an agreement updating a 1989 bilateral joint

[118] See also Gonzalo Vázquez, "2022 Russian Maritime Doctrine: Implications for NATO & the Future of Great Power Competition in the Arctic," Arctic Institute, April 11, 2023; Atle Staalesen, "Assertive Moscow outlines push into central Arctic Ocean," *Barents Observer*, August 17, 2022; Malte Humpert, "Control Over Arctic Ocean Top Priority Of New Russian Naval Doctrine," *High North News*, August 4, 2022.

[119] For additional discussion, see CRS Report R46761, *Russia: Foreign Policy and U.S. Relations*, by Andrew S. Bowen and Cory Welt. See also Heather A. Conley et al., *Russia's Climate Gamble, The Pursuit and Contradiction of Its Arctic Ambitions*, Center for Strategic and International Studies (CSIS), September 2021, 58 pp.

[120] The ACGF states at its website (https://www.arcticcoastguardforum.com/about-acgf) that it "is an independent, informal, operationally-driven organization, not bound by treaty, to foster safe, secure, and environmentally responsible maritime activity in the Arctic. All Arctic countries, Canada, Denmark, Finland, Island, Norway, Russia, Sweden and the United States are members of the forum. Chairmanship duties of the ACGF rotate every two years in concert with the Chairmanship of the Arctic Council." The ACGF holds two meetings each year.

The work of the ACGF is headed by the ACGF Chair and supported by the Secretariat and Working Groups. The Secretariat is responsible for implementing strategic direction and the smooth operation of the ACGF and its Working Groups. Working Groups are subordinate to the Secretariat. The Secretariat and Working Groups are organized at the direction of the Principals and reflect issues relevant to member countries of the Arctic.

[121] See, for example, U.S. Coast Guard, "U.S., Russia Propose Bering Strait Ship Traffic Routing Measures," January 25, 2018; Amy Midgett, "U.S., Russia Jointly Propose Bering Strait Routing Measures," *Coast Guard Maritime Commons*, January 25, 2018; Amy Midgett, "IMO Approves U.S.-Russian Federation Proposal for Bering Strait Routing Measures," *Coast Guard Maritime Commons*, May 25, 2018; Yereth Rosen, "With Marine Traffic Growing, International Shipping Agency Approves US-Russia Plan for Bering Strait Shipping Lanes," *ArcticToday*, May 26, 2018; Associated Press, "Maritime Organization Approves Two-Way Shipping Routes in Bering Strait," *CBC*, May 27, 2018; "U.S., Russia Propose Bering Strait Traffic Routing," *Maritime Executive*, May 27, 2018; Margaret Kriz Hobson, "Amid Ice Melt, New Shipping Lanes Are Drawn Up off Alaska," *E&E News (Scientific American)*, May 29, 2018.

contingency plan for responding to transboundary maritime pollution incidents.[122] Prior to Russia's war in Ukraine, some observers saw possibilities for further cooperation by the A7 states with Russia in the Arctic.[123] Since the start of Russia's war in Ukraine, those possibilities have narrowed considerably, but U.S.-Russian marine safety-related cooperation in the Bering Strait reportedly continued,[124] and some observers see some limited possibilities for additional cooperation.[125]

Tension and Competition

Prior to Russia's war in Ukraine, and as discussed later in this report, the increase in Russian military presence and operations in the Arctic had prompted growing concerns among the A7 states that the Arctic might become a region of military tension and competition, as well as concerns about whether the A7 states are adequately prepared militarily to defend their interests in the region. As discussed later in this report in the section on military operations, the A7 states have responded to Russia's increased military presence and operations in the Arctic by taking steps to increase their own Arctic military capabilities. Russian military exercises in the Arctic are being monitored by the A7 states, and, similar to what happened during the Cold War, Russian military aircraft that periodically fly toward the airspace (including Arctic airspace) of some of the A7 states are being intercepted by military aircraft from those states. In February 2020, a disagreement arose between Norway and Russia regarding Russia's access to the Norwegian archipelago of Svalbard under the terms of the Svalbard Treaty of 1920. In June 2022, Russian legislators reportedly questioned Norway's sovereignty over Svalbard.[126]

Russia's government considers certain parts of the NSR to be internal Russian waters and has asserted a right to regulate commercial shipping passing through these waters—a position that creates a source of tension with the U.S. government, which considers those waters to be international waters.[127] The U.S.-Russian dispute over this issue could have implications not only

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[122] See Melody Schreiber, "U.S. and Russia Sign New Maritime Pollution Agreement, Conduct Joint Bering Sea Patrol," *ArcticToday*, February 10, 2021.

[123] See, for example, Nick Lokker, "Polar Bear in the Room: America Must Talk to Russia About the Arctic," *National Interest*, November 21, 2021; Mark Piesing, "International Competition is Heating Up in the Arctic. These Norwegian Islands Show How It Can Be Managed.," *Barron's*, August 26, 2021; Kari Roberts, "How Canada Should Deal with Russia in the Arctic," *iPolitics*, August 23, 2021; Autumn Gonzales, "Towards a US-Russia Partnership in the Arctic," *Modern Diplomacy*, August 11, 2021; Melody Schreiber and Krestia DeGeorge, "What the Biden-Putin Summit Means—and Doesn't Mean—for Arctic Cooperation," *ArcticToday*, June 18, 2021; Hilde-Gunn Bye, "Plenty of Ground for Cooperation in the Arctic, Putin Says," *High North News*, June 17 (updated June 18), 2021; Malgorzata (Gosia) Smieszek, "US-Russia Cooperation on an Arctic Methane Agreement Could Improve Relations—and Slow Climate Change," *ArcticToday*, June 14, 2021; Paul Arthur Berkman, "Cooperation in the Arctic Offers a Model for US-Russia Cooperation Elsewhere," *ArcticToday*, June 11, 2021; Thomas Rotnem, "The Arctic Council Power Flex that Could Prove Prosperous—for America," *National Interest*, May 31, 2021; Tom Balmforth and Humeyra Pamuk, "Russia, U.S. Tout Cooperation Ahead of Arctic Council Meeting," *Reuters*, May 18, 2021.

[124] Yereth Rosen, "Despite Ukraine war, US and Russia Continue Emergency Cooperation in the Bering Strait," *ArcticToday*, April 11, 2022.

[125] See Yereth Rosen, "Despite Russia's Post-Invasion Isolation, Some Narrow Openings for Arctic Cooperation Remain," *Alaska Beacon*, April 11, 2023.

[126] Atle Staalesen, "Top Russian Legislators Question Norwegian Sovereignty over Svalbard," *Barents Observer*, June 29, 2022; Reuters, "Russia Threatens Retaliation against Norway over Access to Arctic Islands," *Reuters*, June 29, 2022. See also Reuters, "Russia's Speaker Asks Parliament to Look at Scrapping Norway Sea Treaty," *Reuters*, July 2, 2022.

[127] See, for example, Cornell Overfield, "Russia's Arctic Claims Are on Thin Ice, Russia Is Making a Freedom of Navigation Operation More Likely," *Foreign Policy*, December 20, 2022; Thomas Nilsen, "Russian Parliament Passes Law Limiting Freedom of Navigation along Northern Sea Route," *Barents Observer*, December 1, 2022; Jan Jakub (continued...)

for U.S.-Russian relations and the Arctic, but for other countries and other parts of the world as well, since international law is universal in its application, and a successful challenge to international waters in one part of the world can serve as a precedent for challenging it in other parts of the world.[128]

NATO and European Union in the Arctic

NATO

Six of the eight Arctic states—the United States, Canada, Denmark, Iceland, Norway, and (since April 4, 2023) Finland—are members of NATO. A seventh Arctic state—Sweden—has applied to become a member of NATO. During the Cold War, U.S. and allied political and military officials viewed NATO member Norway and its adjacent sea areas as the northern flank of NATO's defensive line against potential aggression by the Soviet-led Warsaw Pact alliance. With the end of the Cold War, NATO planning efforts shifted away from defending against potential aggression by Russia against NATO countries, including NATO countries in the Arctic. With the emergence of great power competition, NATO began to once again focus more on the question of how to deter potential Russian aggression against NATO countries, including NATO countries in in the Arctic. Russia's war in Ukraine has further strengthened NATO's focus on this question.

Solski, "In the Fog of War: Russia Raises Stakes on the Russian Arctic Straits," Arctic Institute, September 22, 2022; Cornell Overfield, "Wrangling Warships: Russia's Proposed Law on Northern Sea Route Navigation," *Lawfare*, October 17, 2022; Peter B. Danilov, "Russia has Advanced Unlawful Maritime Claims in the Arctic, Says Antony Blinken," *High North News*, May 19, 2021; Nikolaj Skydsgaard and Humeyra Pamuk, "Blinken Says Russia Has Advanced Unlawful Maritime Claims in the Arctic," *Reuters*, May 18, 2021.

[128] In that context, it can be noted that the U.S. government views the part of the Northwest Passage that runs through the Canadian archipelago as an international strait, while Canada's government considers it internal Canadian waters. In 1985, the use of the waterway by a U.S. polar icebreaker led to a diplomatic dispute between the United States and Canada. In January 1988, the two countries signed an agreement under which, observers say, the two sides essentially agreed to disagree on the issue. The agreement—formally called Agreement Between the Government of Canada and the Government of the United States of America on Arctic Cooperation—states in part that "the Government of the United States pledges that all navigation by U.S. icebreakers within waters claimed by Canada to be internal will be undertaken with the consent of the Government of Canada," and that "nothing in this agreement of cooperative endeavour between Arctic neighbours and friends nor any practice thereunder affects the respective positions of the Governments of the United States and of Canada on the Law of the Sea in this or other maritime areas or their respective positions regarding third parties." The text of the agreement as posted by the Canadian government is available at https://www.treaty-accord.gc.ca/text-texte.aspx?id=101701.

An August 26, 2021, press report states that

> A U.S. Coast Guard icebreaker embarked Wednesday [August 25, 2021] on a long Arctic mission that includes a rare transit of the Northwest Passage, conducting scientific research and a joint exercise with Canada in Arctic waters. The cutter Healy, one of two operational U.S. Coast Guard icebreakers, departed Wednesday from Seward, Alaska, for the three-week journey to Nuuk, Greenland.... Healy last transited the passage in 2005. In 2017, the U.S. cutter Maple [(WLB-207), a seagoing buoy tender] navigated the Northwest Passage from west to east together with the Canadian icebreaker Terry Fox to conduct research in a joint exercise with Canada.... U.S. vessels may travel through the passage if they are conducting research, according to a 1988 agreement with Canada.... The invocation of the 1988 agreement on Arctic cooperation means Canadian-U.S. relations are "returning back to normality," Rob Huebert, assistant professor at the University of Calgary, told *ArcticToday*.... The Coast Guard first approached Canada to request consent in summer 2020, [Jason Kung, a spokesperson for Global Affairs Canada] said, and Canadian and U.S. agencies have worked together closely on the trip.
>
> (Melody Schreiber, "US Icebreaker Departs on a Voyage that Will Transit the Northwest Passage," *ArcticToday*, August 26, 2021.)

European Union

Three of the eight Arctic states—Denmark, Finland, and Sweden—are members of the European Union (EU), and two other Arctic states—Iceland and Norway—have close ties to the EU as members of the European Economic Area. The EU is showing increased interest in the Arctic.[129] The European Parliament—the EU's only directly elected institution—supports an active EU role in the Arctic. In 2016, the European Commission (the EU's executive) and the EU's High Representative for Foreign Affairs and Security Policy issued a joint communication (i.e., policy paper) on the EU's Arctic strategy.[130] In 2017, the EU appointed its first Ambassador-at-Large for the Arctic, and in October 2019, the EU held its first-ever Arctic Forum, a high-level conference in northern Sweden focused on promoting EU efforts in the Arctic. The EU is also a major financial contributor to Arctic research.

China in the Arctic

China's Activities in the Arctic

China's diplomatic, economic, and scientific activities in the Arctic are a matter of focus for U.S., Canadian, and Nordic policymakers. Observers have expressed curiosity or concern about China's exact mix of motivations for its activities in the Arctic, and about what China's ultimate goals for the Arctic might be.[131] As noted earlier, Russia's diplomatic isolation from the A7 states in the Arctic has led to increased Russian cooperation with China in the Arctic—a development that could strengthen China's presence and activities in the region and affect views among observers in the A7 states and elsewhere regarding China's motivations and goals for its Arctic activities and China's ability to work with the A7 states on matters relating to the Arctic.

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[129] See, for example, Lena Debanck, "The EU as an Actor in the Arctic," *Arctic Institute*, April 25, 2023; Gabriella Gricius and Andreas Raspotnik, "The European Union's 'Never Again' Arctic Narrative," *Journal of Contemporary European Studies*, published online March 20, 2023; Luke Laframboise, "Brussels Looks North: The European Union's Latest Arctic Policy and the Potential for 'Green' Colonialism," *Arctic Institute*, September 20, 2022; Iris Thatcher, "The EU and the Future of Arctic Cooperation in the Northern Dimension," *Polar Points (Wilson Center Polar Institute)*, September 7, 2022.

[130] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, Joint Communication to the European Parliament and the Council, *An Integrated European Union Policy for the Arctic*, April 27, 2016, p. 2.

[131] See, for example, Maria Milagros, "China's Game in the Arctic: A Tale of Deception?" *Modern Diplomacy*, May 25, 2023; Matthew P. Funaiole, Brian Hart, Joseph S. Bermudez Jr., and Aidan Powers-Riggs, "Frozen Frontiers, China's Great Power Ambitions in the Polar Regions," Center for Strategic and International Studies (CSIS), April 18, 2023; Daniel Kochis, "U.S. Policymakers Should Remain Wary of Chinese Ambitions in the Arctic," Heritage Foundation, July 28, 2023; Liisa Kauppila and Sanna Kopra, "China's Rise and the Arctic Region up to 2049–Three Scenarios for Regional Futures in an Era of Climate Change and Power Transition," *Polar Journal*, vol. 12, no. 1, 2022, published online April 7, 2022; Stephanie Pezard, et al., *China's Strategy and Activities in the Arctic, Implications for North American and Transatlantic Security*, RAND, 2022, 165 pp.; Rebecca Wolfson, Cornell Overfield, Mark Rosen, Benjamin DeThomas, and Joshua Tallis, Arctic Prospecting: Measuring China's Arctic Economic Footprint, Center for naval Analyses (CNA), January 2022, 124 pp.; Heidi Holz, Andrew Taffer, Anthony Miller, and Benjamin DeThomas, *Exploring the Relationship between China's Investment in the Arctic and Its National Strategy*, Center for Naval Analyses (CNA), January 2022, 70 pp.; Joshua Tallis, Mark Rosen, and Cornell Overfield, *Arctic Economic Security: Recommendations for Safeguarding Arctic Nations against China's Economic Statecraft*, Center for Naval Analyses (CNA), January 2022, 36 pp.; Cornell Overfield, Anthony Miller, Eleanore Douglas, Kasey Stricklin, and Mary Ellen Connell, Foreign Direct Investment Screening in the Arctic, Center for naval Analyses (CNA), January 2022, 92 pp.

In 2013, China was one of six non-Arctic states that were approved for observer status by the Arctic Council.[132] In January 2018, China released a white paper on China's Arctic policy that refers to China as a "near-Arctic state."[133] (China's northernmost territory, northeast of Mongolia, is at about the same latitude as the Aleutian Islands in Alaska, which, as noted earlier in this report, the United States includes in its definition of the Arctic for purposes of U.S. law.) The white paper refers to trans-Arctic shipping routes as the Polar Silk Road, and identifies these routes as a third major transportation corridor for the Belt and Road Initiative (BRI), China's major geopolitical initiative, first announced by China in 2013, to knit Eurasia and other regions together in a Chinese-anchored or Chinese-led infrastructure and economic network.[134] The polar regions (both the Arctic and Antarctic) are included in China's 14th Five-Year Plan, covering the period 2021-2025.[135]

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[132] The other five were India, Italy, Japan, Singapore, and South Korea. For a list of the observer states and when they were approved for observer status, see Arctic Council, "List of Arctic Council Observers," accessed February 15, 2023, at https://www.arctic-council.org/about/observers/.

[133] "Full Text: China's Arctic Policy," *Xinhua*, January 26, 2018. The white paper states that "China is an important stakeholder in Arctic affairs. Geographically, China is a 'Near-Arctic State', one of the continental States that are closest to the Arctic Circle. The natural conditions of the Arctic and their changes have a direct impact on China's climate system and ecological environment, and, in turn, on its economic interests in agriculture, forestry, fishery, marine industry and other sectors. China is also closely involved in the trans-regional and global issues in the Arctic, especially in such areas as climate change, environment, scientific research, utilization of shipping routes, resource exploration and exploitation, security, and global governance. These issues are vital to the existence and development of all countries and humanity, and directly affect the interests of non-Arctic States including China."

Somewhat similarly, France's June 2016 national roadmap for the Arctic refers to France as a "polar nation." (Republique Francaise, Ministere des Affaires Etrangeres et du Developpement International, *The Great Challenge of the Arctic, National Roadmap for the Arctic*, June 2016, 60 pp.) The document states on page 9 that "France has established itself over the last three centuries as a polar nation, with a strong tradition of expeditions and exploration, and permanent research bases at the poles," and on page 17 that "[b]uilding on its long-standing tradition of exploration and expeditions in high latitudes, France has carved out its place as a polar nation over the last three centuries. France has permanent scientific bases in the Arctic and in Antarctica." It can also be noted that the northernmost part of mainland France, next to Belgium and across the Strait of Dover from England, is almost as far north as the more southerly parts of the Aleutian Islands.

Also somewhat similarly, a November 2018 UK parliamentary report refers to the UK as a "near-Arctic neighbour." The report states the following: "While the UK is not an Arctic state, it is a near-Arctic neighbour. The UK's weather system is profoundly affected by changes in the Arctic's climate and sea currents. The UK has been an Observer to the Arctic Council since 1998." (United Kingdom, House of Commons, Environmental Audit Committee, *The Changing Arctic, Twelfth Report of Session 2017-19*, November 29, 2018, p. 3. [Report, together with formal minutes relating to the report, Ordered by the House of Commons to be printed November 6, 2018]. See also pp. 6, 29, and 32.)

See also Eva Dou, "A New Cold War? China Declares Itself a 'Near-Arctic State,' *Wall Street Journal*, January 26, 2018; Grant Newsham, "China As A 'Near Arctic State'—Chutzpah Overcoming Geography," *Asia Times*, January 30, 2018.

[134] See, for example, Maria Shagina and Elizabeth Buchanan, "China Enters the Arctic Digitization Race," *National Interest*, January 17, 2021; Nima Khorrami, "Data Hunting in Subzero Temperatures: The Arctic as a New Frontier in Beijing's Push for Digital Connectivity," Arctic Institute, August 4, 2020; Marc Lanteigne, "The Twists and Turns of the Polar Silk Road," *Over the Circle*, March 15, 2020; Zhang Chun, "China's 'Arctic Silk Road,'" *Maritime Executive*, January 10, 2020; Sabena Siddiqui, "Arctic Ambition: Beijing Eyes the Polar Silk Road," *Asia Times*, October 25, 2018. See also Atle Staalesen, "Chinese Money for Northern Sea Route," *Barents Observer*, June 12, 2018; Lin Boqiang, "China Can Support Arctic Development as Part of B&R," *Global Times*, August 9, 2018. The BRI's other two main corridors, which were announced at the outset of the BRI, are a land corridor that runs east to west across the middle of Eurasia—the "belt" in BRI—and a sea corridor called the Maritime Silk Road that passes through the South China Sea and the Indian Ocean to the Persian Gulf and the Mediterranean Sea—the "road" in BRI. For more on the BRI, also known as the One Belt, One Road (OBOR) initiative, see CRS In Focus IF11735, *China's "One Belt, One Road" Initiative: Economic Issues*, by Karen M. Sutter, Andres B. Schwarzenberg, and Michael D. Sutherland.

[135] See, for example, Marc Lanteigne, "The Polar Policies in China's New Five-Year Plan," *Diplomat*, March 12, 2021.

China has a Ukrainian-built polar-capable icebreaker, *Xue Long* (Snow Dragon), that has made several transits of Arctic waters conducting what China has said were research expeditions. A second polar-capable icebreaker (the first that China has built domestically), named *Xue Long 2*, entered service in 2019, and China reportedly has begun construction of a third polar-capable icebreaker.[136]

China has expanded its diplomatic activities with the Nordic countries, and increased the size of its diplomatic presence in some of them. China has also engaged in economic discussions with Iceland and with Greenland, a self-governing part of the Kingdom of Denmark.[137] China's engagement with Greenland appears related in significant part to Greenland's deposits of rare earth elements. Like several other nations, China has established a research station in Norway's Svalbard archipelago. China maintains a second research station in Iceland.

China appears interested in using the NSR to shorten commercial shipping times between Europe and China[138] and perhaps also to reduce China's dependence on southern sea routes (including those going to the Persian Gulf) that pass through the Strait of Malacca—a maritime choke point that China appears to regard as vulnerable to being closed off by other parties (such as the United States) in time of crisis or conflict.[139] In addition to using the NSR, China reportedly reached an agreement with Russia on July 4, 2017, to create an "Ice Silk Road."[140]

China has made significant investments in Russia's Arctic oil and gas industry, particularly the Yamal natural gas megaproject located on Russia's Yamal Peninsula in the Arctic.[141] In February 2023, it was reported that a Russian firm had signed an agreement with a Chinese firm for the development of a titanium mining project in the Russian Arctic.[142] China's government reportedly is also interested in mining opportunities in the Canadian Arctic, and as mentioned earlier, in Greenland.[143] China's leaders may also be interested in Arctic fishing grounds.

The Chinese high-altitude surveillance balloon that flew over parts of the United States and Canada in early 2023 reportedly entered U.S. airspace on January 28, 2023, north of the Aleutian

[136] See, for example, Echo Xie, "China Starts Building Third Icebreaker, Which Scientists Say Could Send Researchers to Polar Seabeds by 2025," *South China Morning Post*, June 27, 2023; Thomas Nilsen, "Third Chinese Polar Icebreaker Will Carry Deep-Sea Submersibles," *Barents Observer*, June 28, 2023.

[137] See, for example, Yang Jiang, *Chinese Investments in Greenland, Origins, Progress and Actors*, Dansk Institut for Internationale Studier (DIIS), 2021, 34 pp. (posted online November 17, 2021); Marc Lanteigne, "Greenland's Widening World," *Over the Circle*, March 28, 2020; Marco Volpe, "The Tortuous Path of China's Win-Win Strategy in Greenland," Arctic Institute, March 24, 2020; Marc Lanteigne, "Stumbling Block: China-Iceland Oil Exploration Reaches an Impasse," *Over the Circle*, January 24, 2018. "Greenland Plans Office in Beijing to Boost Trade Ties with China," *Reuters*, July 18, 2018.

[138] See, for example, Eduardo Baptista, "China 'More Than Other States' Looks to Future Sea Route Through Resource-Rich Arctic, Study Says," *South China Morning Post*, September 22, 2020.

[139] See, for example, Jonathan Hall, "Arctic Enterprise: The China Dream Goes North," *Journal of Political Risk*, September 2019. See also Andrew Latham, "China Looks to the Arctic to Avoid Another Suez Slowdown," *National Interest*, April 2, 2021.

[140] Xinhua, "China, Russia agree to jointly build 'Ice Silk Road,'" *Xinhuanet*, July 4, 2017.

[141] See, for example, Malte Humpert (High North News), "China Acquires 20 Percent Stake in Novatek's Arctic LNG 2 Project," *ArcticToday*, April 30, 2019; Ernesto Gallo and Giovanni Biava, "A New Energy Frontier Called 'Polar Silk Road,'" *China Daily*, April 12, 2019.

[142] Malte Humpert, "Russian Mining Company Partners With China to Develop Massive Titanium Deposit in Arctic," *High North News*, February 6, 2023; "China to Assist Russia with Titanium Mining in the Arctic," *Jane's*, February 1, 2023.

[143] See, for example, Regin Winther Poulsen, "How Greenland's Mineral Wealth Made It a Geopolitical Battleground," *Foreign Policy*, December 18, 2022.

Islands (i.e., in the U.S. Arctic as defined under U.S. law).[144] A March 1, 2023, press report stated that "months before a Chinese spy balloon drifted across Alaska and Canada, the Canadian military discovered and retrieved Chinese spy buoys in the Arctic, a region of long interest to Beijing. The Chinese buoys were monitoring U.S. submarines and the melting of ice sheets."[145]

China's activities in the Arctic may additionally reflect a view among China's leaders that China, like other major world powers, should be active in the polar regions for conducting research and other purposes. (Along with its growing activities in the Arctic, China has increased the number of research stations it maintains in the Antarctic.[146])

Arctic States' Response

China's activities in the Arctic could create new opportunities for cooperation between China and the Arctic states. They also, however, have the potential for posing challenges to the Arctic states in terms of defending their own interests in the Arctic. A general question for U.S. policymakers is how to integrate China's activities in the Arctic into overall U.S.-China relations, and whether and how, in U.S. policymaking, to link China's activities in the Arctic to its activities in other parts of the world. As noted earlier, some observers view the Arctic as having become an arena for geopolitical competition among the United States, Russia, and China. Some observers see potential areas for U.S.-Chinese cooperation in the Arctic.[147]

One specific question could be whether to impose punitive costs on China in the Arctic for unwanted actions that China takes elsewhere. As one potential example, U.S. policymakers could consider moving to suspend China's observer status on the Arctic Council[148] as a punitive cost-

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[144] Ellen Nakashima, Shane Harris, and Jason Samenow, "U.S. Tracked China Spy Balloon from Launch on Hainan Island along Unusual Path," *Washington Post*, February 14, 2023. See also Liam Denning, "China's 'Climate' Balloon Risks Arctic Peace," *Bloomberg*, February 6, 2023. For further discussion of the balloon, see CRS Insight IN12118, *Monitoring the Sovereign Skies*, by Bart Elias.

[145] Xiaoshan Xue, "Reports: Canada Found, Retrieved Chinese Spy Buoys in Arctic," *Voice of America*, March 1, 2023.

[146] For additional discussion, see CRS Report R46708, *Antarctica: Overview of Geopolitical and Environmental Issues*, by Pervaze A. Sheikh, Bruce Vaughn, and Kezee Procita. See also Alexander B. Gray, "China's Next Geopolitical Goal: Dominate Antarctica," *National Interest*, March 20, 2021.

[147] See, for example, Yuanyuan Ren, "U.S.-China Arctic Cooperation in a New Era of Great Power Competition: Opportunities and Challenges," *Yearbook of Polar Law Online*, published online February 23, 2023; Nonh Hong, *China and the United States in the Arctic: Exploring the Divergence and Convergence of Interests*, Institute for China-America Studies (ICAS), October 2022, 36 pp.

[148] Paragraph 37 of the Arctic Council's rules of procedure states the following:

> Once observer status has been granted, Observers shall be invited to the meetings and other activities of the Arctic Council unless SAOs [Senior Arctic Officials] decide otherwise. Observer status shall continue for such time as consensus exists among Ministers. Any Observer that engages in activities which are at odds with the Council's [Ottawa] Declaration [of September 19, 1996, establishing the Council] or these Rules of Procedure shall have its status as an Observer suspended.

Paragraph 5 of Annex II of the Arctic Council's rules of procedure—an annex regarding the accreditation and review of observers—states the following:

> Every four years, from the date of being granted Observer status, Observers should state affirmatively their continued interest in Observer status. Not later than 120 days before a Ministerial meeting where Observers will be reviewed, the Chairmanship shall circulate to the Arctic States and Permanent Participants a list of all accredited Observers and up-to-date information on their activities relevant to the work of the Arctic Council.

(Arctic Council, *Arctic Council Rules of Procedure*, p. 9. The document was accessed February 15,

(continued...)

imposing measure for unwanted Chinese actions in the South China Sea.[149] In a May 6, 2019, speech in Finland, then-Secretary of State Pompeo stated (emphasis added)

> The United States is a believer in free markets. We know from experience that free and fair competition, open, by the rule of law, produces the best outcomes.
>
> But all the parties in the marketplace have to play by those same rules. Those who violate those rules should lose their rights to participate in that marketplace. Respect and transparency are the price of admission.
>
> And let's talk about China for a moment. **China has observer status in the Arctic Council, but that status is contingent upon its respect for the sovereign rights of Arctic states.** The U.S. wants China to meet that condition and contribute responsibly in the region. But China's words and actions raise doubts about its intentions.[150]

China's interest and investments in Greenland are a matter of concern for U.S. policymakers. Chinese firms have invested in resource extraction ventures in Greenland, including potential sites for mining rare earth elements. In February 2019, it was reported that the United States in 2018 had urged Denmark to finance the construction of airports that China had offered to build in Greenland. U.S. officials were concerned about this attempt by China to increase its presence and influence in Greenland and the broader Arctic region. (The Danish government ultimately financed the construction of the airports.[151])

In May 2019, the State Department announced a plan for establishing a permanent diplomatic presence in Greenland,[152] and on June 2020, the State Department formally announced the

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2023, at https://oaarchive.arctic-council.org/handle/11374/940.

Paragraph 4.3 of the Arctic Council's observer manual for subsidiary bodies states in part

> Observer status continues for such time as consensus exists among Ministers. Any Observer that engages in activities which are at odds with the Ottawa Declaration or with the Rules of Procedure will have its status as an Observer suspended.
>
> (Arctic Council. *Observer Manual for Subsidiary Bodies*, p. 5. The document was accessed February 15, 2023, at https://oaarchive.arctic-council.org/handle/11374/939.)

See also Alyson JK Bailes, "Understanding The Arctic Council: A 'Sub-Regional' Perspective," *Journal of Military and Strategic Studies*, Vol. 15, Issue 2, 2013: 48; Brianna Wodiske, "Preventing the Melting of the Arctic Council: China as a Permanent Observer and What It Means for the Council and the Environment," *Loyola of Los Angeles International and Comparative Law Review*, Vol. 315, Issue 2, 2014 (November 1, 2014): 320; Sebastian Knecht, "New Observers Queuing Up: Why the Arctic Council Should Expand—And Expel," Arctic Institute, April 20, 2015; Evan Bloom, "Establishment of the Arctic Council," undated; accessed February 15, 2023, at https://2009-2017.state.gov/e/oes/ocns/opa/arc/ac/establishmentarcticcouncil/index.htm, which states "The following paper was authored by Evan Bloom in July 1999 when serving as an attorney in the Office of the Legal Adviser at the U.S. Department of State. Mr. Bloom is now the Director of the Office of Oceans and Polar Affairs for the Bureau of Oceans and International Environmental and Scientific Affairs at the U.S. Department of State." See also Kevin McGwin, "After 20 years, the Arctic Council Reconsiders the Role of Observers," *ArcticToday*, October 24, 2018.

[149] For more on China's actions in the South China Sea and their potential implications for U.S. interests, see CRS Report R42784, *U.S.-China Strategic Competition in South and East China Seas: Background and Issues for Congress*.

[150] U.S. Department of State, "Looking North: Sharpening America's Arctic Focus, Remarks, Michael R. Pompeo, Secretary of State, Rovaniemi, Finland, May 6, 2019."

[151] Drew Hinshaw and Jeremy Page, "How the Pentagon Countered China's Designs on Greenland; Washington Urged Denmark to Finance Airports that Chinese Aimed to Build on North America's Doorstep," *Wall Street Journal*, February 10, 2019. See also Marc Lanteigne, "Greenland's Airport Saga: Enter the US?" *Over the Circle*, September 18, 2018; Marc Lanteigne, "Greenland's Airports: A Balance between China and Denmark?" *Over the Circle*, June 15, 2018; Arne Finne (translated by Elisabeth Bergquist), "Intense Airport Debate in Greenland," *High North News*, May 30, 2018.

[152] U.S. Department of State, "Secretary Pompeo Postpones Travel to Greenland," Press Statement, Morgan Ortagus, Department Spokesperson, May 9, 2019. See also Krestia DeGeorge, "US State Department Announces Plans for a (continued...)

reopening of the U.S. consulate in Greenland's capital of Nuuk.[153] In April 2020, the U.S. government announced $12.1 million economic aid package for Greenland that the Trump Administration presented as a U.S. action done in a context of Chinese and Russian actions aimed at increasing their presence and influence in Greenland.[154]

Some observers argue that a desire to preclude China (or Russia) from increasing its presence and influence in Greenland may have been one of the reasons why President Trump in August 2019 expressed an interest in the idea of buying Greenland from Denmark.[155]

Russian-Chinese cooperation in the Arctic (including China's investment in Russia's Arctic oil and gas industry) can both reflect and contribute to Russia and China's strategic partnership. A February 4, 2022, joint statement by Russia and China about their strategic partnership stated that the two countries "agreed to continue consistently intensifying practical cooperation for the sustainable development of the Arctic."[156] On the other hand, Russian officials reportedly are also concerned that China's continued growth in wealth and power might eventually lead to China becoming the dominant power in Eurasia, and to Russia being relegated to a subordinate status in Eurasian affairs.[157] Some observers argue that actual levels of Sino-Russian cooperation in the Arctic are not as great as Chinese or Russian announcements about such cooperation might suggest.[158]

Diplomatic Presence in Greenland," *ArcticToday*, May 9, 2019; Morten Soendergaard Larsen and Robbie Gramer, "Trump Puts Down New Roots in Greenland," *Foreign Policy*, November 8, 2019.

[153] See, for example, Eavan Cull, "Setting Up Shop in Nuuk," *Foreign Service Journal*, May 2021; Lauren Meier and Guy Taylor, "U.S. Reopens Consulate in Greenland Amid Race for Arctic Supremacy," *Washington Times*, June 10, 2020.

[154] See U.S. Department of State, Briefing On the Road to Nuuk: Economic Cooperation, Special Briefing, Michael J. Murphy, Deputy Assistant Secretary, Bureau of European and Eurasian Affairs, Francis R. Fannon, Assistant Secretary, Bureau of Energy Resources, Jonathan Moore, Principal Deputy Assistant Secretary, Bureau of Oceans and International Environmental and Scientific Affairs, Gretchen Birkle, USAID Deputy Assistant Administrator, May 15, 2020; and U.S. Department of State, Briefing on the Administration's Arctic Strategy, Special Briefing, Office of the Spokesperson, April 23, 2020.

[155] See, for example, Marc Lanteigne and Mingming Shi, "'No Sale': How Talk of a US Purchase of Greenland Reflected Arctic Anxieties," *Over the Circle*, September 17, 2020; Stuart Lau, "Did China's Growing Presence in Arctic Prompt Donald Trump's Offer to Buy Greenland?" *South China Morning Post*, September 1, 2019; Nadia Schadlow, "Why Greenland Is Really About China," *The Hill*, August 28, 2019; Daniel Lippman, "Trump's Greenland Gambit Finds Allies Inside Government," *Politico*, August 24, 2019; Seth Borenstein (Associated Press), "Icy Arctic Becomes Hot Property for Rival Powers," *Navy Times*, August 22, 2019; Ragnhild Grønning, "Why Trump Is Looking to Buy Greenland—Even If It's Not for Sale," *High North News*, August 19, 2019. See also Caitlin Hu and Stephen Collinson, "Why Exactly Is the US So Interested in Greenland?" *CNN*, July 23, 2020. See also Tarisai Ngangura, "Ex-Staffer: Trump Wanted to Trade 'Dirty' Puerto Rico for Greenland," *Vanity Fair*, August 19, 2020; Jacob Gronholt-Pedersen, "As the Arctic's Attractions Mount, Greenland is a Security Black Hole," *Reuters*, October 20, 2020; Gordon Lubold, "U.S. Holds Talks Over Economic, Security Arrangements With Greenland," *Wall Street Journal*, October 28, 2020. See also Peter Baker, "Cosmetics Billionaire Convinced Trump That the U.S. Should Buy Greenland," *New York Times*, September 14, 2022.

[156] For the text of the joint statement, see, for example, USC US-China Institute, "Russia-China Joint Statement On International Relations, February 4, 2022," February 4, 2022.

[157] See, for example, Paul Goble, "Moscow Needs Beijing in the Arctic but Worries About China's Expanding Role," *Eurasia Daily Monitor*, February 1, 2022.

[158] See, for example, Jim Townsend and Andrea Kendall-Taylor, *Partners, Competitors, or a Little of Both? Russia and China in the Arctic*, Center for a New American Security (CNAS), March 2021, 17 pp.

Linkages Between Arctic and South China Sea

Observers have sometimes made a linkage between the Arctic and the South China Sea in connection with international law of the sea or international cooperation and competition.[159] One aspect of this linkage relates to whether China's degree of compliance with international law of the sea in the South China Sea has any implications for understanding potential Chinese behavior regarding its compliance with international law of the sea (and international law generally) in the Arctic. A second aspect, mentioned above, is whether the United States should consider the option of moving to suspend China's observer status on the Arctic Council as a punitive cost-imposing measure for unwanted Chinese actions in the South China Sea. A third aspect concerns the question of whether the United States should become a party to UNCLOS; discussions of that issue sometimes mention both the Arctic and the situation in the South China Sea.[160]

U.S. and Allied Military Forces and Operations[161]

Overview

During the Cold War, the Arctic was an arena of military competition between the United States and the Soviet Union, with both countries, for example, operating long-range bombers, tactical combat aircraft, maritime patrol aircraft, nuclear-powered submarines, surface warships, and ground forces in the region. The end of the Cold War and the collapse of most elements of the Russian military establishment following the dissolution of the Soviet Union in December 1991 greatly reduced this competition, leading to a post-Cold War period of reduced emphasis on the Arctic in U.S. military planning, budgeting, and operations.

Over the past 10 to 15 years, the emergence of great power competition and a significant increase in Russian military presence and operations in the Arctic has introduced renewed elements of military tension and competition into the Arctic. In response, the seven Arctic states other than Russia (aka the A7 states) are placing an increased emphasis on the Arctic in their military planning, budgeting, and operations. As noted in this report's section on the Arctic's geopolitical environment, Russia's war in Ukraine has increased concerns among the A7 states about the purpose behind Russia's military modernization in the Arctic. Russian military exercises in the Arctic are being monitored by the A7 states, and, similar to what happened during the Cold War, Russian military aircraft that periodically fly toward the airspace (including Arctic airspace) of some of the A7 states are being intercepted by military aircraft from those states.

Department of Defense (DOD) officials have stated that U.S. military operations in Alaska can play a role in supporting U.S. military operations not only in the Arctic, but in the Indo-Pacific

[159] See, for example, Ali Mammadov, "China, the Arctic, and International Law," *Modern Diplomacy*, April 22, 2022; Nong Hong, "Weighing the Sources of International Law: The Arctic, Antarctica and the South China Sea," Institute for China-America Studies (ICAS), December 11, 2020; Robinson Meyer, "The Next 'South China Sea' Is Covered in Ice," *Atlantic*, May 15, 2019; Justin D. Nankivell, "The Role of History and Law in the South China Sea and Arctic Ocean," *Maritime Awareness Project*, August 7, 2017; Sydney J. Freedberg, "Is The Arctic The next South China Sea? Not Likely," *Breaking Defense*, August 4, 2017; Caroline Houck, "The Arctic Could Be the Next South China Sea, Says Coast guard Commandant," *Defense One*, August 1, 2017; Daniel Thomassen, "Lessons from the Arctic for the South China Sea," Center for International Maritime Security, April 4, 2017. For a different perspective, see Elizabeth Buchanan and Bec Strating, "Why the Arctic Is Not the 'Next' South China Sea," *War on the Rocks*, November 5, 2020.

[160] For further discussion of this situation, see CRS Report R42784, *U.S.-China Strategic Competition in South and East China Seas: Background and Issues for Congress*.

[161] This section was prepared by Ronald O'Rourke, Specialist in Naval Affairs, Foreign Affairs, Defense, and Trade Division.

region. In July 2021 remarks at Eielson Air Force Base in Alaska, Secretary of Defense Lloyd J. Austin III stated: "We are an Indo-Pacific nation and we are an Arctic nation. And here in Alaska those two critical regions intersect. This is where we can project power into both regions and where we must be able to defend ourselves from threats coming from both places."[162] Parts of Alaska (particularly the panhandle, the southern part of mainland Alaska, and the Aleutian Islands) are situated on or near great circle routes (i.e., the shortest possible routes) linking the U.S. West Coast to locations in the Western Pacific that are close to China.

Russia's Arctic Military Modernization

As noted earlier, Russia since 2008 has adopted a series of strategy documents outlining plans that call for, among other things, bolstering the country's Arctic military capabilities. Among other actions, Russia established a new Arctic Joint Strategic Command at Severomorsk (the home of the Russian navy's Northern Fleet), upgraded the command to the full status of a Military District in 2021 (making it the country's fifth Military District), reactivated and modernized Arctic military bases that fell into disuse with the end of the Cold War, assigned upgraded forces to those bases, and increased military exercises and training operations in the Arctic.[163]

Prior to Russia's war in Ukraine, some observers expressed growing concern at these developments. Other observers noted the cooperative aspects of relations among the Arctic states, including Russia, and argued, that the competitive aspects were overstated.[164] Some observers argued that Russia's military investment in the Arctic were sometimes exaggerated, reflected

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[162] Department of Defense, "Transcript, Secretary of Defense Lloyd J. Austin III Press Conference at Eielson Air Force Base, Alaska," July 24, 2021. Later in his remarks, Austin stated that Alaska

> is a very critical place on the—on the globe. It is the intersection of the areas of responsibility of a couple of combatant commands, you know, the Indo-Pacific Command, which is really important to us, as well as Northern Command. It truly is a place where we think that as we continue to—to develop our capabilities here, it will certainly help us in our efforts to—to create capacity and capability that allows us to do what we set out to do in increasing the competitive edge with adversaries like—like China and Russia.

See also Hilde-Gunn Bye, "US Secretary of Defense Highlights the Importance of Alaska," *High North News*, August 2 (updated August 3), 2021; Robert Delaney, "Arctic Is Key Region in Countering China's Aggression, US Air Force Officials Say," *South China Morning Post*, July 28, 2021; Carla Babb, "Alaska Seen as Strategic US Military Asset Against China, Russia," *Voice of America*, July 25, 2021.

[163] Regarding increased Russian military presence and operations in the Arctic, see, for example, Richard R. Burgess, "Navy Admirals Detail Russian Arctic Build-Up," *Seapower*, February 15, 2023; Rich Abott, "Panel: Russian Posture In Arctic Becoming More Offensive, Reconstituting Soviet Abilities," *Defense Daily*, February 10, 2023; John Grady, "Russian Arctic Threat Growing More Potent, Report Says," *USNI News*, January 26, 2023 (regarding the CSIS cited next); Colin Wall and Njord Wegge, *The Russian Arctic Threat, Consequences of the Ukraine War*, Center for Strategic and International Studies (CSIS), January 2023, 16 pp.; Malte Humpert, "From Ukraine to the Arctic: Russia's Capabilities in the Region and the War's Impact on the North," *High North News*, September 22 (updated September 28), 2022. See also Heather A. Conley and Joseph S. Bermudez Jr., *Ice Curtain: Tiksi Airbase—Many Russian Announcements, Little Equipment*, Center for Strategic and International Studies (CSIS), March 2020, 9 pp.; Heather A. Conley and Joseph S. Bermudez Jr., *Ice Curtain: Why Is There a New Russian Military Facility 300 Miles from Alaska*? Center for Strategic and International Studies (CSIS), March 2020, 6 pp.; Matthew Melino, Heather A. Conley, and Joseph S. Bermudez Jr., *Modernization on the Kola Peninsul*a, Center for Strategic and International Studies (CSIS), March 2020, 15 pp.; Matthew Melino and Heather A. Conley, "The Ice Curtain: Russia's Arctic Military Presence," Center for Strategic and International Studies (CSIS), March 26, 2020.

[164] See, for example, Robert David English and Morgan Grant Gardner, "Phantom Peril in the Arctic, Russia Doesn't Threaten the United States in the Far North—But Climate Change Does," *Foreign Affairs*, September 29, 2020; Mia Bennett, "U.S. Rhetoric About the Strategic Importance of the Arctic Is Out of Step with Its Spending Priorities," *ArcticToday*, July 26, 2019; "Arctic Conflict With Russia 'Not Likely In The Short-Term', Analyst Says," *Forces*, January 30, 2019.

normal modernization of aging capabilities, or was intended partly for domestic Russian consumption.[165] As noted earlier, Russia's war in Ukraine has heightened concerns among the A7 states and other observers about the purpose behind Russia's military modernization in the Arctic.

U.S. and Allied Arctic Military Activities

In General

DOD and the Coast Guard (which is part of the Department of Homeland Security [DHS]) are devoting increased attention to the Arctic in their planning, budgeting, and operations. DOD as a whole, the Army, the Navy and Marine Corps, the Air Force, and the Coast Guard have each issued Arctic strategy documents.[166] All U.S. military services are conducting increased exercises and training operations in the region, some in conjunction with forces from the other A7 states and with non-A7 NATO allies, that are aimed at

- reacquainting U.S. forces with—and responding to changes in—operating conditions in the region,
- identifying Arctic military capability gaps,
- rebuilding Arctic-specific warfighting skills that eroded during the post-Cold War era,
- testing the performance of equipment under Arctic conditions,
- strengthening interoperability with allied forces for conducting operations in the region, and
- sending Russia and China signals of resolve and commitment regarding the Arctic.[167]

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[165] See, for example, Hilde-Gunn Bye, "Russia Pays Considerable Attention to Improve Arctic Infrastructure, Says Defence Minister," *High North News*, April 14, 2021; Lyle Goldstein, "Washington Should Chill Out over Russia's Arctic Ambitions," *Defense News*, November 13, 2020; Robert D. English, "Why an Arctic Arms Race Would Be a Mistake," *ArcticToday*, June 18, 2020; Marc Montgomery, "Russia's Military Feat in Arctic, Spectacular, But No Real Threat to West," *Radio Canada International*, May 12, 2020; Elizabeth Buchanan and Mathieu Boulègue, "Russia's Military Exercises in the Arctic Have More Bark Than Bite," *Foreign Policy*, May 20, 2019; Arne F. Finne, "Russia Is a Responsible Actor in the Arctic," *High North News*, January 22, 2019. See also Hilde-Gunn Bye, "From Norway to North America: Differing Views On New Russian Weapon Systems," *High North News*, February 24, 2020.

[166] See the following documents:

- Department of Defense, *Report to Congress, Department of Defense Arctic Strategy*, June 2019, 18 pp.;
- Department of the Army, *Regaining Arctic Dominance, The U.S. Army in the Arctic*, January 19, 2021, 48 pp.;
- Department of the Navy, *A Blue Arctic, A Strategic Blueprint for the Arctic*, undated, released January 5, 2021, 25 pp.;
- Department of the Air Force, *Arctic Strategy, Ensuring a Stable Arctic Through Vigilance, Power Projection, Cooperation, and Preparation*, undated, with cover letter dated July 21, 2020, 14 pp.; and
- U.S. Coast Guard, *Arctic Strategic Outlook*, April 2019, 45 pp.

[167] See, for example, Liam Denning, "Hiding an Army at the Top of the World," *Bloomberg*, June 4, 2023; Anne Kauranen, "NATO Launches Arctic Manoeuvres, Vowing to Protect Newest Member Finland," *Reuters*, May 31, 2023; Greg Hadley, "In a First, USAF F-35s Join Multinational Arctic Challenge Exercise," *Air & Space Forces Magazine*, May 30, 2023; Euronews with EVN, "Arctic Exercise Challenge Returns with Important Geopolitical Stakes," *Euronews*, May 30, 2023; U.S. Air Forces in Europe and Air Forces Africa, "Arctic Challenge 2023: U.S. Joins Coalition for Largest Nordic Exercise," May 29, 2023; NATO, "Finland to Begin Exercise Arctic Challenge with Allies and Partner Sweden," May 25, 2023; Alex Bengel, "11th Airborne Division Wraps Up Series of Exercises for (continued...)

In addition to these increased exercises and training operations, the Coast Guard, as a major acquisition project, is procuring new polar icebreakers called Polar Security Cutters (PSCs) to replace its aging heavy polar icebreakers. (For further discussion of this program, see the next section of this report on icebreakers.)

Canada, the UK, and the Nordic countries are taking steps to increase their own military presence and operations in the region, and as noted above, have participated alongside U.S. military forces in certain Arctic exercises.[168] NATO is conducting increased exercises in the region, some of which have been large exercises involving thousands of personnel from multiple countries.

U.S. Navy and Coast Guard

The diminishment of Arctic ice is creating new operating areas in the Arctic for Navy surface ships and Coast Guard cutters.[169] The Navy has increased deployments of attack submarines and surface ships to the Arctic for exercises and other operations. The Coast Guard annually deploys a polar icebreaker, other cutters, and aircraft into the region to perform various Coast Guard missions and to better understand the implications of operating such units there. Key points relating to the Navy and Coast Guard in the Arctic that have emerged over the past 10 to 15 years include the following:

- Search and rescue (SAR) in the Arctic is a mission of increasing importance, particularly for the Coast Guard, and one that poses potentially significant operational challenges.[170]

Arctic Readiness," *Webcenter Fairbanks*, April 5, 2023; Georgina Fernandez, "Over 8,000 Soldiers Perfect Arctic Combat Skills During Multinational Readiness Exercise," *Alaska's News Source*, April 5, 2023; John C. K. Daly, "The West's Arctic Forge 23 Drills Unsettle Russian Military," *Eurasia Daily Monitor*, March 28, 2023; Reuters, "Winter Military Exercises Are Under Way in Northern Norway," *ArcticToday*, March 11, 2023; Thomas Nilsen, "Three Exercises, One Scenario: Russia," *Barents Observer*, March 5, 2023; Kipp Hanley, "'Arctic Angels' Soar Again: Inside the Rebirth of the 11th Airborne Division," Military Officers Association of America (MOAA), February 17, 2023; Georgina Fernandez, "Soldiers Prepare for New Military Focus on Arctic Security," *Alaska's News Source*, February 16, 2023; U.S. Army Europe and Africa, "US Forces in Europe to take part in Exercise Arctic Forge," February 13, 2023; Shephard News Team, "US Navy Performs EOD Exercise in Arctic Conditions," *Shephard Media*, February 12, 2023; Caitlin M. Kenney, "'Incredibly Hard': US Forces Prep for Winter Combat," *Defense One*, February 9, 2023; Balinda O'Neal, "National Guard Leaders Join Multi-state Arctic Event," Air National Guard, February 1, 2023; Meghann Myers, "National Guard Preps for Potential Arctic Conflicts with Russia, China," *Military Times*, January 30, 2023; Michael Sword, "Arctic Warfare Heats Up: Unique Division Specializes in Cold-Weather Operations," Association of the United States Army (AUSA), January 24, 2023; Colton Jones, "US Troops Test Their Capabilities in Arctic Environment," *Defence Blog*, January 23, 2023.

[168] See, for example, Astri Edvardsen, "The Nordic Region Strengthens Double-Edged Defense Cooperation With the US," *High North News*, February 17, 2023; Astri Edvardsen, "Norway Explores Cooperation With the US and UK on Maritime Surveillance in the High North," *High North News*, February 10, 2023;Elisabeth Gosselin-Malo, "Norway Special Operators Field Pitches on Fresh, Arctic-Capable Gear," *Defense News*, February 9, 2023; Hilde-Gunn Bye, "Allied and Norwegian Forces Prepare for the Largest Military Exercise in Norway in 2023," *High North News*, February 1 (updated February 3), 2023; Eilís Quinn, "Norway, Finland, Sweden Prioritize North in Updated Statement," *Eye on the Arctic (Radio Canada International)*, November 22, 2022; Christopher Woody, "New Missions in the High North Are Taking US and British Aircraft Carriers Closer to a Frigid Frontline with Russia," *Business Insider*, November 8, 2022; Lee Willett, "Flank Speed: NATO Builds Arctic Deterrence and Defence," *Jane's Navy International*, October 19, 2022.

[169] See, for example, Sonoko Kuhara, "What the 'Blue Arctic' Means for the US Pacific Military Presence," *Diplomat*, August 21, 2021; Seapower Staff, "U.S. Coast Guard Cutters Patrol the U.S. Arctic," *Seapower*, August 13, 2021.

[170] See, for example, Department of Homeland Security, Office of the Chief Financial Officer, *Arctic Search and Rescue*, Fiscal Year 2017 Report to Congress, March 13, 2018, 16 pp.

- More complete and detailed information on the Arctic as an operating area is needed to more properly support expanded Navy and Coast Guard ship and aircraft operations in the region.[171]
- The Navy and the Coast Guard currently have limited infrastructure in place in the Arctic to support expanded ship and aircraft operations in the Arctic.[172]
- Improved communication abilities are needed, because existing U.S. military communications systems were designed to support operations in lower latitudes rather than in the polar regions. Improved capabilities for conducting surveillance and reconnaissance in the region are needed so as to support improved domain awareness (DMA), meaning real-time or near-real-time awareness of military and other activities taking place across the region. U.S. military services are starting to take actions to address the need for improved communications and improved surveillance and reconnaissance in the Arctic.[173]
- Navy officials have stated that they do not see a strong near-term need for building ice-hardened surface ships and deploying them into the Atlantic, but acknowledge that such a need might emerge in the longer run.[174]
- Cooperation with other Arctic countries will be valuable in achieving defense and homeland security goals.

Some Specific Developments

U.S. and Canada Plan to Update Warning Radars in Arctic

The United States and Canada are working together to modernize the North American Aerospace Defense Command (NORAD). Efforts are to include joint investments in new sensing and command and control capabilities for defending against ballistic missile threats."[175]

[171] See, for example, Sarena Padilla and Garner Fleming, "Navy, Coast Guard, NOAA Work to Improve Arctic Forecasting for U.S., Allied Forces," *Defense Opinion*, February 20, 2023.

[172] See, for example, *Identifying Potential Gaps in U.S. Coast Guard Arctic Capabilities*, Homeland Security Operational Analysis Center (HSOAC), 2018, 100 pp.

[173] See, for example, Jon Harper, "Northern Command Testing Commercial Satcom Capabilities in the Arctic," *Fedscoop*, May 5, 2022; Walker D. Mills, "Solving Communications Gaps in the Arctic with Balloons," Center for International Maritime Security (CIMSEC), August 23, 2021; Bill Liquori and Iris Ferguson, "How the US Space Force Plans to Improve Arctic Communication," *C4ISRNet*, July 14, 2021.

[174] See, for example, Ben Werner, "Arleigh Burke Destroyers Are More Viable Option for Near-Term Navy Presence in Arctic," *USNI News*, September 18, 2019; Megan Eckstein, "CNO: Arctic Operations Limited Now, But Future Ship Designs Should Consider Environment," *USNI News*, September 12, 2016.

[175] See, for example, Jeff Pelletier, "Biden, Trudeau Promise Upgrades to Arctic Defence," *Nunatsiaq News*, March 24, 2023; Murray Brewster, "A Plan to Plug Gaps in the Continent's Arctic Defence Shield Faces Roadblocks," *CBC News*, January 4, 2023; Michael Peck, "The US and Canada Are Updating a Cold War-Era System to Keep an Eye on Russian and Chinese Missiles. Experts Say They Need to Add a Lot More Territory Too," *Business Insider*, October 26, 2022; Hilde-Gunn Bye, "Canada to Spend Billions on Modernizing Air Defense in the Arctic," *High North News*, June 21 (updated June 23), 2022; Lee Berthiaume (Canadian Press), "Ukraine War Sparks Fresh Worries About North America's Own Defences," *CBC*, March 5, 2022. See also by Caitlin Lee and Aidan Poling, *Bolstering Arctic Domain Awareness to Deter Air & Missile Threats to the Homeland*, Mitchell Institute, June 2023, 31 pp.; Murray Brewster, "Canada Spending Almost $5B to Upgrade Continental Defence, Anand Says," *CBC News*, June 20, 2022; Paul Vieira, "Canada Plans Billions in Military Spending to Counter Russia Threat in Arctic," *Wall Street Journal*, June 20, 2022.

Impact of Warmer Temperatures on Bases in Alaska and Exercises in Norway

DOD's September 2021 draft climate adaptation plan states: "In the Arctic, permafrost plays an important role regarding natural and built infrastructure. For example, it provides stability of large acreages of wetlands and lakes across the tundra. Permafrost thaw threatens to undermine roads and structural foundations."[176] An August 2020 press report identifies Eielson Air Force Base southeast of Fairbanks, Fort Wainwright in Fairbanks, and Clear Space Force Station south of Anderson (previously known as Clear Air Force Base) as locations where facilities have been impacted by thawing permafrost.[177]

A March 2022 press report stated: "The weather along Norway's Arctic coast... is becoming increasingly hard to predict as warming trends change the terrain and storms become more frequent.... The changing conditions mean that U.S. forces will have to adapt how they operate, both for the safety of their forces and the success of any potential future combat operations in the High North.... In the air, pilots must account for more extreme rainfall and storms.... Avalanches are also a greater risk now."[178]

A May 24, 2023, press report stated: "Climate change is rapidly altering the Arctic landscape, in particular the permafrost that serves as a foundation for buildings across the region. Warming temperatures are thawing out the frozen ground, and in the process it is threatening to unsettle structures that were built decades ago. That's particularly worrisome for the U.S. military, which maintains facilities across the Arctic region. And it's one reason [Deputy Defense Secretary Kathleen] Hicks embarked on a two-day tour of the nation's northernmost military bases."[179]

September 2022 Establishment of DOD Arctic Strategy and Global Resilience Office

In September 2022, DOD established an office for Arctic strategy and global resilience "to ensure U.S. strategy and policy protects U.S. interests in that crucial region," and named Iris A. Ferguson as Deputy Assistant Secretary of Defense for Arctic and Global Resilience.[180]

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[176] Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment*), Department of Defense Draft Climate Adaptation Plan, Report Submitted to National Climate Task Force and Federal Chief Sustainability Officer*, September 1, 2021, p. 13.

[177] Sara Karlovitch, Luciana Perez-Uribe, Julia Lerner, and Lindsey Collins, "As the World Warms, Costs Rise for Alaska Military Bases," *Anchorage Daily News*, August 1, 2020. (Also published as Sara Karlovitch, Luciana Perez-Uribe, Julia Lerner, and Lindsey Collins, "Global Warming Is Having a Costly, and Dangerous, Impact on Key Military Bases in Alaska," *Seattle Times*, August 9, 2020.) See also Sharon E. Burke, "The Arctic Threat that Must Not Be Named," *War on the Rocks*, January 28, 2021; Brian W. Everstine, "Climate Change Will Guide How the Air Force Builds Arctic Infrastructure," *Air Force Magazine*, November 20, 2020; Rhemi Marlatt, "The Intersection of U.S. Military Infrastructure & Alaskan Permafrost Through the 21st Century," Arctic Institute, October 27, 2020.

[178] Phillip Walter Wellman, "As Weather Warms, Heavy Rains and Avalanches Become Part of Planning for Marines During Arctic Exercise," Stars and Stripes, March 22, 2022.

[179] Daniel Cusick, "U.S. Military Sees Growing Threat in Thawing Permafrost," *E&E News (Scientific American)*, May 24, 2023. See also Ellen Knickmeyer, "Climate Toll on Arctic Bases: Sunken Runways, Damaged Roads," *Associated Press*, April 15, 2022; Department of Defense, Inspector General, *(U) Evaluation of the Department of Defense's Efforts to Address the Climate Resilience of U.S. Military Installations in the Arctic and Sub-Arctic*, Report No. DODIG-2022-083, April 13, 2022, 45 pp., declassified version, accessed July 3, 2023, at https://media.defense.gov/2022/Apr/15/2002977604/-1/-1/1/DODIG-2022-083.PDF. For a press report about this DOD Inspector General report, see Malte Humpert, "U.S. Arctic and Sub-Arctic Military Bases Are Unprepared For Impacts of Climate Change," *High North News*, May 3, 2022.

[180] Jim Garamone, "DOD Establishes Arctic Strategy and Global Resilience Office," *DOD News*, September 27, 2022; Mike Glenn, "Pentagon Establishes New Senior Coordinator for Arctic Policy," *Washington Times*, September 27, 2022.

June 2021 DOD Creation of Ted Stevens Center for Arctic Security Studies

In June 2021, DOD announced the creation of "a new DOD center to focus on issues related to the Arctic. The Ted Stevens Center for Arctic Security Studies will be the sixth such regional center for the department."[181]

April 2021 Agreement Regarding Bases in Norway

On April 16, 2021, "the United States and the Kingdom of Norway concluded the recently negotiated Supplementary Defense Cooperation Agreement (SDCA).... The Agreement supplements the provisions of the 1951 NATO Status of Forces Agreement (SOFA) and establishes a framework to advance our capabilities, in support of the NATO Alliance's collective defense.... The SDCA includes four initial key locations as focal points for increased cooperation with Norway: Evenes Air Station, Ramsund Naval Station, Rygge Air Station, and Sola Air Station."[182]

August 2018 Reestablishment of 2nd Fleet

In May 2018, the Navy announced that it would reestablish the 2nd Fleet, which was the Navy's fleet during the Cold War for countering Soviet naval forces in the North Atlantic. The fleet's formal reestablishment occurred in August 2018. The 2nd Fleet was created in 1950 and disestablished in September 2011. In its newly reestablished form, it is described as focusing on countering Russian naval forces not only in the North Atlantic but in the Arctic as well.[183]

Sufficiency of U.S. Arctic Military Activities

Some observers have expressed concern about whether the United States is doing enough militarily to defend its interests in the Arctic, and in some cases have offered recommendations for doing more.[184] Whether DOD and the Coast Guard are devoting sufficient resources to the Arctic and taking sufficient actions for defending U.S. interests in the region is a topic of

[181] Department of Defense news release, "DOD Announces Center to Collaborate on, Advance Shared Interests in Arctic Region," *DOD News*, June 9, 2021. See also Department of Defense, "The Department of Defense Announces Establishment of Arctic Regional Center," June 9, 2021.

[182] Department of State, "U.S.-Norway Supplementary Defense Cooperation Agreement (SDCA)," Fact Sheet, Bureau Of Political-Military Affairs, April 16, 2021; Government of Norway, "Norway signs Supplementary Defense Cooperation Agreement with the United States," April 16, 2021. See also Chad Garland, "US Can Build Military Facilities in Norway Under New Defense Cooperation Pact," *Stars and Stripes*, April 16, 2021; Thomas Nilsen, "U.S. Navy Will Build Airport Infrastructure in Northern Norway to Meet Upped Russian Submarine Presence," *Barents Observer*, April 16, 2021; Terje Solsvik and Nerijus Adomaitis, "Norway to Allow U.S. Military to Build on Its Soil in New Accord," *Reuters*, April 16, 2021; Paul McLeary, "Norway, US Bolster Russian Sub Watching With New Bases," *Breaking Defense*, April 19, 2021.

[183] See, for example, Christopher Woody, "The US Navy's Newest Fleet Is Bulking Up for 'Leaner, Agile' Operations to Counter Russia in the Atlantic and the Arctic," *Business Insider*, January 18, 2019; Patricia Kime, "The Navy Isd gearing Up for 'Leaner, Agile' Operations in Arctic, North Atlantic," *Military.com*, January 16, 2019; Rich Abott, "2nd Fleet To Be Fully Operational in 2019, Sees Real Russian Threat," *Defense Daily*, December 3, 2018; Sam LaGrone, "U.S. 2nd Fleet Racing Toward a 2019 Operational Capability," USNI News, November 29, 2018; Paul McLeary, "New Second Fleet To Stay Lean, Unpredictable, Commander Says; & Watching China," *Breaking Defense*, November 29, 2018; Sam LaGrone, "CNO: New 2nd Fleet Boundary Will Extend North to the Edge of Russian Waters," *USNI News*, August 24, 2018.

[184] See, for example, Theresa Hitchens, "Eyeing Russia and China, NORTHCOM head frets over US ability to respond to Arctic threats," *Breaking Defense*, October 12, 2022; Greg Hadley, "Arctic Hasn't Gotten Enough in Past Pentagon Budgets, VanHerck Says. Will That Change in 2023?" *Air & Space Forces Magazine*, March 25, 2022.

congressional oversight.[185] Those who argue that DOD and the Coast Guard are not devoting sufficient resources and taking sufficient actions argue, for example, that DOD and the Coast Guard should build ice-hardened surface ships other than icebreakers for deployment to the Arctic and/or establish a strategic seaport in Alaska's north to better support DOD and Coast Guard operations in the Arctic.[186] (Anchorage, in the southern part of Alaska's mainland, was designated a U.S. strategic seaport for supporting DOD operations in 2004.[187]) A June 2023 press report stated that a $600 million project to expand port facilities at Nome, Alaska, will make Nome "the nation's first deep-water Arctic port. The expansion, expected to be operational by the end of the decade, will accommodate not just larger cruise ships of up to 4,000 passengers, but cargo ships to deliver additional goods for the 60 Alaska Native villages in the region, and military vessels to counter the presence of Russian and Chinese ships in the Arctic."[188]

Polar Icebreaking[189]

Within the U.S. government, the Coast Guard is the U.S. agency responsible for polar icebreaking. U.S. polar ice operations conducted in large part by the Coast Guard's polar icebreakers support 9 of the Coast Guard's 11 statutory missions.[190] The Coast Guard's large icebreakers are called polar icebreakers rather than Arctic icebreakers because they perform missions in both the Arctic and Antarctic.

The Coast Guard's polar icebreakers do not simply break ice—they are multimission cutters that conduct a variety of other operations that are conducted in lower-latitude waters by the Coast

[185] See, for example, Riley Rogerson, "Top US Northern Command Official Calls Arctic Military Resources Insufficient at Senate Hearing," *Anchorage Daily News*, March 23, 2023.

[186] Brian W. Everstine, "DOD Leaders Want More Arctic Funding, But Not Right Now," *Air Force Magazine*, June 17, 2021; Greg Hadley, "VanHerck: Services 'Didn't Move the Ball Very Far' With Arctic Spending in 2022," *Air Force Magazine*, June 10, 2021.

[187] See, for example, Patti Bielling, "Anchorage Is Named DoD's Newest Strategic Seaport," Military Surface Deployment & Distribution Command (SSDC), news release No. 028-2004, August 17, 2004, accessed July 3, 2023, at https://www.portofalaska.com/wp-content/uploads/2006_POA_Strategic_Seaport_Press_Release.pdf. For more on U.S. strategic seaports, see U.S. Department of Transportation, Maritime Administration, "National Port Readiness Network (NPRN)," updated December 7, 2021, accessed July 3, 2023, at https://www.maritime.dot.gov/ports/strong-ports/national-port-readiness-network-nprn; Kevin Tokarski, "The Maritime Administration Strategic Ports Program," second of three briefings (slides 11 through 23 of 41), accessed July 3, 2023, at https://www.aapa-ports.org/files/2019AnnualConvention/Strategic%20Ports.pdf; Government Accountability Office, *Defense Logistics: The Department of Defense's Report on Strategic Seaports Addressed All Congressionally Directed Elements*, GAO-13-511R, May 13, 2013, 23 pp.; Rolando C. Baez, "The Strategic Seaport Program: Ensuring Transportation Readiness," U.S. Army, January 10, 2017; Joan Bondareff and Kate Scontras, "Strategic Seaports," *Maritime Reporter*, December 2012: 16-17, accessed July 3, 2023, at https://magazines.marinelink.com/nwm/MaritimeReporter/201212/#page/18, and reprinted (with bylines of Joan M. Bondareff and Katherine V. Scontras,) at https://www.blankrome.com/publications/strategic-seaports.

[188] Mark Thiessen, "Cruising to Nome: The First U.S. Deep Water Port for the Arctic to Host Cruise Ships, Military," *Associated Press*, June 18, 2023.

[189] This section was prepared by Ronald O'Rourke, Specialist in Naval Affairs, Foreign Affairs, Defense, and Trade Division. It adapts material from CRS Report RL34391, *Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress*.

[190] The nine missions supported by polar ice operations are search and rescue; maritime safety; aids to navigation; ice operations; marine environmental protection; living marine resources; other law enforcement (protect the exclusive economic zone [EEZ]); ports, waterways and costal security; and defense readiness. The two missions not supported by polar ice operations are illegal drug interdiction and undocumented migrant interdiction. (Department of Homeland Security, *Polar Icebreaking Recapitalization Project Mission Need Statement, Version 1.0*, approved by DHS June 28, 2013, p. 10.)

Guard's general-purpose cutters. U.S. polar ice operations conducted in large part by the Coast Guard's polar icebreakers support 9 of the Coast Guard's 11 statutory missions.

The operational U.S. polar icebreaking fleet currently consists of one heavy polar icebreaker, *Polar Star*, and one medium polar icebreaker, *Healy*. In addition to *Polar Star*, the Coast Guard has a second heavy polar icebreaker, *Polar Sea*. *Polar Sea*, however, suffered an engine casualty in June 2010 and has been nonoperational since then. *Polar Star* and *Polar Sea* entered service in 1976 and 1978, respectively, and are now well beyond their originally intended 30-year service lives. The Coast Guard has used *Polar Sea* as a source of spare parts for keeping *Polar Star* operational.[191]

Operations to support National Science Foundation (NSF) research activities in both polar regions account for a significant portion of U.S. polar icebreaker operations. Providing support for NSF's research in the Antarctic focuses on performing an annual mission, called Operation Deep Freeze (ODF), to break through Antarctic sea ice so as to reach and resupply McMurdo Station, the large U.S. Antarctic research station located on the shore of McMurdo Sound, near the Ross Ice Shelf. The Coast Guard's medium polar icebreaker, *Healy*, spends most of its operational time in the Arctic supporting NSF research activities and performing other operations.

Even with the diminishment of polar ice, there are still significant ice-covered areas in the polar regions, and diminishment of polar ice could lead in coming years to increased commercial cargo ship, cruise ship, research ship, and naval surface ship operations, as well as increased exploration for oil and other resources, in the Arctic. Such activities could require increased levels of support from polar icebreakers, particularly since waters described as "ice free" can actually still have some amount of ice.

Some observers have identified polar icebreaking capacity as a component of U.S.-Russia (or U.S.-China) competition in the Arctic, and express concern about what they view as a U.S. "icebreaker gap" compared to the much-larger Russian polar icebreaker fleet.[192] Other observers disagree with that perspective.[193]

The Coast Guard in its FY2013 budget initiated a program, now known as the Polar Security Cutter (PSC) program, to acquire new heavy polar icebreakers. The Coast Guard envisages procuring at least three new PSCs (i.e., heavy polar icebreakers), followed by the procurement of at least three Arctic Security Cutters (ASCs, i.e., medium polar icebreakers). The Navy and Coast Guard in 2020 estimated the total procurement costs of the first three PSCs in then-year dollars as $1,038 million (i.e., about $1.0 billion) for the first ship, $794 million for the second ship, and $841 million for the third ship, for a combined estimated cost of $2,673 million (i.e., about $2.7 billion).The first ship will cost more than the other two because it will incorporate design costs for the class and be at the start of the production learning curve for the class. The procurement of the first two PSCs is fully funded. The design and construction of the first PSC has been delayed; it might now delivered to the Coast Guard no earlier than 2028. The Coast Guard's proposed FY2024 budget requests $170.0 million in continued procurement funding for the PSC program.

As part of its FY2023 budget submission, the Coast Guard, in addition to requesting procurement funding for the PSC program, also requested $125.0 million for procuring an existing

[191] See CRS Report RL34391, *Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress*, by Ronald O'Rourke.

[192] See, for example, Mike Glenn, "U.S. Icebreaker Gap with Russia a Growing Concern as Arctic 'Cold War' Heats Up," *Washington Times*, September 23, 2021.

[193] See, for example, Paul C. Avey, "The Icebreaker Gap Doesn't Mean America Is Losing In The Arctic," *War on the Rocks*, November 28, 2019.

commercially available polar icebreaker that would be modified to become a Coast Guard polar icebreaker. The ship would be used to help bridge the Coast Guard's polar icebreaking capacity until the new PSCs enter service, and augment the Coast Guard's polar icebreaking capacity after the new PSCs enter service. Congress, as part of its action on the Coast Guard's FY2023 budget, denied this funding request. As part of its FY2024 budget submission, the Coast Guard has again requested $125.0 million for procuring an existing commercially available polar icebreaker.

Search and Rescue (SAR)[194]

Increasing sea and air traffic through Arctic waters has increased concerns regarding Arctic-area search and rescue (SAR) capabilities. Given the location of current U.S. Coast Guard operating bases, it could take Coast Guard aircraft several hours, and Coast Guard cutters days or even weeks, to reach a ship in distress or a downed aircraft in Arctic waters. The Coast Guard states that "the closest Coast Guard Air Station to the Arctic is located in Kodiak, AK, approximately 820 nautical miles south of Utqiagvik, AK, which is nearly the same distance as from Boston, MA, to Miami, FL."[195] In addition to such long distances, the harsh climate complicates SAR operations in the region.

Particular concern has been expressed about cruise ships carrying large numbers of civilian passengers that may experience problems and need assistance. There have been incidents of this kind with cruise ships in waters off Antarctica, and a Russian-flagged passenger ship with 162 people on board ran aground on Canada's Northwest Passage on August 24, 2018.[196]

The Coast Guard is participating in exercises focused on improving Arctic SAR capabilities. Further increasing U.S. Coast Guard SAR capabilities for the Arctic could require one or more of the following: enhancing or creating new Coast Guard operating bases in the region; procuring additional Arctic-capable aircraft, cutters, and rescue boats for the Coast Guard; and adding systems to improve Arctic maritime communications, navigation, and domain awareness. It may also entail enhanced forms of cooperation with navies and coast guards of other Arctic countries.

On May 12, 2011, representatives from the member states of the Arctic Council, meeting in Nuuk, Greenland, signed an agreement on cooperation on aeronautical and maritime SAR in the Arctic.[197] The agreement divides the Arctic into SAR areas within which each party has primary responsibility for conducting SAR operations. **Figure 5** shows a map of the national areas of SAR responsibility based on the geographic coordinates listed in the Annex to the agreement.

[194] This section was prepared by Ronald O'Rourke, Specialist in Naval Affairs, Foreign Affairs, Defense, and Trade Division.

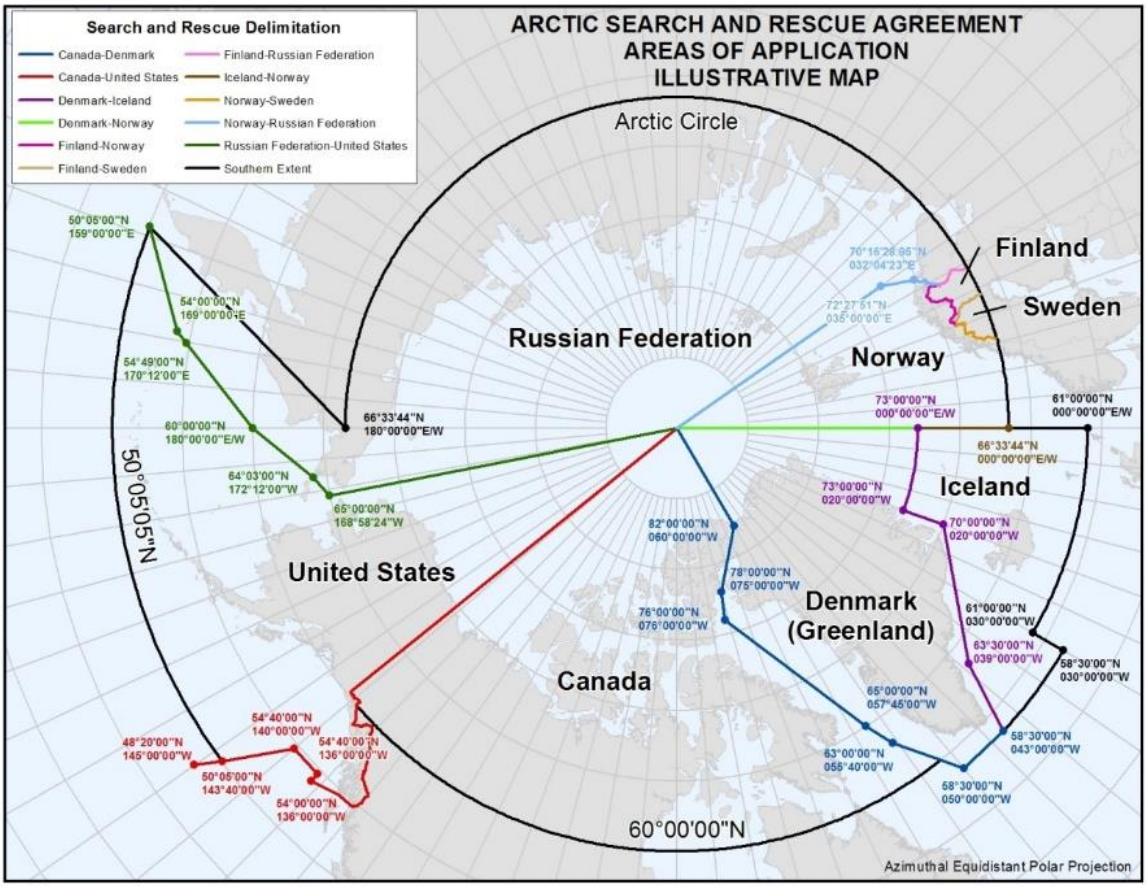
[195] Coast Guard, *Arctic Strategic Outlook*, April 2019, p. 11.

[196] Malte Humpert, "A Cruise Ship Runs Aground in Canada's Arctic Waters; The Akademik Ioffe's Sister Ship Was Nearby, and Together with Canadian Coast guard Ships, Was Able to Rescue All Passengers," *ArcticToday*, August 28, 2018.

[197] For a State Department fact sheet on the agreement, see "Secretary Clinton Signs the Arctic Search and Rescue Agreement with Other Arctic Nations," May 12, 2011, accessed February 15, 2023, at https://2009-2017.state.gov/r/pa/prs/ps/2011/05/163285.htm.

Figure 5. Arctic SAR Areas in Arctic SAR Agreement

(Based on geographic coordinates listed in the agreement)



Source: Map posted at "Arctic Region," U.S. Department of State, accessed February 15, 2023, at https://www.state.gov/key-topics-office-of-ocean-and-polar-affairs/arctic/.

Commercial Sea Transportation[198]

Background

The search for a shorter route from the Atlantic to Asia has been the quest of maritime powers since the Middle Ages. The diminishment of Arctic ice raises the possibility of saving several thousands of miles and several days of sailing between major trading blocs.[199] If the Arctic were to become a viable shipping route, the ramifications could extend far beyond the Arctic. For example, lower shipping costs could be advantageous for China (at least its northeast region), Japan, and South Korea because their manufactured products exported to Europe or North

[198] This section was prepared by John Frittelli, Specialist in Transportation Policy, Resources, Science, and Industry Division.

[199] Extended daylight hours in the Arctic during the summer may also be an advantage.

America could become less expensive relative to other emerging manufacturing centers in Southeast Asia, such as India.[200] Melting ice could potentially open up two trans-Arctic routes:[201]

- **The Northern Sea Route** (NSR, a.k.a. the "Northeast Passage"), along Russia's northern border from Murmansk to Provideniya, is about 2,600 nautical miles in length. It was opened by the Soviet Union to domestic shipping in 1931 and to transit by foreign vessels in 1991. This route would be applicable for trade between northeast Asia (north of Singapore) and northern Europe. Most transits through the NSR are associated with the carriage of LNG from Russia's Yamal Peninsula, and Russia is actively promoting the use of this route. The NSR accounts for the vast majority of large cargo ship transits in the Arctic.[202]
- **The Northwest Passage** (NWP) runs through the Canadian Arctic Islands. The NWP actually consists of several potential routes. The southern route is through Peel Sound in Nunavut, which has been open in recent summers and contains mostly one-year ice. However, this route is circuitous, contains some narrow channels, and is shallow enough to impose draft restrictions on ships. The more northern route, through McClure Strait from Baffin Bay to the Beaufort Sea north of Alaska, is much more direct and therefore more appealing to ocean carriers, but more prone to ice blockage.[203] The NWP is potentially applicable for trade between northeast Asia (north of Shanghai) and the northeast of North America, but it is less commercially viable than the NSR.[204] Cargo ship transits have been extremely rare but cruise vessel excursions and research vessels are more common.

Destination Traffic, Not Trans-Arctic Traffic

Most cargo ship activity currently taking place in the Arctic is to transport natural resources from the Arctic or to deliver general cargo and supplies to communities and natural resource extraction facilities. Thus, cargo ship traffic in the Arctic presently is mostly regional, not trans-Arctic.

Unpredictable Ice Conditions Hinder Trans-Arctic Shipping

Arctic waters do not necessarily have to be ice free to be open to shipping. Multiyear ice can be over 10 feet thick and problematic even for icebreakers, but one-year ice is typically 3 feet thick or less. This thinner ice can be more readily broken up by icebreakers or ice-class ships (cargo ships with reinforced hulls and other features for navigating in ice-infested waters). However, more open water in the Arctic has resulted in another potential obstacle to shipping: unpredictable ice flows. In the NWP, melting ice and the opening of waters that were once covered with one-year ice has allowed blocks of multiyear ice from farther north and icebergs from Greenland to

[200] Presentation by Stephen Carmel, Senior Vice President, Maersk Line Ltd., Halifax International Security Forum, *Arctic Security: The New Great Game?* November 21, 2009.

[201] A third but more remote possibility is a route directly over the North Pole.

[202] Traffic statistics available at https://arctic-lio.com/.

[203] This was the route pioneered by the *SS Manhattan*, an oil tanker modified for ice breaking in 1969 to carry Alaskan North Slope oil to the Atlantic. This was the first commercial passage through the NWP, but the building of the Alaskan pipeline was found to be the more economical means of transporting oil from the North Slope to the lower 48 states.

[204] Although the NWP is often compared to the alternative route through the Panama Canal in terms of distance and sailing days from Asia to the U.S. east coast, another alternative to consider is the shorter and faster transcontinental rail route across Canada or the United States.

flow into potential sea lanes. The source of this multiyear ice is not predicted to dissipate in spite of climate change. Moreover, the flow patterns of these ice blocks are very difficult to forecast.[205] Thus, the lack of ice in potential sea lanes during the summer months can add even greater unpredictability to Arctic shipping. This is in addition to the extent of ice versus open water, which is also highly variable from one year to the next and seasonally.

The unpredictability of ice conditions is a major hindrance for trans-Arctic shipping in general, but can be more of a concern for some types of ships than it is for others. For instance, it would be less of a concern for cruise ships, which may have the objective of merely visiting the Arctic rather than passing through and could change their route and itinerary depending on ice conditions. On the other hand, unpredictability is of the utmost concern for container ships that carry thousands of containers from hundreds of different customers, all of whom expect to unload or load their cargo upon the ship's arrival at various ports as indicated on the ship's advertised schedule. The presence of even small blocks of ice or icebergs from a melting Greenland ice sheet requires slow sailing and could play havoc with schedules. Several container shipping lines and shippers have pledged not to ship through the Arctic.[206] Ships carrying a single commodity in bulk from one port to another for just one customer have more flexibility in terms of delivery windows, but would not likely risk an Arctic passage under prevailing conditions.

Ice is not the sole impediment to Arctic shipping. The region frequently experiences adverse weather, including not only severe storms, but also intense cold, which can impair deck machinery. During the summer months when sea lanes are open, heavy fog is common in the Arctic.

Commercial ships would face higher operating costs on Arctic routes than elsewhere. Ship size is an important factor in reducing freight costs. Many ships currently used in other waters would require two icebreakers to break a path wide enough for them to sail through; ship owners could reduce that cost by using smaller vessels in the Arctic, but this would raise the cost per container or per ton of freight.[207] Also, icebreakers or ice-class cargo vessels burn more fuel than ships designed for more temperate waters and would have to sail at slower speeds. The shipping season in the Arctic only lasts for a few weeks, so icebreakers and other special required equipment would sit idle the remainder of the year. None of these impediments by themselves may be enough to discourage Arctic passage but they do raise costs, perhaps enough to negate the savings of a shorter route. Thus, from the perspective of a shipper or a ship owner, shorter via the Arctic does not necessarily mean cheaper and faster.[208]

Basic Navigation Infrastructure Is Lacking

Considerable investment in navigation-related infrastructure would be required if trans-Arctic shipping were to become a reality. Channel marking buoys and other floating visual aids are not possible in Arctic waters because moving ice sheets will continuously shift their positions. Therefore, vessel captains would need to rely on marine surveys and ice charts. For some areas in

[205] S.E.L. Howell and J.J. Yackel, "A Vessel Transit Assessment of Sea Ice Variability in the Western Arctic, 1969-2002: Implications for Ship Navigation," *Canadian Journal of Remote Sensing*, vol. 30, no. 2, 2004.

[206] Ocean Conservancy, https://oceanconservancy.org/protecting-the-arctic/take-the-pledge/.

[207] "Arctic Unlikely to See Major Shipping Growth," *New Zealand Transport and Logistics Business Week*, April 24, 2008.

[208] Stephen M. Carmel, Senior Vice President, Maersk Line Ltd., "The Cold, Hard Realities of Arctic Shipping," *United States Naval Institute, Proceedings*; July 2013, pp. 38-41.

the Arctic, however, these surveys and charts are out of date or not sufficiently accurate.[209] To remedy this problem, aviation reconnaissance of ice conditions and satellite images would need to become readily available for ship operators.[210] Ship-to-shore communication infrastructure would need to be installed where possible. Refueling stations may be needed, as well as, perhaps, transshipment ports where cargo could be transferred to and from ice-capable vessels at both ends of Arctic routes. Shipping lines would need to develop a larger pool of mariners with ice navigation experience. Marine insurers would need to calculate the proper level of risk premium for polar routes, which would require more detailed information about Arctic accidents and incidents in the past.

The U.S. Army Corps of Engineers, along with the state of Alaska, has studied the feasibility of a "deep-draft" port in the Arctic (accommodating ships with a draft of about 35 feet). The northern and northwestern coastlines of Alaska are exceptionally shallow, generally limiting harbor and near-shore traffic to shallow-draft barges. Coast Guard cutters and icebreakers have drafts of 35 to 40 feet while NOAA research vessels have drafts of 16 to 28 feet, so at present these vessels are based outside the Arctic and must sail considerable distances to reach Arctic duty stations. Supply vessels supporting offshore oil rigs typically have drafts over 20 feet. A deep-draft port could serve as a base of operations for larger vessels, facilitating commercial maritime traffic in the Arctic. The study concluded that the existing harbors of Nome or Port Clarence on Alaska's west coast may be the most suitable for deepening because of their proximity to the Bering Strait and deeper water.[211] However, at a July 2016 hearing, the Coast Guard indicated its preferred strategy was to rely on mobile assets (vessels and aircraft) and seasonal bases of operation rather than pursue a permanent port in the Arctic.[212] Congress has provided funds for engineering and design of the Nome project.

The U.S. Committee on the Marine Transportation System, a Cabinet-level committee of federal agencies with responsibilities for marine transportation, identified a list of infrastructure improvements for Arctic navigation in a 2013 report.[213] The report prioritizes improvements to information infrastructure (weather forecasting, nautical charting, ship tracking) and emergency response capabilities for ships in distress.

Regulation of Arctic Shipping

Due to the international nature of the shipping industry, maritime trading nations have adopted international treaties that establish standards for ocean carriers in terms of safety, pollution prevention, and security. These standards are agreed upon by shipping nations through the International Maritime Organization (IMO), a United Nations agency that first met in 1959.[214]

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[209] In July and August 2010, NOAA surveyed the Bering Straits area in order to update its charts but stated that it will take more than 25 years to map the prioritized areas of navigational significance in U.S. Arctic waters. See https://web.archive.org/web/20180605213143/http://www.noaanews.noaa.gov/stories2010/20100720_fairweather.html.

[210] Ice reporting that currently exists is intended for scientists not mariners.

[211] *Alaska Deep-Draft Arctic Port System Study*, March 2013; http://www.poa.usace.army.mil/Library/ReportsandStudies/AlaskaRegionalPortsStudy.aspx. The navigation channel at Nome presently ranges from 10 to 20 feet in depth. Much of the harbor at Port Clarence has a natural depth of 35 to 40 feet.

[212] Oral testimony of Admiral Charles D. Michel, Coast Guard Vice Commandant, House Committee on Transportation and Infrastructure, Subcommittee on Coast Guard and Maritime Transportation, *Coast Guard Arctic Implementation Capabilities*, July 12, 2016.

[213] U.S. Committee on the Marine Transportation System, *U.S. Arctic Marine Transportation System: Overview and Priorities for Action*, 2013.

[214] See http://www.imo.org/ for more information.

Key conventions that the 168 IMO member nations have adopted include the Safety of Life at Sea Convention (SOLAS), which was originally adopted in response to the *Titanic* disaster in 1912 but has since been revised several times; the Prevention of Pollution from Ships (MARPOL), which was adopted in 1973 and modified in 1978; and the Standards for Training, Certification, and Watchkeeping for Seafarers (SCTW), which was adopted in 1978 and amended in 1995 and 2010. It is up to ratifying nations to enforce these standards. The United States is a party to these conventions, and the U.S. Coast Guard enforces them when it boards and inspects ships and crews arriving at U.S. ports and the very few ships engaged in international trade that sail under the U.S. flag.

Like the United States, most of the other major maritime trading nations lack the ability to enforce these regulations as a "flag state" because much of the world's merchant fleet is registered under so-called "flags of convenience." While most ship owners and operators are headquartered in major economies, they often register their ships in Panama, Liberia, the Bahamas, the Marshall Islands, Malta, and Cyprus, among other "open registries," because these nations offer more attractive tax and employment regulatory regimes. Because of this development, most maritime trading nations enforce shipping regulations under a "port state control" regime—that is, they require compliance with these regulations as a condition of calling at their ports. The fragmented nature of ship ownership and operation can be a further hurdle to regulatory enforcement. It is common for cargo ships to be owned by one company, operated by a second company (which markets the ship's space), and managed by a third (which may supply the crew and other services a ship requires to sail), each of which could be headquartered in different countries.

Arctic Polar Code

While SOLAS and other IMO conventions include provisions regarding the operation of ships in ice-infested waters, they were not specific to the polar regions. To supplement these requirements, a new IMO polar code went into effect on January 1, 2017.[215] The code applies to passenger and cargo ships of 500 gross tons or more engaged in international voyages. It does not apply to fishing vessels, military vessels, pleasure yachts, or smaller cargo ships. The polar requirements are intended to improve safety and prevent pollution in the Arctic, and they include provisions on ship construction, ship equipment related to navigation, and crew training and ship operation. The code requires ships to carry fully or partially enclosed lifeboats. The code requires that the crew have training in ice navigation. Nations can enforce additional requirements on ships arriving at their ports or sailing through their coastal waters. For instance, U.S. Coast Guard regulations largely follow IMO conventions but mandate additional requirements in some areas. U.S. coastal states can require ships calling at their ports to take additional safety and pollution prevention safeguards.[216] Canada and Russia have additional pollution regulations for Arctic waters exceeding MARPOL. The U.S. Coast Guard has studied and has recommended a specific vessel traffic separation scheme for the Bering Strait between Alaska and Russia, which experiences over 400 transits per year, and which the IMO has approved.[217]

[215] https://www.imo.org/en/MediaCentre/HotTopics/Pages/Polar-default.aspx.

[216] For example, see Alaska State Legislature, HJR 19, Arctic Marine Safety Agreements; http://www.akleg.gov/basis/Bill/Detail/30?Root=HJR%2019.

[217] 82 *Federal Register* 11935, February 27, 2017.

Oil, Gas, and Mineral Exploration[218]

Lands and waters in the Arctic region—including U.S. lands and waters in and around Alaska—have attracted interest and presented challenges in terms of oil, gas, and mineral development. Decreases in ice extent in and around the Arctic Ocean may alter options for exploration in offshore and onshore areas across the region, for the United States and other countries. Efforts to map the margins of the U.S. outer continental shelf (OCS) and the continental shelves of other nations could impact oil, gas, and mineral exploration.

Offshore Oil and Gas Exploration

The shrinking Arctic ice cap, or conversely, the growing amount of ice-free ocean, has increased interest in exploring for offshore oil and gas in the region. Reduced sea ice means that ships towing seismic arrays[219] can explore regions of the Arctic Ocean for longer periods of time with less risk of colliding with floating sea ice. Less sea ice over longer periods compared to previous decades also means that the seasonal window for offshore Arctic drilling remains open longer, increasing the opportunities for making a discovery.

In addition to the improved access to larger portions of the Arctic afforded by shrinking sea ice, interest in Arctic oil and gas was fueled by a 2008 U.S. Geological Survey (USGS) appraisal of undiscovered oil and gas north of the Arctic Circle.[220] The USGS stated that the "extensive Arctic continental shelves may constitute the geographically largest unexplored prospective area for petroleum remaining on Earth."[221] In the report, the USGS estimated that 90 billion barrels of oil, nearly 1,700 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids may remain to be discovered in the Arctic (including both U.S. and international resources north of the Arctic Circle).[222] The U.S. Energy Information Administration stated in 2012 that this would constitute approximately 13% of the world's undiscovered conventional oil resources and 30% of natural gas.[223] In terms of U.S. resources specifically, DOI's Bureau of Ocean Energy Management (BOEM) estimated in 2021 that the Alaska portions of the U.S. OCS contain undiscovered, technically recoverable resources of approximately 25 billion barrels of oil and 124 trillion cubic feet of natural gas (although not all of these resources may be economically viable to recover).[224]

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[218] This section was prepared by Laura Comay, Specialist in Natural Resources Policy, Resources, Science, and Industry Division; Caitlin Keating-Bitonti, Analyst in Natural Resources Policy, Resources, Science, and Industry Division; and Brandon Tracy, Analyst in Energy Policy, Resources, Science, and Industry Division.

[219] A seismic array is typically a long string or streamer of geophones—acoustic devices used for recording seismic signals—towed behind a ship while the ship traverses a prospective oil and gas-bearing portion of the seafloor. The seismic signals are processed and interpreted to give a cross-section or three-dimensional image of the subsurface.

[220] See USGS Fact Sheet 2008-3049, *Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle*, at http://pubs.usgs.gov/fs/2008/3049/, hereinafter referred to as "USGS 2008 Fact Sheet."

[221] USGS 2008 Fact Sheet.

[222] USGS 2008 Fact Sheet, p. 1.

[223] U.S. Energy Information Administration, "Today in Energy: Arctic Oil and Natural Gas Resources," January 20, 2012, at http://www.eia.gov/todayinenergy/detail.cfm?id=4650.

[224] Bureau of Ocean Energy Management (BOEM), "Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2021," at https://www.boem.gov/sites/default/files/documents/oil-gas-energy/resource-evaluation/2021_National_Assessment_Map_BTU.pdf. BOEM defines *technically recoverable resources* as "oil and gas that could be produced as a consequence of natural pressure, artificial lift, pressure maintenance, or other secondary recovery methods, but without any consideration of economic viability" (BOEM, "Assessment of Undiscovered Oil and Gas Resources of the Nation's Outer Continental Shelf, 2021," at (continued...)

Despite the warming trend in the Arctic, severe weather and sea ice continue to pose challenges to exploration. In addition, any discovery of new oil and gas deposits far from existing storage, pipelines, and shipping facilities could not be developed until infrastructure is built to extract and transport the petroleum.

Offshore of Alaska, the U.S. OCS covers more than 1 billion acres,[225] including some areas with high oil, gas, and mineral potential. Some have expressed interest in expanding America's oil and gas portfolio in the Alaska OCS. Currently, two of the 15 federal planning areas in BOEM's Alaska region—the Beaufort Sea and Cook Inlet—contain active federal leases, and only the Beaufort Sea has producing wells (from a joint federal-state unit).[226] In July 2022, BOEM released a proposed oil and gas leasing program for 2023-2028 that considers one potential lease sale in the region during that period, which would be for the Cook Inlet planning area (which lies outside the Arctic boundary as defined by the ARPA).[227] Under the Trump Administration, BOEM had issued a draft five-year offshore oil and gas leasing program that would have scheduled lease sales in all 15 Alaska planning areas, including three sales in the Beaufort Sea and three in the Chukchi Sea, both of which lie within the ARPA-defined Arctic boundary.[228] The draft program did not advance further in the Trump Administration, and large parts of the Beaufort and Chukchi Seas are now withdrawn from leasing disposition (see discussion below).

Offshore oil and gas activities in the region have fluctuated as industry weighs changing oil prices, development costs, and regulations.[229] BOEM reported that, between February and November 2016, companies relinquished more than 90% of leases they had held in the Beaufort and Chukchi Sea planning areas, in the midst of a slump in oil prices.[230] While there were 450 active leases in the Chukchi Sea planning area at the end of 2015, as of January 2023 there were

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https://www.boem.gov/sites/default/files/documents/oil-gas-energy/resource-evaluation/2021%20Fact%20Sheet.pdf).BOEM's *2023-2028 National Outer Continental Shelf Oil and Gas Leasing Proposed Program*, chapter 5, July 2022, at https://www.boem.gov/sites/default/files/documents/oil-gas-energy/national-program/2023-2028_Proposed%20Program_July2022.pdf, estimates a range of resources that would be economically recoverable under various oil and gas price points and cost conditions.

[225] This region includes some areas within the Arctic boundary as defined by the ARPA (15 U.S.C. 4111; see **Figure 1**), such as the Beaufort and Chukchi Seas, and some areas outside that boundary, such as Cook Inlet.

[226] Bureau of Ocean Energy Management, "BP Exploration (Alaska) (BPXA)—Northstar," at http://www.boem.gov/About-BOEM/BOEM-Regions/Alaska-Region/Leasing-and-Plans/Plans/BP-North-Star.aspx. There also are additional (non-federal) leases in Alaska state waters; see Alaska Department of Natural Resources, Division of Oil and Gas, "Acreage by Lessee—Summary," November 4, 2022, at https://dog.dnr.alaska.gov/Documents/Leasing/PeriodicReports/Lease_AcreageByLesseeSummary.pdf.

[227] 15 U.S.C. 4111; see **Figure 1**. Additionally, under P.L. 117-169, commonly known as the Inflation Reduction Act of 2022, BOEM must hold an earlier-scheduled lease sale for the Cook Inlet planning area by the end of 2022. This sale (Lease Sale 258) had originally been scheduled in the five-year leasing program for 2017-2022, prepared under the Obama Administration (BOEM, *2017-2022 Outer Continental Shelf Oil and Gas Leasing Proposed Final Program*, November 2016, at https://www.boem.gov/2017-2022-OCS-Oil-and-Gas-Leasing-PFP/, hereinafter cited as "BOEM 2017-2022 Proposed Final Program"). For more information, see BOEM, "Lease Sale 258," at https://www.boem.gov/oil-gas-energy/leasing/lease-sale-258.

[228] BOEM, *2019-2024 Outer Continental Shelf Oil and Gas Leasing Draft Proposed Program*, January 2015, at https://www.boem.gov/NP-Draft-Proposed-Program-2019-2024/. The draft program also included other Alaska region planning areas in addition to the Beaufort and Chukchi Seas and Cook Inlet, although industry interest in these other areas may be lower, as many are thought to have relatively low or negligible petroleum potential.

[229] For example, in 2015, Shell Oil Company announced its decision to cease exploration in offshore Alaska for the foreseeable future. Shell cited several reasons for the decision, including insufficient indications of oil and gas at its Burger J well in the Chukchi Sea, the high costs associated with Arctic exploration, and the "challenging and unpredictable" federal regulatory environment. Royal Dutch Shell, PLC, "Shell Updates on Alaska Exploration," press release, September 28, 2015, at http://www.shell.com/global/aboutshell/media/news-and-media-releases/2015/shell-updates-on-alaska-exploration.html.

[230] BOEM 2017-2022 Proposed Final Program, p. S-3.

none.[231] In the Beaufort Sea, active leases dropped from 77 at the end of 2015 to 6 in January 2023.[232] Despite these changes, recent discoveries onshore and in state waters on Alaska's North Slope have contributed to ongoing interest in the region.

The evolving federal regulatory environment for Arctic offshore activities has been shaped by concerns about industry's ability to respond to potential oil spills, given the region's remoteness and harsh conditions. The section of this report on "Oil Pollution Implications of Arctic Change" discusses this issue in greater detail. In July 2016, BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) released final safety regulations for Arctic exploratory drilling that include multiple requirements for companies to reduce the risks of potential oil spills—for example, the requirement that companies have a separate rig available at drill sites to drill a relief well in case of a loss of well control.[233]

Concerns about the impacts of oil and gas activities have led to bans by both Congress and the President on leasing in certain Arctic Ocean areas deemed especially sensitive.[234] For example, some withdrawals and moratoria have prohibited federal planning and permitting in the Bristol Bay area of the North Aleutian Basin.[235] In December 2016, President Obama indefinitely withdrew from leasing other large portions of the U.S. Arctic, including the entire Chukchi Sea planning area and almost all of the Beaufort Sea planning area.[236]

Offshore Mineral Exploration

Seabed mineral deposits can form in seafloor environments within a country's OCS and in areas beyond national jurisdiction in the deep sea. Volcanic activity at ocean ridges often increases the concentration of dissolved metals in the surrounding seawater. In these areas, minerals can precipitate from the seawater onto the seabed, forming mineral deposits. Polymetallic sulfide, or seafloor massive sulfide, deposits commonly form at active and inactive hydrothermal vents

[231] For 2015 data, see BOEM, "Combined Leasing Report, as of January 1, 2016," at https://www.boem.gov/Combined-Leasing-Reports-2016/. For January 2023 data, see BOEM, "Combined Leasing Report, as of January 1, 2023," at https://www.boem.gov/sites/default/files/documents/oil-gas-energy/leasing/Lease%20stats%201-1-23.pdf.

[232] Ibid.

[233] Department of the Interior, "Requirements for Exploratory Drilling on the Arctic Outer Continental Shelf," 81 *Federal Register* 46477, July 15, 2016. In December 2020, the Trump Administration published a proposed revision to the rule (85 *Federal Register* 79266), but in June 2021 the Biden Administration withdrew the proposed revision.

[234] Section 12(a) of the Outer Continental Shelf Lands Act (43 U.S.C. §1341(a)) authorizes the President to, "from time to time, withdraw from disposition any of the unleased lands of the outer Continental Shelf."

[235] For the current ban, see Presidential Memorandum, "Withdrawal of Certain Portions of the United States Arctic Outer Continental Shelf from Mineral Leasing," December 20, 2016, at https://www.whitehouse.gov/the-press-office/2016/12/20/presidential-memorandum-withdrawal-certain-portions-united-states-arctic.

[236] Ibid. President Obama separately withdrew from leasing consideration planning areas in the North Bering Sea (Executive Order 13754, December 9, 2016). In April 2017, President Trump's Executive Order 13795 modified President Obama's withdrawals so as to open all these areas for leasing consideration except for the North Aleutian Basin. However, in a March 2019 court decision (League of Conservation Voters v. Trump, 363 F.Supp.3d 1013 (D.Alaska 2019)), the U.S. District Court for the District of Alaska vacated this provision in President Trump's executive order. Additionally, in January 2021, President Biden's Executive Order 13990 reinstated President Obama's Arctic withdrawals in their original form.

along ocean ridges, and commonly contain copper, gold, zinc, lead, barium, and silver.[237] Ferromanganese crusts and nodules have been observed on the Arctic seabed.[238]

Non-hydrocarbon mineral deposits in waters surrounding Alaska can be divided into two general categories: deposits in shallow, coastal waters, which are generally under state mining jurisdiction, and deposits in federal waters in the OCS, which are generally deeper waters and are under federal jurisdiction. (For information on areas beyond the U.S. OCS, see the following section on "Extent of the Continental Margin.") Mining in the coastal waters surrounding Alaska is relatively common; examples include various ongoing gold mining operations in Nome and in the Norton Sound, and a barite mine on Castle Island that operated from 1966 until 1980.[239]

Interest in identifying potential mineral deposits in Alaska's OCS, including in waters inside the Arctic region, has been increasing. Two potential drivers for this interest include growing demand for some minerals, and decreasing sea ice, which could lower exploration and exploitation costs. In an assessment of available geologic information, the USGS stressed caution in drawing conclusions from prior exploration efforts, noting that characterization of regions as

> prospective for deep-ocean minerals in the Alaska OCS, where "prospective" indicates that a region is consistent with the geologic and oceanographic criteria required to potentially host marine minerals, ... does not mean that a region hosts marine minerals and does not indicate that the marine minerals occurring in that region will be economically viable. Sparse geologic sampling limits knowledge of marine minerals in the Alaska region, especially in deep water regions.[240]

BOEM, the federal agency authorized to oversee mineral leasing in the OCS, does not indicate that any entity has requested a mineral lease in Alaska's OCS waters.[241]

Extent of the Continental Margin

Increased interest in developing offshore resources, including hydrocarbons and seabed minerals, in the Arctic has sparked efforts by Arctic coastal countries to map the extent of their continental margins beyond the limits of the 200-nautical-mile Exclusive Economic Zone (EEZ). Mapping projects are underway, by individual countries and through cooperative government studies, to support submissions to the Commission on the Limits of the Continental Shelf (CLCS), including for offshore areas that may contain large amounts of oil, natural gas, or methane hydrates, as well as seabed minerals.

Under Article 76 of UNCLOS, countries can make a submission to the CLCS concerning the extent of their continental shelves. Under Article 76, the extent of the continental margin beyond

[237] International Seabed Authority (ISA), "Minerals: Polymetallic Sulphides," at https://www.isa.org.jm/index.php/exploration-contracts/polymetallic-sulphides; International Energy Agency, "The Role of Critical Minerals in Clean Energy Transition" (2022), p. 156, at https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf; and Kathryn Miller et al., "An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps," *Frontiers in Marine Science*, vol. 4 (2018).

[238] James Hein et al., "Arctic Deep Water Ferromanganese-Oxide Deposits Reflect the Unique Characteristics of the Arctic Ocean," *Geochemistry, Geophysics, Geosystems*, vol. 18, (2017) pp. 3771-3800.

[239] Amy Gartman, Kira Mizell, and Douglas C. Kreiner, *Marine Minerals in Alaska—A Review of Coastal and Deep-Ocean Regions*, U.S. Geological Survey, Professional Paper 1870, 2022, p. 4, https://doi.org/10.3133/pp1870; and U.S. Geological Survey, "Castle Island," at https://mrdata.usgs.gov/ardf/show-ardf.php?ardf_num=PE026.

[240] Ibid., pp. 4-5.

[241] BOEM, "Requests and Active Leases," at https://www.boem.gov/marine-minerals/requests-and-active-leases.

the 200-mile limit depends on the position of the foot of the continental slope,[242] the thickness of sediments, and the depth of water. Also, the continental margin could include geologic features that extend from the continent out to sea, which may include undersea ridges continuing for hundreds of miles offshore. Some Arctic coastal countries have made submissions to the CLCS regarding the inclusion of an undersea ridge as part of their extended continental shelf (ECS). The three major Arctic Ocean ridge systems are the Alpha-Mendeleev Ridge, the Lomonosov Ridge, and the Gakkel Ridge.

Arctic coastal countries have conducted complex investigations needed to support submissions to the CLCS for an ECS in the Arctic. All Arctic coastal countries except for the United States, which is a non-party to UNCLOS, have made submissions to the CLCS. Disputes over maritime boundaries involving ridge systems or other regions of the Arctic Ocean must be resolved between the countries involved in the disagreement, because the CLCS has no mandate to establish boundaries or resolve disputes and cannot prejudice the resolution of boundary disputes. Arctic coastal countries with submissions yet to receive an action from the CLCS include Canada, the Kingdom of Denmark (Greenland), and the Russian Federation.[243] The CLCS may take years to study the scientific merits of countries' submissions and to render a decision for these claims.

Russia's initial 2001 UNCLOS submission included the Lomonosov Ridge, an undersea feature spanning the Arctic from Russia to Canada, as an extension of its continental margin. The submission demonstrated Russia's bid to extend political activities and potentially establish security infrastructure in Arctic regions. The CLCS found the Russian Federation's 2001 submission to have insufficient scientific evidence. In 2015, the Russian Federation presented to the CLCS a revised submission that included not only the Lomonosov Ridge but also the Mendeleev Rise and Chukchi Plateau—additional subsea features claimed by Russia to be natural parts of its continental margin.[244] The United States communicated no objections to the Division of Ocean Affairs and the Law of the Sea regarding Russia's 2015 revised submission.[245] In late March 2021, the Russian Federation submitted two addenda to its 2015 revised submission, presenting evidence for the Gakkel Ridge and the Nansen and Amundsen Basins to be components of the extended Russian continental shelf.[246] In total, Russia's ECS submission would capture approximately 70% of the Arctic Ocean beyond its EEZ, extending into both

[242] According to UNCLOS Article 76, the foot of the continental slope is determined as the point of maximum change in the gradient at its base.

[243] Iceland, though not an Arctic coastal state, has filed a submission regarding waters in the vicinity of the Arctic Circle (United Nations, Division for Ocean Affairs and the Law of the Sea, "Submissions, through the Secretary-General of the United Nations, to the Commission on the Limits of the Continental Shelf, pursuant to article 76, paragraph 8, of the United Nations Convention on the Law of the Sea of 10 December 1982," updated March 31, 2021, at https://www.un.org/Depts/los/clcs_new/commission_submissions.htm). See also Department of State, "Frequently Asked Questions—U.S. Extended Continental Shelf Project," at https://www.state.gov/frequently-asked-questions-u-s-extended-continental-shelf-project/.

[244] United Nations, "Partial Revised Submission of the Russian Federation to the Commission on the Limits of the Continental Shelf in Respect of the Continental Shelf of the Russian Federation in the Arctic Ocean," 2015, at http://www.un.org/Depts/los/clcs_new/submissions_files/rus01_rev15/2015_08_03_Exec_Summary_English.pdf.

[245] Department of State, "Receipt of the Partial Revised Submission made by the Russian Federation to the Commission on the Limits of the Continental Shelf," at https://www.un.org/depts/los/clcs_new/submissions_files/rus01_rev15/2015_11_02_US_NV_RUS_001_en.pdf.

[246] UN, "Addendum to the Partial Revised Submission of the Russian Federation to the Commission on the Limits of the Continental Shelf in the Area of the Gakkel Ridge, Nansen and Amundsen Basins," 2021, at https://www.un.org/depts/los/clcs_new/submissions_files/rus01_rev15/Addendum_1_2021_Executive_Summary_Gakkel_Ridge_English.pdf.

Canada's and Greenland's EEZs.[247] Thus far, no country has submitted a formal response to the CLCS regarding Russia's 2021 addenda. The CLCS has not rendered a decision on the Russian Federation submission as of January 2023.

In December 2014, the Kingdom of Denmark with the Government of Greenland submitted a recommendation on the Northern Continental Shelf of Greenland to the CLCS.[248] Their submission presented data suggesting that the Lomonosov Ridge, the Gakkel Ridge, the Alpha-Mendeleev ridge complex, and the Chukchi Borderland are morphologically continuous with the land mass of Greenland. As of January 2023, the CLCS has not rendered a decision for this submission.

In 2019, Canada made a partial submission to the CLCS for the consideration of areas of the Central Arctic Plateau, which included the Lomonosov Ridge, Alpha Ridge, and Mendeleev Rise, providing evidence that these areas are natural components of its continental margin.[249] Canada's submission includes potentially overlapping areas with the United States' continental shelf in the Arctic Ocean. Through regular consultations, the United States does not object to the consideration of Canada's submission on the Arctic Ocean and communicated such to the Division of Ocean Affairs and the Law of the Sea on August 28, 2019.[250] In December of 2022, Canada submitted an addendum to its 2019 partial submission that delineates additional outer limits of the continental shelf.[251] Canada's 2022 addendum identified, "overlaps in [Canada's and the Russia's] respective continental shelves in the Arctic Ocean."[252] As of January 2023, Russia has yet to respond to the overlap identified in Canada's addendum and the CLCS has not rendered a decision on the partial submission of Canada.

In the Arctic, the United States has potentially overlapping ECS with Russia and Canada. The United States has started to gather and analyze data to determine the extent of its continental shelf through a U.S. federal initiative called the U.S. Extended Continental Shelf (ECS) Project that is consistent with international law.[253] Much of the data to delineate the ECS for the United States and Canada was collected in a two-ship operation involving the U.S. Coast Guard Cutter *Healy* and the Canadian Coast Guard ship *Louis S. Saint Laurent*.[254] These data will help the United

[247] *ArcticToday*, "Russia Extends Its Claim to the Arctic Ocean Seabed" April 4, 2021, at https://www.arctictoday.com/russia-extends-its-claim-to-the-arctic-ocean-seabed/?wallit_nosession=1.

[248] UN, "Partial Submission of the Government of the Kingdom of Denmark together with the Government of Greenland to the Commission on the Limits of the Continental Shelf The Northern Continental Shelf of Greenland," 2014, at https://www.un.org/depts/los/clcs_new/submissions_files/dnk76_14/dnk2014_es.pdf.

[249] UN, "Partial Submission of Canada to the Commission on the Limits of the Continental Shelf regarding its Continental Shelf in the Arctic Ocean," 2019, at https://www.un.org/depts/los/clcs_new/submissions_files/can1_84_2019/CDA_ARC_ES_EN_secured.pdf.

[250] Department of State, "Receipt of the Partial Submission Made by Canada to the Commission on the Limits of the Continental Shelf," at https://www.un.org/depts/los/clcs_new/submissions_files/can1_84_2019/2019_08_28_USA_NV_UN_001.pdf.

[251] UN, "Addendum to the Partial Submission of Canada to the Commission on the Limits of the Continental Shelf regarding its Continental Shelf in the Arctic Ocean," 2022, at https://www.un.org/depts/los/clcs_new/submissions_files/can1_84_2019/cda1eseng.pdf.

[252] Ibid, p. 10.

[253] The purpose of the U.S. Extended Continental Shelf (ECS) Project is to establish the full extent of the continental shelf of the United States, consistent with international law. The work to delineate the ECS is coordinated by the ECS Task Force, located at the National Oceanic and Atmospheric Administration's (NOAA's) National Centers for Environmental Information in Boulder, CO. The Department of State, U.S. Geological Survey (USGS), and NOAA conduct the majority of work on the project. NOAA has the lead in collecting bathymetric data. USGS has the lead in collecting seismic data. For more information, see the project's website at https://www.state.gov/u-s-extended-continental-shelf-project/.

[254] Ibid.

States and Canada delineate the extent of their own ECS, which may enable the countries to determine the amount of overlap in the seabed and ultimately establish a maritime boundary in the Arctic.[255]

Russia (then the Soviet Union) and the United States addressed potentially overlapping ECS areas in the Arctic by agreeing to a maritime boundary in 1990. To date, Russia has not asserted its ECS in any areas that might be considered part of the U.S. ECS.[256]

Exploration and commercial recovery of seabed minerals occurring in areas beyond national jurisdiction in the Arctic are not limited to Arctic countries. The International Seabed Authority (ISA), an organization established under the UNCLOS that regulates mineral-related activities taking place in areas beyond national jurisdiction, has the authority to issue seabed mining exploration and exploitation contracts to companies sponsored by countries party to the UNCLOS.[257] As of January 2023, the ISA had issued no contracts for seabed mining activities in the Arctic Ocean.[258] Seabed mining activities occurring within a country's OCS would be regulated by that country's domestic law.

Onshore Energy and Mineral Development

Alaska generally, including some areas within the Arctic region, is known to contain economically viable onshore deposits of oil, gas, and minerals. A warming Arctic means new opportunities and challenges for energy and mineral exploration and development onshore. Longer summers could extend exploration seasons for areas that are only accessible for ground surveys during the warmer months. Such impacts could be felt on existing and prospective energy developments, including potential future developments on the 1.6-million-acre Coastal Plain of the Arctic National Wildlife Refuge (ANWR),[259] and on existing mineral operations inside the Arctic, producing gold, silver, zinc, lead, and construction aggregates.[260]

Many factors affect the economic viability of an onshore energy or mineral development; one key factor is transportation costs. Onshore energy and mineral developments require transportation access to deliver machinery and supplies, and to transport the product to market. Generally, onshore developments in temperate climates can be accessed by roads; the rugged terrain and harsh climate in parts of the Arctic can result in sites being inaccessible by permanent roads. Some responses to these unusual transportation challenges include the use of sea transport and seasonal roads.

Current infrastructure in the Arctic that supports energy and mineral development includes the construction and use of ice roads, which are built and used when temperatures fall and remain below a threshold. As temperatures rise, the roads weaken, ultimately to a point at which they can no longer be used. Warmer Arctic temperatures are shortening the ice road transport season and

[255] Ibid.

[256] The Senate gave advice and consent to ratify the maritime boundary agreement in 1991. Although the Russian Duma has not approved the agreement, both countries continue to provisionally apply the boundary agreement. See U.S. Department of State's "Frequently Asked Questions" portion of the U.S. ECS Project website, https://www.state.gov/frequently-asked-questions-u-s-extended-continental-shelf-project/.

[257] UNCLOS Article 156. For more information on the International Seabed Authority, see CRS Report R47324, *Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress*, by Caitlin Keating-Bitonti.

[258] ISA, "Exploration Contracts," at https://www.isa.org.jm/exploration-contracts.

[259] CRS In Focus IF12006, *Arctic National Wildlife Refuge: Status of Oil and Gas Program*, by Laura B. Comay; and CRS Report RL33872, *Arctic National Wildlife Refuge (ANWR): An Overview*, by Laura B. Comay, Michael Ratner, and R. Eliot Crafton.

[260] U.S. Geological Survey, *Mineral Commodity Summaries 2022*, 2022, pp. 10-16, https://doi.org/10.3133/mcs2022.

creating transportation challenges, while changes in the technologies employed to build and manage ice roads are acting to extend the ice road season.[261]

In some parts of the Arctic, where ice, gravel, and paved roads are not feasible, less sea ice could allow ships to transport heavy equipment to remote locations, and to transport ore from mines to markets. Such potential improvements in access would be limited by the onshore development's proximity to a suitable sea harbor where a port could be established.

Another factor that could affect onshore energy and mineral developments is the thawing of the permafrost. Permafrost, which is ground, soil, rock, or other material that remains frozen from year to year, has historically served as a solid foundation base for infrastructure, including roads. Thawing permafrost creates many challenges, as roads, buildings, and other infrastructure can become unstable and collapse. These changes can result in higher costs to onshore energy and mineral developments, potentially leading existing developments to close, or rendering new projects unfeasible to pursue.

Oil Pollution and Pollution Response[262]

Oil Pollution Implications of Arctic Change

Climate change impacts in the Arctic, particularly the decline of sea ice and retreating glaciers, has led to increased human activities in the region, some of which have the potential to create oil pollution.[263] A primary concern is the threat of a large oil spill in the area. Although a major oil spill has not occurred in the Arctic, potential economic activity, such as tourism (cruise ships), oil and gas exploration, and cargo transportation, increases the risk of oil pollution (and other kinds of pollution) in the Arctic.[264] Significant spills in high northern latitudes (e.g., the 1989 *Exxon Valdez* spill on the southern coast of Alaska and spills in the North Sea) suggest that the "potential impacts of an Arctic spill are likely to be severe for Arctic species and ecosystems."[265]

Risk of Oil Pollution in the Arctic

A primary factor determining the risk of oil pollution in the Arctic is the level and type of human activity conducted in the region. Although changes to the Arctic climate are expected to increase access to natural resources and shipping lanes, the region will continue to present logistical challenges that may hinder human activity in the region. For example, unpredictable ice conditions may discourage trans-Arctic shipping. If trans-Arctic shipping were to occur frequently, it would likely represent a considerable portion of the overall oil pollution risk in the

[261] See National Oceanic and Atmospheric Administration, "Arctic Change," at https://www.pmel.noaa.gov/arctic-zone/detect/land-road.shtml.

[262] This section was prepared by Jonathan L. Ramseur, Specialist in Environmental Policy, Resources, Science, and Industry Division.

[263] For further discussion of issues relating to oil spills in general, see CRS Report RL33705, *Oil Spills: Background and Governance*.

[264] Arctic Council, Emergency Prevention, Preparedness and Response Working Group, *Guide to Oil Spill Response in Snow and Ice Conditions*, 2015, at https://oaarchive.arctic-council.org/handle/11374/403; see also Brian Dunn, "Report on 12th Arctic Shipping Summit, Montreal, February 21-22," *Canadian Sailings*, March 12, 2018, pp. 34-36.

[265] Arctic Monitoring and Assessment Programme (AMAP), Arctic Oil and Gas 2007, 2008.

region. In recent decades, many of the world's largest oil spills have been from oil tankers, which can carry millions of gallons of oil.[266]

Offshore oil exploration and extraction activities in the Arctic may present a risk of oil pollution. Interest in these activities in the region has fluctuated in recent years. Historically, oil well blowouts from offshore oil operations have been a source of major oil spills, eclipsing the largest tanker spills. The largest unintentional oil spill in recent history was from the 2010 *Deepwater Horizon* incident in the Gulf of Mexico.[267] During that incident, the uncontrolled well released (over an 87-day period) approximately 200 million gallons of crude oil.[268] The second-largest unintentional oil spill in recent history—the *IXTOC I*, estimated at 140 million gallons—was due to an oil well blowout in Mexican Gulf Coast waters in 1979.[269]

Until the 2010 *Deepwater Horizon* incident, the spill record for offshore platforms in U.S. federal waters had shown improvement from prior years.[270] A 2003 National Research Council (NRC) study of oil and gas activities on Alaska's North Slope stated "blowouts that result in large spills are unlikely."[271] Similar conclusions were made in federal agency documents regarding deepwater drilling in the Gulf of Mexico before the 2010 *Deepwater Horizon* event.[272] Some would likely contend that the underlying analyses behind these conclusions should be adjusted to account for the 2010 Gulf oil spill. However, others may argue that any activities in U.S. Arctic waters present less risk of an oil well blowout than was encountered by the *Deepwater Horizon* drill rig, because the proposed U.S. Arctic operations would be in shallower waters (150 feet) than the deepwater well (approximately 5,000 feet) that was involved in the 2010 Gulf oil spill. In addition, some have pointed out that the pressures in the Chukchi Sea would be two to three times less than they were in the well involved in the 2010 Gulf oil spill.[273] Regardless of these differences, even under the most stringent control systems, oil exploration and extraction activities would present some level of oil spill risk in the region, as some accidents are likely to occur from equipment failure or human error. In addition, as discussed below, an oil spill in the Arctic would present unique response and cleanup challenges.

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[266] For example, the *Exxon Valdez* spilled approximately 11 million gallons of oil, but its carrying capacity was approximately 60 million gallons.

[267] Larger oil spills occurred during the 1991 Iraq War, but many of those spills were deliberate. A 1910-1911 onshore oil blowout in the California San Joaquin Valley is reported to have spilled 9.4 million barrels of crude oil (almost 400 million gallons).

[268] An estimated 17% of this oil did not enter the Gulf environment but was directly recovered from the wellhead by the responsible party (British Petroleum, BP). See the Federal Interagency Solutions Group, Oil Budget Calculator Science and Engineering Team, *Oil Budget Calculator: Deepwater Horizon-Technical Documentation*, November 2010; and CRS Report R42942, *Deepwater Horizon Oil Spill: Recent Activities and Ongoing Developments*.

[269] National Research Council (NRC) of the National Academies of Science, *Oil in the Sea III: Inputs, Fates, and Effects*, 2003.

[270] See CRS Report RL33705, *Oil Spills: Background and Governance*; and Dagmar Etkin (Environmental Research Consulting), Analysis of U.S. Oil Spillage, Prepared for American Petroleum Institute, August 2009.

[271] National Research Council of the National Academies of Science, *Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope*, 2003.

[272] See, for example, Minerals Management Service (MMS), Outer Continental Shelf Oil & Gas Leasing Program: 2007-2012, Final Environmental Impact Statement, 2007, chapter 4; MMS, Proposed Gulf of Mexico OCS Oil and Gas Lease Sale 206, Central Planning Area, Environmental Assessment, 2007.

[273] Letter from Marvin E. Odum, President, Shell Oil Company to S. Elizabeth Birnbaum, Minerals Management Service (May 14, 2010). Cited in a staff paper from the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling ("The Challenges of Oil Spill Response in the Arctic," 2011).

Potential Impacts

No oil spill is entirely benign. Even a relatively minor spill, depending on the timing and location, can cause significant harm to individual organisms and entire populations. Regarding aquatic spills, marine mammals, birds, bottom-dwelling and intertidal species, and organisms in early developmental stages—eggs or larvae—are especially vulnerable. However, the effects of oil spills can vary greatly. Oil spills can cause impacts over a range of time scales, from only a few days to several years, or even decades in some cases.

Conditions in the Arctic may have implications for oil spill impacts that are less understood than in the more temperate regions.[274] According to a 2016 study, "oil spill science in ice-covered waters is at an ad hoc level."[275] For example, information on the long-term effects of oil and its environmental persistence within the Arctic is limited.[276] In addition, the historical data for the region do not provide reliable baselines to assess current environmental or ecosystem states,[277] presenting challenges to those tasked with measuring impacts.

Response and Cleanup Challenges in the Arctic

Conditions in the Arctic impose unique challenges for personnel charged with (1) oil spill response, which is the process of getting people and equipment to the incident, and (2) cleanup duties, either recovering the spilled oil or mitigating the contamination so that it poses less harm to the ecosystem. These challenges may play a role in policy development for economic activities in the Arctic.

Spill Response Challenges

Response time is a critical factor for oil spill recovery. With each hour, spilled oil becomes more difficult to track, contain, and recover, particularly in icy conditions, where oil can migrate under or mix with surrounding ice.[278] Most response techniques call for quick action, which may pose logistical challenges in areas without prior staging equipment or trained response professionals. Many stakeholders are concerned about a "response gap" for oil spills in the Arctic.[279] A response gap is a period of time in which oil spill response activities would be unsafe or infeasible. A 2016 study (prepared for the Bureau of Safety and Environmental Enforcement) estimated response gaps for two locations in the U.S. Beaufort and Chukchi Seas during the summer and winter seasons, and for the year overall.[280] The study found that during the summer months (July-October), open water oil recovery would not be "favorable" approximately 33% of the time.[281] By comparison, that estimate increases to 75% and 95% for the year overall and for the winter

[274] National Research Council (NRC) of the National Academies of Science, *Responding to Oil Spills in the U.S. Arctic Marine Environment*, 2014 (hereinafter, NRC Report, 2014).

[275] Mawuli Afenyo, "A State-of-the-Art Review of Fate and Transport of Oil Spills in Open and Ice-Covered Water," *Ocean Engineering*, 2016.

[276] NRC Report, 2014.

[277] Ibid.

[278] World Wildlife Fund, *Oil Spill: Response Challenges in Arctic Waters* (2007).

[279] Coastal Response Research Center, *Opening the Arctic Seas: Envisioning Disasters and Framing Solutions* (2009), partnership between the National Oceanic and Atmospheric Administration and the University of New Hampshire.

[280] Nuka Research and Planning Group, *Estimating an Oil Spill Response Gap for the U.S. Arctic Ocean*, 2016; study funded by the Department of the Interior's Bureau of Safety and Environmental Enforcement.

[281] A 2017 study stated that most of the marine activities in the Arctic region occur during the summer months. See Jeremy Wilkinson, et al., "Oil Spill Response Capabilities and Technologies for Ice-Covered Arctic Marine Waters: A Review of Recent Developments and Established Practices," *Ambio*, 2017.

months (November-June), respectively. The response gap for the northern Arctic latitudes is likely to be extremely high compared to other regions.[282]

In the event of an oil spill, the Coast Guard has response authority in the coastal zone.[283] A Coast Guard official would serve as the On-Scene Coordinator with the authority to perform cleanup immediately using federal resources, monitor the response efforts of the spiller, or direct the spiller's cleanup activities. According to a 2014 National Research Council (NRC) report, "the lack of infrastructure in the Arctic would be a significant liability in the event of a large oil spill."[284] The logistics in the Arctic were described as a "tyranny of distance" by the Vice Commandant of the Coast Guard.[285]

The Coast Guard has no designated air stations north of Kodiak, AK, which is almost 1,000 miles from the northernmost point of land along the Alaskan coast in Point Barrow, AK.[286] Although some of the communities have airstrips capable of landing cargo planes, no roads connect these Arctic communities to the main highway systems or large communities in Alaska.[287] Vessel infrastructure is also limited. The nearest major port is in the Aleutian Islands, approximately 1,300 miles from Point Barrow.

A 2010 Government Accountability Office (GAO) report identified further logistical obstacles that would hinder an oil spill response in the region, including "inadequate" ocean and weather information for the Arctic and technological problems with communications.[288] A 2014 GAO report highlighted steps taken by some groups (e.g., the National Oceanic and Atmospheric Administration) to improve some of these logistical elements.[289] The U.S. Coast Guard includes an initiative to "strengthen marine environmental response in the Arctic" as part of its Arctic Strategy Implementation Plan.[290] A 2016 GAO Report provided an initial assessment of these efforts.[291] In 2019, the Coast Guard issued its Arctic Strategic Outlook, which stated one of its objectives was to "enhance capability to operate effectively in a dynamic Arctic."[292]

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[282] A 2007 estimate of Prince William Sound (PWS) also may be instructive. A 2007 study found a response gap for PWS of 38% for the time of the study period (65% during the winter season). Note that PWS has existing infrastructure for response, while the more remote Arctic areas do not. Nuka Research and Planning Group, LLC, *Response Gap Estimate for Two Operating Areas in Prince William Sound, Alaska* (2007), Report to Prince William Sound Regional Citizens' Advisory Council.

[283] For more details, see CRS Report RL33705, *Oil Spills: Background and Governance*.

[284] NRC Report, 2014.

[285] Admiral Ray Charles, Vice Commandant of the Coast Guard, Testimony before the Senate Committee on Commerce, Science, and Transportation, December 12, 2019, https://www.commerce.senate.gov/2019/12/expanding-opportunities-challenges-and-threats-in-the-arctic-a-focus-on-the-u-s-coast-guard-arctic-strategic-outlook.

[286] G.M. Sulmasy and A.P. Wood, U.S. Coast Guard Academy, "U.S. Coast Guard Activity in the Arctic Region," Law of the Sea Institute, Occasional Paper #6, 2014; and U.S. Coast Guard, *Report to Congress: U.S. Coast Guard Polar Operations*, 2008.

[287] NRC Report, 2014.

[288] Government Accountability Office, *Coast Guard: Efforts to Identify Arctic Requirements Are Ongoing, but More Communication about Agency Planning Efforts Would Be Beneficial*, GAO-10-870, 2010.

[289] Government Accountability Office, *Key Issues Related to Commercial Activity in the U.S. Arctic over the Next Decade*, GAO-14-299, 2014.

[290] U.S. Coast Guard, *Arctic Strategy Implementation Plan*, 2015, https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5pw/Arctic%20Policy/CGAS%20IPlan%20Final%20Signed.pdf?ver=2017-08-25-075935-927.

[291] Government Accountability Office, *Arctic Strategy Is Underway, but Agency Could Better Assess How Its Actions Mitigate Known Arctic Capability Gaps*, GAO-16-453, 2016.

[292] U.S. Coast Guard, Arctic Strategic Outlook, 2019, https://www.uscg.mil/Portals/0/Images/arctic/Arctic_Strategic_Outlook_APR_2019.pdf.

In addition, the Department of the Interior's BOEM and BSEE issued a final rule in 2016 requiring certain safety measures for drilling operations in the Arctic, but, as discussed above, the status of that rulemaking is uncertain.[293]

The costs of an oil spill response would likely be significantly higher than a similar incident in lower latitude locations of comparable remoteness. This could place a relatively larger burden on the oil spill liability and compensation framework.[294] Pursuant to the Oil Pollution Act (OPA),[295] parties responsible for an oil spill may be liable for cleanup costs, natural resource damages, and specific economic damages.[296] OPA provided both limited defenses from liability and conditional liability limits for cleanup costs and other eligible damages.[297] The Oil Spill Liability Trust Fund (OSLTF) provides an immediate source of funds for federal responses to oil spills and compensation for certain damages.[298] The OSLTF can be used if a responsible party's liability limit is reached, but the fund can only provide $1 billion per incident.[299]

Oil Spill Cleanup Challenges

The history of oil spill response in the Aleutian Islands highlights the challenges and concerns for potential spills in the Arctic:

> The past 20 years of data on response to spills in the Aleutians has also shown that almost no oil has been recovered during events where attempts have been made by the responsible parties or government agencies, and that in many cases, weather and other conditions have prevented any response at all.[300]

The behavior of oil spills in cold and icy waters is not as well understood as oil spills in more temperate climates.[301] In addition, in the summer months, the sea ice zone is a particularly challenging environment because the concentration of ice floes within a region is continuously changing.[302] The 2014 NRC report highlights some recent advancements in understanding oil spill behavior in the Arctic climate. At the same time, the report recommends further study on a range of related issues.

The 2014 NRC report states that in colder water temperatures or sea ice, "the processes that control oil weathering—such as spreading, evaporation, photo-oxidation, emulsification, and natural dispersion—are slowed down or eliminated for extended periods of time."[303] In some respects, the slower weathering processes may provide more time for response strategies, such as in situ burning or skimming. On the other hand, the longer the oil remains in an ecosystem, the more opportunity there is for exposure to humans and other species in the ecosystem.

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[293] See the section above titled "Offshore Oil and Gas Exploration."

[294] For more information on this framework, see CRS Report RL33705, *Oil Spills: Background and Governance*.

[295] P.L. 101-380, primarily codified at 33 U.S.C. §2701 et seq.

[296] 33 U.S.C. §2702.

[297] 33 U.S.C. §2703 and §2704.

[298] 33 U.S.C. §2712.

[299] 26 U.S.C. §9509.

[300] Transportation Research Board of the National Academy of Sciences, *Risk of Vessel Accidents and Spills in the Aleutian Islands: Designing a Comprehensive Risk Assessment* (2008), Special Report 293, National Academies Press. Washington, DC.

[301] NRC Report, 2014.

[302] Jeremy Wilkinson, et al., "Oil Spill Response Capabilities and Technologies for Ice-Covered Arctic Marine Waters: A Review of Recent Developments and Established Practices," *Ambio*, 2017.

[303] NRC Report, 2014.

In addition, the 2014 report states the following:

> Arctic conditions impose many challenges for oil spill response—low temperatures and extended periods of darkness in the winter, oil that is encapsulated under ice or trapped in ridges and leads, oil spreading due to sea ice drift and surface currents, reduced effectiveness of conventional containment and recovery systems in measurable ice concentrations, and issues of life and safety of responders.

Oil Spill Policy–Regional Framework

The existing framework for international governance of maritime operations in the Arctic combines broader maritime agreements and agreements that focus on the geographic region. In terms of broader frameworks, the Safety of Life at Sea Convention (SOLAS) and other International Maritime Organization (IMO) conventions include provisions regarding ships in icy waters, but the provisions are not specific to the polar regions.

The IMO's International Code for Ships Operating in Polar Waters (Polar Code) entered into force in 2017 and is mandatory under SOLAS and the International Convention for the Prevention of Pollution from Ships (known as MARPOL).[304] The Polar Code addresses a range of issues, including environmental protection.

In 2013, the member states of the Arctic Council signed an Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic.[305] The agreement's objective is to "strengthen cooperation, coordination, and mutual assistance ... on oil pollution preparedness and response in the Arctic." The agreement entered force in 2016.[306] A 2018 Coast Guard document describes the agreement as "binding."[307] The agreement includes multiple requirements for the parties, including oil spill notification, a process for requesting assistance and seeking reimbursement for costs, and joint preparation activities. Pursuant to the agreement the Arctic nations have conducted several joint training exercises.[308]

In addition, the United States has separate bilateral agreements with Canada and Russia that address oil spill response operations. The agreement with Canada was established in 1974 for the Great Lakes and has been amended several times to add more geographic areas, including Arctic waters.[309] According to the 2014 NRC report: "formal contingency planning and exercises with Canada have enabled both the United States and Canada to refine procedures and legal requirements for cross-border movement of technical experts and equipment in the event of an emergency."

The U.S.-Russian agreement was made in 1989 and applies to oil spill-related activities in Arctic waters. The 2014 NRC report asserted that the agreement has not been tested to the same extent

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[304] See the above section titled "Regulation of Arctic Shipping."

[305] Available at http://www.arctic-council.org. The agreement is sometimes described as the Agreement on Cooperation on Marine Oil Spill Preparedness and Response in the Arctic (MOSPA).

[306] Arctic Council, *Status of ratification of Agreements negotiated under the auspices of the Arctic Council*, 2016.

[307] U.S. Coast Guard, Marine Environmental Response and Preparedness Manual, 2018, https://media.defense.gov/2018/Oct/01/2002046527/-1/-1/0/CIM_16000_14A.PDF.

[308] See Arctic Council, Emergency Prevention Preparedness and Response Working Group, Planning Guidance for MOSPA Exercises, 2019; see also Michael LeVine et al., "Oil Spill Response in the North American Arctic," in *Managing the Risks of Offshore Oil and Gas Accidents: The International Legal Dimension*, edited by Gunther Handl and Kristoffer Svendsen, 2019.

[309] For more information, see U.S. Department of the Interior, Bureau of Ocean Energy Management, *Oil Spill Preparedness, Prevention, and Response on the Alaska OCS*, 2019.

as the U.S.-Canada agreement. In 2018, officials from both nations reportedly held a tabletop exercise for an oil spill scenario in the Bering Strait.[310]

Fisheries[311]

The effects of climate change such as increasing sea surface temperatures and decreasing permanent sea ice are altering the composition of marine ecosystems in the Arctic. Climate change is likely to affect the ranges and productivity of living marine resources including species that support marine fisheries. In addition, ocean acidification is occurring as the increasing concentration of carbon dioxide (CO_2) in the atmosphere leads to greater absorption of CO_2 by the global ocean. The increase in CO_2 absorption changes ocean chemistry and makes ocean waters more acidic (decreases the pH). The Arctic Ocean is acidifying faster than most other regions of the global ocean and is likely to affect marine organisms (e.g., Arctic cod) and ecosystems in the Arctic region.[312]

As a greater portion of the waters in the central Arctic Ocean become open for longer periods, the region's resources will become more accessible to commercial fishing. Large commercial fisheries already exist in the Arctic, including in the Barents and Norwegian Seas north of Europe, the Central North Atlantic off Greenland and Iceland, the Bering Sea off Russia and the United States (Alaska), and the Newfoundland and Labrador Seas off northeastern Canada.[313] Unprecedented amounts of foreign fishing vessel trash washed ashore across the Bering Strait region in 2020, demonstrating increased foreign interest in exploiting Arctic marine fisheries (e.g., Pacific cod, pollock).[314]

As climate changes and ocean acidification increases, fishery managers will be challenged to adjust management measures for existing fisheries. Uncertainties related to these changes and potential new fisheries in the central Arctic Ocean have prompted many fishery managers to support precautionary approaches to fisheries management in the region. Currently, there is no commercial fishing in central Arctic Ocean and it is questionable whether existing fisheries resources could sustain a fishery.

For waters under U.S. jurisdiction, in 2009, the National Marine Fisheries Service in the Department of Commerce's National Oceanic and Atmospheric Administration implemented the North Pacific Fishery Management Council's (NPFMC) Fishery Management Plan for Fish Resources of the Arctic Management Area (Arctic plan).[315] The management area includes marine waters in the U.S. Exclusive Economic Zone (EEZ) of the Chukchi and Beaufort Seas.[316] The Arctic plan addresses concerns that unregulated or inadequately regulated commercial fisheries in the U.S. EEZ off Alaska could harm marine resources such as commercial fish populations, fish habitat, and other marine populations. The Arctic plan prohibits commercial fishing in the Arctic

[310] World Wildlife Federation, "Russia and the United States Hold Joint Exercises to Respond to Oil Spills in the Bering Strait," November 2018, https://wwf.ru/en/resources/news/bioraznoobrazie/rossiya-i-ssha-proveli-sovmestnye-ucheniya-po-reagirovaniyu-na-razlivy-nefti-v-beringovom-prolive/.

[311] This section was prepared by Caitlin Keating-Bitonti, Analyst in Natural Resources Policy.

[312] Twila A. Moon et al., *Arctic Report Card 2021*, National Oceanic and Atmospheric Association, December 2021.

[313] Erik J. Molenaar and Robert Corell, *Arctic Fisheries*, Arctic Transform, February 9, 2009; available at http://arctic-transform.org/download/FishBP.pdf.

[314] Twila A. Moon et al., *Arctic Report Card 2021*, National Oceanic and Atmospheric Association, December 2021.

[315] 74 *Federal Register* 56734-56746, November 3, 2009.

[316] The state of Alaska has jurisdiction over waters from 0-3 nautical miles from the baseline. The baseline generally follows the shoreline. NOAA, "Fish Resources of the Arctic Management Plan," at https://www.fisheries.noaa.gov/management-plan/fish-resources-arctic-management-plan.

Management Area and moves the northern boundary of the Bering Sea/Aleutian Islands king and tanner crab fishery management plan out of the Arctic Management Area south to the Bering Strait.[317] The plan takes a precautionary approach by requiring the consideration of research needs that may improve scientific understanding of fish stocks and environmental conditions before developing commercial fisheries in the region.[318] The NPFMC developed a discussion paper that examines exploratory fishing undertaken by regional fishery management organizations and potential application of these efforts to the Arctic Ocean.[319]

The United States also has been active in promoting international approaches to management of stocks in the Arctic Ocean. International cooperation is necessary to manage Arctic resources because fish stocks are shared to some degree among the five Arctic coastal states.[320] Further, a large portion of the central Arctic Ocean is a high seas area roughly the size of the Mediterranean Sea (2.8 million square kilometers) that lies outside the EEZs of these nations. Ideally, regional management would recognize the need to coordinate management for fish populations that move among these national jurisdictional zones and the high seas.

On June 1, 2008, Congress passed a joint resolution (P.L. 110-243) that directed "the United States to initiate international discussions and take necessary steps with other nations to negotiate an agreement for managing migratory and transboundary fish stocks in the Arctic Ocean." The joint resolution also supported establishment of "a new international fisheries management organization or organizations for the region." On July 16, 2015, the five Arctic coastal states signed a nonbinding declaration to prevent unregulated commercial fishing in the high seas portion of the central Arctic Ocean.[321] These five nations agreed that a precautionary approach to fishing is needed because there is limited scientific knowledge of marine resources in the central Arctic Ocean.

The declaration was followed by negotiations among officials from the five Arctic coastal states, four major fishing nations,[322] and the European Union.[323] On October 3, 2018, the parties signed a legally binding international accord to prevent unregulated high seas fisheries in the central Arctic Ocean. The objective of the accord, as stated in its preamble, is

> to prevent unregulated fishing in the high seas portion of the central Arctic Ocean through the application of precautionary conservation and management measures as part of a long-term strategy to safeguard healthy marine ecosystems and to ensure the conservation and sustainable use of fish stocks.[324]

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[317] NOAA, "Implementation of the Fishery Management Plan for Fish Resources of the Arctic Management Area (Arctic FMP)," at https://www.fisheries.noaa.gov/action/implementation-fishery-management-plan-fish-resources-arctic-management-area-arctic-fmp.

[318] North Pacific Fishery Management Council, "Fishery Management Plan for Fish Resources of the Arctic Management Area," August 2009, p. 41, at https://www.npfmc.org/wp-content/PDFdocuments/fmp/Arctic/ArcticFMP.pdf.

[319] Steve MacLean, *Exploratory Fishing in Global Regional Fishery Management Organizations*, North Pacific Fishery Management Council, Anchorage, AK, February 2018.

[320] As noted in the "Background" section, the five Arctic coastal states include the United States, Canada, Denmark (by virtue of Greenland), Norway, and the Russian Federation.

[321] See https://www.regjeringen.no/globalassets/departementene/ud/vedlegg/folkerett/declaration-on-arctic-fisheries-16-july-2015.pdf.

[322] The four major fishing nations include Iceland, Japan, South Korea, and the People's Republic of China.

[323] The agreement includes Arctic indigenous peoples as participants in meetings and as a source of scientific information and local knowledge.

[324] Fisheries and Oceans Canada, *Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean*, October 3, 2018, https://www.dfo-mpo.gc.ca/international/agreement-accord-eng.htm.

The parties agreed that no commercial fisheries will be conducted in the Arctic high seas before an international management regime is put in place to regulate commercial fishing. The ban on unregulated commercial fishing will remain in force for 16 years and for successive 5-year increments unless any party presents a formal objection to extension of the agreement.[325] The agreement also established a joint scientific program to conduct research and monitor the region's marine ecosystem, requiring the parties to meet every two years to share relevant scientific information.[326] The agreement is seen as the first step toward establishing one or more regional fisheries management organizations for the Arctic Ocean. On June 25, 2021, the agreement entered into force with the ratification of all ten signatories.[327] However, it remains an open question whether an Arctic Ocean regional fishery management organization will be established, which countries would be included in such an arrangement, and if sustainable commercial fisheries can be developed in the central Arctic Ocean.

Protected Species[328]

There are several federal trust species in the Arctic protected by U.S. statutes such as the Endangered Species Act (ESA; 16 U.S.C. §§1531-1543), Marine Mammal Protection Act (MMPA; 16 U.S.C. §§ 1361-1407), and the Migratory Bird Treaty Act (MBTA; 16 U.S.C. §703-712).[329] Species included under these statutes are protected to varying degrees from factors that affect their populations. Some examples of species listed under one or more of these statutes include the polar bear (*Ursus maritimus*), the bowhead whale (*Balaena mysticetus*), and the Eskimo curlew (*Numenius borealis*).[330]

Ecological changes due to climate change and human activities could affect some protected species in the Arctic. For example, the polar bear was listed as threatened under the ESA in 2008 and is protected under MMPA due to its classification as a marine mammal.[331] Declining sea ice levels in the Arctic threaten polar bear populations. Polar bears use sea ice as a platform to hunt for seals and other prey, travel to maternal denning areas, and seek mates, among other things.[332] In contrast, changing ecological conditions in the Arctic could be helping the bowhead whale. The bowhead whale is listed under the ESA and covered by the MMPA. Bowhead whale populations declined due to hunting and commercial whaling until these activities ceased in the 1920s. According to scientists, in the past 30 years populations of bowhead whales have increased in the Pacific Arctic and East Canada/West Greenland region due to increases in ocean primary production and the availability of zooplankton, which is a food source for the species.[333]

[325] Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean, Article 13.

[326] Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean, Article 4.

[327] Department of State, "The Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean Enters into Force," press release, June 25, 2021.

[328] This section was prepared by Pervaze A. Sheikh, Specialist in Natural Resources Policy.

[329] For more information on the Endangered Species Act, see CRS Report R46677, *The Endangered Species Act: Overview and Implementation*, by Pervaze A. Sheikh, Erin H. Ward, and R. Eliot Crafton.

[330] Covered species pursuant to the ESA, MBTA, and MMPA are listed in the Code for Federal regulations at 50 C.F.R. §§17.11-17.12 (Endangered and Threatened Wildlife and Plants), 50 C.F.R. §10.13 (List of Migratory Birds), and 50 C.F.R. 18.3 and 216.3 (definitions).

[331] There are 19 populations of polar bears inhabiting the Arctic.

[332] U.S. Fish and Wildlife Service, *Polar Bears*, https://www.fws.gov/alaska/pages/marine-mammals/polar-bear.

[333] Richard L. Thoman et al., *Arctic Report Card 2020*, National Oceanic and Atmospheric Association, December 2020.

Certain activities in the Arctic have the potential to affect, directly or indirectly, species, including federal trust species, and habitat in the areas in which they are undertaken. In turn, the laws that designate or provide the authority to list and protect federal trust species and their implementing regulations may, with certain exceptions, restrict certain activities, require action agencies to seek permits, or mandate efforts to protect such species. ESA, MMPA, and MBTA, for example, prohibit *take*, including in some cases nonlethal harassment, of covered species.[334] For example, as described in the cases below, federal agencies that authorize, fund, or carry out activities that may affect federally listed endangered or threatened species or modify critical habitat designated under the ESA may be required to consult with FWS or NMFS pursuant to Section 7 of the ESA, and individuals undertaking actions that may harm or harass marine mammals may be required to obtain an incidental take authorization from either FWS or NMFS. For marine mammals that are listed as threatened or endangered under the ESA, action agencies may be required to obtain both an incidental take authorization pursuant to the MMPA, as well as undertake consultation pursuant to the ESA.

Section 9 of the ESA identifies prohibited acts related to species listed as endangered under the act, and Section 4(d) authorizes the listing agency, either FWS or NMFS, to establish protections, including prohibiting take, for species listed as threatened through the issuance of a special rule known as a 4(d) rule.[335] Further, Section 7 of the act requires federal agencies that carry out, fund, or authorize actions that may affect listed species or designated critical habitat to consult with FWS or NMFS.[336] This consultation may result in in the issuance of a biological opinion, which provides recommendations and requirements to minimize or avoid negative impacts to listed species and critical habitat and may authorize the incidental take—take that is otherwise prohibited and incidental to but not the purpose of an otherwise lawful the action—of listed species.[337] Activities that may require Section 7 consultation could include, but are not limited to, actions related to construction, fisheries, oil and gas, research, and military. For example, the Bureau of Land Management may need to consult with FWS before authorizing oil and gas activities that may affect the polar bear (*Ursus maritimus*) or may be required to consult with FWS.[338] Similarly the Navy may need to consult with NMFS before undertaking military activity

[334] *Take* is defined in statute for ESA and MMPA and defined or clarified in regulations for MMPA and MBTA. With regard to the ESA, *take* "means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. §1532(19)). Pursuant to MMPA, take is defined "take" means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. §1362(13)) and is further clarified in regulations to include "the collection of dead animals or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; or the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in the disturbing or molesting of a marine mammal" (50 C.F.R. §18.3). For the MBTA, *take* is not defined in statute but is defined in regulation to mean "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 C.F.R. §10.12). Pursuant to regulations, both ESA and MMPA allow for certain subsistence use and take by Alaska Natives (50 C.F.R. parts 17 and 18).

[335] Section 9 of the ESA is at 16 U.S.C. 1538, and Section 4(d) is at 16 U.S.C. 1533(d). In the 1970s, FWS promulgated rules, collectively known as the blanket 4(d) rule that extended most of the protections afforded to endangered species to threatened species, unless they were superseded by a species-specific 4(d) rule. The blanket 4(d) rule was modified in 2019, and automatic protections were no longer provided for species listed by FWS after September 26, 2019. NMFS never implemented a similar blanket 4(d) rule, and NMFS issues 4(d) rules on a case by case basis. For more information, see CRS Report R46677, *The Endangered Species Act: Overview and Implementation*, by Pervaze A. Sheikh, Erin H. Ward, and R. Eliot Crafton.

[336] Section 7 of the ESA is at 16 U.S.C. 1536. For more information on Section 7 of the ESA, see CRS Report R46867, *Endangered Species Act (ESA) Section 7 Consultation and Infrastructure Projects*, by Erin H. Ward, R. Eliot Crafton, and Pervaze A. Sheikh.

[337] Incidental taking is defined at 50 C.F.R. 17.3 as it related to the ESA.

[338] For example, see FWS, Fairbanks Fish and Wildlife Office, Biological Opinion for Coastal Plain Oil and Gas (continued...)

that may affect the arctic ringed seal (*Phoca hispida hispida*).[339] In addition, because each of the aforementioned activities may impact marine mammals, both would also be subject to MMPA and may require an incidental harassment authorization under such act.[340]

CRS Reports on Specific Arctic-Related Issues

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CRS Insight IN11161, *Greenland, Denmark, and U.S. Relations*, by Kristin Archick

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CRS In Focus IF12006, *Arctic National Wildlife Refuge: Status of Oil and Gas Program*, by Laura B. Comay

CRS Report R45192, *Oil and Gas Activities Within the National Wildlife Refuge System*, by R. Eliot Crafton, Laura B. Comay, and Marc Humphries

CRS Report RL33705, *Oil Spills: Background and Governance*, by Jonathan L. Ramseur

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Leasing Program Arctic National Wildlife Refuge, Consultation with the Bureau of Land Management, March 13, 2020, at https://ecos.fws.gov/tails/pub/document/16469143.

[339] For example, see NMFS, Alaska Office, Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion Ice Exercise 2020 NMFS Consultation Number: AKRO-2019-02445, at https://repository.library.noaa.gov/view/noaa/24263.

[340] For example, see NMFS, Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to U.S. Navy 2020 Ice Exercise Activities in the Beaufort Sea and Arctic Ocean, 85 *Federal Register* 6518, 2/05/2020.

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