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Subcommittee on Security of the Committee on Commerce, Science, and Transportation

“Expanding Opportunities, Challenges, and Threats in the Arctic: A Focus on the US Coast Guard Arctic Strategic Outlook”

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Chairman Sullivan, Ranking Member Markey, and distinguished Members of the Subcommittee:

Thank you for the opportunity to testify before you today. My name is Sherri Goodman. I am a Senior Fellow at the Polar Institute and the Environmental Change & Security Program of the Woodrow Wilson International Center and a Senior Strategist at the Center for Climate & Security. I have over 30 years of experience as a security professional. I served as the first Deputy Undersecretary of Defense (Environmental Security). I am also the Founder and former Executive Director of the CNA Military Advisory Board, comprised of senior retired generals and admirals – including Coast Guard – that since 2007 have continuously assessed the security implications of climate change, which we characterize as a “threat multiplier.”

As we convene in Washington at the end of 2019, with a global climate summit currently taking place in Madrid, what is happening in the Arctic is the clearest evidence of how rising temperatures, melting sea ice, and collapsing permafrost are reshaping the security landscape in which the US Coast Guard, and our military forces, now operate. The opening of a new ocean is occurring within our lifetimes, and most dramatically within the last 2 decades. The Arctic Ocean is now an increasingly accessible, navigable, maritime border for the US. The Arctic region is warming at 2-3 times the global average, according to the latest Intergovernmental Panel on Climate Change (IPCC) report. And what happens in the Arctic doesn't stay in the Arctic. Greenland's ice storage keeps our coastal cities, like Miami and Houston, above water. Changing weather patterns in the lower 48 states, from the polar vortex creating extreme weather events to disruptive storms that wreak havoc in prime agricultural regions, have all Americans feeling the effects of Arctic climate change.

My Bottom Line Up Front (BLUF) today is:

- 1. Climate change is a threat multiplier, reshaping the strategic operating environment for the Coast Guard in the Arctic, and around the world.**
- 2. In the Arctic, a changing climate is emboldening our competitors and adversaries (Russia and China), creating new risks and complicating navigating conditions for the Coast Guard and our military.**

3. We have a "Responsibility to Prepare"¹ for changing Arctic conditions, and the Coast Guard needs to enhance its operating capabilities in the Arctic, from additional ice breaking, to improved domain awareness (mapping and charting), communications and research capabilities.
4. Leadership on Arctic security is essential to America's overall security and strategic interests, and must be a whole of US government and partnership effort including allies, communities, private sector, and others, that serves to undergird the rules-based order and support Arctic resilience.

#1: Climate change is a threat multiplier, reshaping the strategic operating environment for the Coast Guard in the Arctic, and around the world.

The recent IPCC Special Report on Oceans and Cryosphere in a Changing Climate found that climate change is evident in the furthest reaches of the globe from the highest mountain peaks to the deepest oceans.² Greenland is now melting from the top down. Here are the key findings that shape the strategic operating environment for the Coast Guard and others operating in the Arctic region:

- **"Arctic sea ice extent in September (when sea ice extent is at its minimum) has declined about 13 percent per decade** (during the satellite era from 1979 to 2018), changes likely unprecedented in at least 1,000 years. The Arctic's older, thicker sea ice, which acts as a bastion against melting of other sea ice, has almost completely disappeared. Only about 10 percent of sea ice is at least five years old.
- **Ice sheets and glaciers are losing ice around the world.** Between 2006 and 2015, Greenland's Ice Sheet lost 278 gigatons (Gt) of mass per year. Antarctica's Ice Sheet lost 155 Gt per year, and glaciers around the world (beyond Greenland and Antarctica) lost 220 Gt a year. Combined, the ice loss between Greenland, Antarctica and other glaciers not part of ice sheets was 653 Gt per year. For context, a single gigaton of water would fill about 400,000 Olympic pools.³
- **The Arctic has warmed more than double the global average in the last two decades.** During the winters of 2016 and 2018, surface temperatures in the central Arctic were 6 degrees C (10.8 degrees F) above the 1981-2010 average.

¹ Werrell, Caitlin and Francesco Femia. "The Responsibility to Prepare and Prevent." The Center for Climate and Security. October 2019. <https://climateandsecurity.org/2019/01/31/interview-with-sherri-goodman-a-responsibility-to-prepare/>

² Maddox, Marisol. "Two Divergent Paths for Our Planet Revealed in New IPCC Report on Oceans and Cryosphere." New Security Beat. November 18, 2019. <https://www.newsecuritybeat.org/2019/11/divergent-paths-planet-revealed-ipcc-report-oceans-cryosphere/>

³ Walbolt, Kristen. "10 things: All about ice." NASA's Jet Propulsion Lab. March 28, 2018. <https://sealevel.nasa.gov/news/114/10-things-all-about-ice>

- **From 2007 to 2016, permafrost temperatures increased by about 0.3 degrees C (0.5 degrees F), a record level of warming for permafrost.** Warming of permafrost can be a ticking time bomb. Arctic and boreal permafrost contains 1440-1600 Gt of carbon. When it melts, that carbon is emitted into the atmosphere, fueling more warming.”⁴

Arctic communities have already experienced disruptions to their freshwater supply, infrastructure, transportation, tourism and cultural traditions, due to a melting cryosphere. Many species dependent on cold temperatures, ice, and snow are at risk, with some facing extinction. These changes will worsen as warming continues.

Indeed, the Coast Guard’s Strategic Outlook identifies that “the warming of the Arctic has led to longer and larger windows of reduced ice conditions,” and that “from 2006 to 2018, satellite imagery observed the 12 lowest Arctic ice extents on record.”

#2: In the Arctic, a changing climate is emboldening our competitors and adversaries (Russia and China), creating new risks and complicating navigating conditions for the Coast Guard and our military.

The Arctic has emerged as a region of geostrategic competition, primarily because rising temperatures, melting sea ice, and collapsing permafrost now grant access to this region previously locked in ice most of year. Indeed, climate change is enabling great power competition in the Arctic today. While the Arctic has, since the end of the Cold War, been a region characterized by cooperation and diplomacy, it has more recently become a zone of increased tensions over valuable energy and mineral resources, and access to shipping routes. The retreating and thinning of Arctic ice have given rise to exponential growth in economic and military activities, including shipping, resource extraction, and other commerce. The Coast Guard Strategic Outlook stresses that “The Arctic maritime domain will continue to open and increased activity will create more demand for Coast Guard services. Near-term variability will result in a dynamic operating environment that exposes mariners and Arctic communities to unpredictable levels of risk.” Rapid Arctic change is feeding into China’s and Russia’s strategic ambitions, both regionally and globally.

As I stated in an article in Foreign Policy last year, “China has large ambitions throughout the Arctic.”⁵ This includes the advancement of both commercial and military objectives. For instance, China is aiming to use Russia’s Northern Sea Route to ship goods and other materials to and from ports in Europe. This will shorten travel times compared to traditional routes through

⁴ Levin, Kelly and Ezra Northrop. “4 Things to Know About the IPCC Special Report on the Ocean and Cryosphere.” World Resources Institute. September 25, 2019. <https://www.wri.org/blog/2019/09/4-things-know-about-ipcc-special-report-ocean-and-cryosphere>

⁵ Goodman, Sherri, and Elisabeth Freese. "China's Ready to Cash In on a Melting Arctic." Foreign Policy. May 1, 2018. <https://foreignpolicy.com/2018/05/01/chinas-ready-to-cash-in-on-a-melting-arctic/>

the Straits of Malacca and Suez Canal, offering China a new strategic advantage in terms of global trade and freedom of navigation. In January 2018, this ambition was formalized in China's first public Arctic policy, wherein China declared itself to be a "near Arctic State," and articulated its intention to build a "Polar Silk Road" that will stretch from Shanghai to Hamburg, first across the Northern Sea Route, and potentially later, across the central Arctic Ocean.⁶ In the long term, China foresees using the even shorter Transpolar Sea Route across the very top of the Arctic, when that opens in a few decades due to melting sea ice. This route, which might be available for several months each year, would save China from having to depend on Russian-controlled waters. As Li Zhenfu, director of Dalian Maritime University's research Center for Polar Maritime studies, noted, "[w]hoever has control over the Arctic route will control the new passage of world economics and international strategies."⁷

China also is deepening its Arctic presence through foreign direct investment in several Northern European Arctic States.⁸ China is exploiting climate change and the very real need for Arctic-based infrastructure investment to assert itself as a key partner in economic development and scientific exploration. This presence enhances their own domain awareness, and investments could plausibly be leveraged to influence policy to be more desirable for China's long-term strategic interests.⁹

In a recent article, Coast Guard Commander, William Woityra, points out that mistrust of China's actions and intentions in the Arctic is firmly rooted in a pattern of behavior that they have displayed, which shows that "When it is convenient, and when there are economic incentives to cheat, China has a history of turning a blind eye to the illegal activity of its industries, or tacitly supporting them."¹⁰

Russia has been increasing its military presence and assertiveness in the Arctic – and a significant amount of it is proportionate to their vast Arctic territory – but their ambitions have political, military and commercial dimensions. On the political side, Russia has the longest Arctic coastline of any Arctic coastal state, and Russian identity has historically been tied to the Arctic. Expanding Arctic development, as ice and permafrost melt, is therefore likely to enjoy broad public support from a nation that identifies with its Arctic heritage. Commercially, approximately 20 percent of Russia's GDP is derived from Arctic activities, primarily energy, industrials and mining.¹¹ Russian President Vladimir Putin has set ambitious cargo shipping

⁶ State Council Information Office of the People's Republic of China. "Full Text: China's Arctic Policy." The State Council of the People's Republic of China. January 26, 2018.

http://english.gov.cn/archive/white_paper/2018/01/26/content_281476026660336.htm

⁷ Jakobson, Linda. "China Prepares for an Ice-Free Arctic." Insights on Peace and Security. March 2010.

<https://www.sipri.org/sites/default/files/files/insight/SIPRIInsight1002.pdf>

⁸ Rosen, Mark E and Cara B. Thuringer, "Unconstrained Foreign Direct Investment: An Emerging Challenge to Arctic Security." CNA. November 2017.

⁹ Goodman, Sherri and Marisol Maddox. "China's Growing Arctic Presence." China-US Focus. November 19, 2018. <https://www.chinausfocus.com/finance-economy/chinas-growing-arctic-presence>

¹⁰ Woityra, William. "China Can't Be Trusted in the Arctic. Proceedings. December 2019. Vol. 145/12/1,402.

¹¹ Devyatkin, Pavel. "Russia's Arctic Strategy: Aimed at Conflict or Cooperation? (Part I)." The Arctic Institute. February 6, 2018. <https://www.thearcticinstitute.org/russias-arctic-strategy-aimed-conflict-cooperation-part-one/>

goals, which would quadruple the volume to be shipped through the Northern Sea Route from 20 million tons to 80 million tons by 2024.¹² Though this cargo increase still represents a small portion of total global shipping, it is still a lofty goal for an environmentally sensitive region which does not yet have fully developed emergency response capabilities. Russia seeks to monetize the Northern Sea Route as a new access route from China to Europe which, as the ice melts, will presumably be available for several months each year. This could cut up to 15 days off the current route via the Suez Canal and the Strait of Malacca. It is noteworthy that President Putin has stated that he sees the Northern Sea Route as a future “global, competitive transport artery” that is “the key to the development of the Russian Arctic and the regions of the Far East.”¹³

Militarily, Russia has been upgrading its bases along the Northern Sea Route and exerting increasingly aggressive behavior against our High North allies and partners. Russia has violated Swedish¹⁴ airspace, simulated attacking northern Norway¹⁵ and tested electronic warfare capabilities, including the jamming of GPS systems during the NATO exercise Trident Juncture, and in days since, as well.¹⁶ Russia claims its military buildup is primarily for economic reasons, presenting the Northern Sea Route as a maritime toll road through the Arctic, and seeking to monetize the route by requiring transit vessels to pay a “toll” for military escort through the shallow waters close to the Russian coastline. However, it is clear that Russia would be able to use these forces and capabilities for other purposes as well. Just last month Russia tested a hypersonic missile for the first time in the Arctic,¹⁷ and they plan to launch their first weaponized icebreaker, *Ivan Papanin*, by 2023.¹⁸ In short, China and Russia are opportunistically expanding their power and influence in direct response to a melting Arctic, and this will have significant consequences for U.S. interests.

The increased presence of Russian and Chinese vessels in Arctic waters near the US presents other risks as well. Among the new risks in a rapidly changing Arctic, one that “keeps me up at night,” is a potential nuclear shipping incident in Arctic waters. Russia’s nuclear safety record is deeply concerning, from Chernobyl, to the Kursk submarine sinking in 2000, to the 2019 failed

¹² Staalesen, Atle. “It’s an order from the Kremlin: shipping on Northern Sea Route to reach 80 million tons by 2024.” *The Barents Observer*. May 15, 2018. <https://thebarentsobserver.com/en/arctic/2018/05/its-order-kremlin-shipping-northern-sea-route-increase-80-million-tons-2024>

¹³ Staalesen, Atle. “Russia’s Putin to turn Northern Sea Route into global shipping artery.” *Eye on the Arctic*. May 15, 2018. <https://www.rcinet.ca/eye-on-the-arctic/2018/05/15/arctic-shipping-russia-policy-international-kremlin/>

¹⁴ Sweden: Russian Military Planes Briefly Violated Airspace.” *Associated Press*. January 24, 2019. <https://apnews.com/097a3fd978f14f4e9a7f4e5cb4d1d600>

¹⁵ Nilsen, Thomas. “11 Russian Fighter Jets Made Mock Attack on Norwegian Arctic Radar.” *The Barents Observer*. February 12, 2019. <https://thebarentsobserver.com/en/security/2019/02/11-russian-fighter-jets-made-mock-attack-norwegian-arctic-radar>

¹⁶ Staalesen, Atle. “GPS Jamming on Agenda as Russian Defence Delegation Sat down for Talks in Oslo.” *The Independent Barents Observer*. March 18, 2019. <https://thebarentsobserver.com/en/security/2019/03/gpsjamming-agenda-russian-defence-delegation-sits-down-talks-oslo>

¹⁷ Devitt, Polina. “Russia Tests Hypersonic Missile in Arctic, TASS cites Source.” *Reuters*. November 30, 2019. <https://www.reuters.com/article/us-russia-arctic-missiles/russia-tests-hypersonic-missile-in-arctic-tass-cites-sources-idUSKBN1Y40BB>

¹⁸ “Russian Shipyard Launches Missile-Carrying Icebreaker.” *The Maritime Executive*. October 28, 2019. <https://www.maritime-executive.com/article/russian-shipyard-launches-missile-carrying-icebreaker>

recovery of the Skyfall missile and the nuclear submarine which caught on fire. These incidents reveal a Russian tendency to not only withhold critical incident information about the extent and severity of radioactive contamination but to actually cover the incidents up in an attempt to evade accountability. This irresponsible practice has implications for Coast Guard and partner agency mission planning in responding to a crisis in the Arctic.

To help prepare for future such incidents, a scenario demonstration was conducted earlier this year by the Council on Strategic Risks, Sandia National Labs and the Wilson Center's Polar Institute at the Arctic Futures 2050 conference. With Coast Guard and Alaskan Native community participation, we demonstrated "how a table-top exercise can be used to bring science, indigenous and policy communities together to develop information, ideas and proposed actions to drive future research directions, policy initiatives and planning for emergency response in the Arctic of 2050. This exercise used as a triggering event an Arctic maritime incident that takes place in the year 2050 in which a Chinese-owned LNG tanker collides with its Russian nuclear-powered icebreaker escort in a winter storm."

Key takeaways from the exercise include:¹⁹

- "The initial operational response to any major Arctic shipping incident will follow well established search and rescue protocols and will be led by the United States Coast Guard."
- "If a nuclear incident of this type occurs, it is likely to become an incident of national significance and an incident command structure will be established. A nuclear accident in shallow water has the potential to become a very serious incident."
- "Important predictive capabilities for situational awareness and informing response decisions does not currently exist for winter Arctic conditions."
- "The US Arctic currently lacks multiple facets of both operational and research infrastructure needed to provide key elements of both short and long-term response to a major winter-time incident."
- "There must be a strong indigenous voice and participation in the response effort. Arctic indigenous communities have important knowledge to inform response decisions and must be part of response decisions."
- "This incident has the potential to rapidly become a major international incident. Communication lines with Russian (and other countries') institutions will be important. Confidence Building Measures (CBM) could help to prepare both the US and Russia for a future contingency."

¹⁹ Goodman, Sherri, Peter Davies, Jim Townsend, Marisol Maddox. "Inclusive Planning for Changing Arctic Futures: Demonstrating a Scenario-Based Discussion." Council on Strategic Risks. September 5, 2019 <https://councilonstrategicrisks.org/2019/09/19/planning-for-a-changing-arctic-a-scenario-based-discussion-paper/>

#3: We have a Responsibility to Prepare for changing Arctic conditions and the Coast Guard needs to enhance its operating capabilities in the Arctic, from additional ice breaking, to improved domain awareness (mapping and charting), communications and research capabilities.

As former Secretary of Defense Mattis stated in 2018, “We need to up our game in the Arctic.” While the Coast Guard has a long and storied tradition of Arctic operations, for which I have deep respect, in the climate era we also need to enable the Coast Guard to “up its game in the Arctic,” to meet its essential missions. As the Coast Guard Strategic Outlook states: “The United States is an Arctic Nation, and the United States Coast Guard has served as the lead Federal agency for homeland security, safety and environmental stewardship in the Arctic region for over 150 years.”

Among the U.S.’s emerging needs in a changing Arctic is a strategic deep-water port. Currently, the closest deep-water port to the US Arctic is 800 miles away in Kodiak, Alaska. That is inadequate in the climate era with increased navigation, tourism, and other sea-based traffic and the accompanying risks for search and rescue. An Arctic deep-water port is a strategic initiative that the US government, engaging the private sector in a financially meaningful way, needs to plan for future maritime safety and other operations.

I am pleased that the Committee has included in the Coast Guard Authorization Act a provision to prepare a report on the Arctic capabilities of the Armed Forces, including identifying gaps in Department of Navy capabilities to protect Coast Guard assets during Freedom of Navigations operations. This capability is becoming more important in a changing Arctic.

The US has fallen behind in equipping our forces to operate safely and securely in a changing Arctic. There are 3 key components to Coast Guard’s operational capability in the Arctic. Each one requires additional support:

1. Speed the deployment of additional ice breaking capability in the form of the “polar security cutter, aviation assets and autonomous systems. Today, Coast Guard has limited ice breaking capability that must fulfill missions at both poles, including Antarctica. As the Strategic Outlook diplomatically states: “This national fleet does not currently have the capability or capacity necessary to assure access in the high latitudes.” The Administration and Congress have authorized one new polar security cutter; however, the Coast Guard needs at least 6, of which 3 are “medium” and 3 are “heavy,” according to its own requirements. And, from an acquisition standpoint, it is financially preferable to conduct a multiple buy, as a single vessel will have very high unit costs. At least one

vessel in the Polar Security Cutter fleet should be science-ready so they are able to continue serving as a platform for scientific research that is critical to domain awareness and detection of changes over time.²⁰ Additionally, the Coast Guard needs modern aviation capability for search and rescue, as well as the autonomous systems that are able to substantially enhance a variety of Coast Guard mission sets, from illegal fishing detection to mapping and charting.

2. Improve Arctic Domain Awareness and Communications capabilities. Given the rapidly changing Arctic environmental and operating conditions, it is essential that we improve US Arctic, including maritime, domain awareness capabilities. MDA is a diverse set of capabilities, some of which are within the Coast Guard's budget, but many of which are supported by other agencies, and which also need to be harnessed from local communities with direct observations of the changing Arctic conditions. As the Coast Guard Strategic Outlook states, Arctic domain awareness requirements include:
 - a. Information about national defense and security;
 - b. Information on vessel crew, passenger and cargo carried;
 - c. Pollution detection and tracking capabilities;
 - d. Weather and environmental observations, including ice reconnaissance;
 - e. Assessment of living marine resources; and,
 - f. Assessment of human activity and infrastructure.

Consider again the possible nuclear shipping incident with a Russian nuclear -powered icebreaker and a Chinese LNG vessel in the Bering Strait. Information on all of the above will be essential in responding to such a crisis should it occur. That is why we need to act today to increase our MDA and communications capabilities in the Arctic which includes improving national communications infrastructure for broadband and satellite coverage to support security as well as commercial, recreational, and subsistence-based activities.

In that regard, I am pleased that the White House has recently announced an intent to develop a national strategy on mapping, exploring and characterizing the US Exclusive Economic Zone (EEZ) and the shoreline and near-shoreline areas of Alaska. Some of our current Arctic charts date back to the 1800s and are wholly inadequate for today's needs. Only around 4 percent of Arctic waters off the coast of Alaska have been charted to modern standards.²¹ As the recent White House Memorandum stated, "Data and information about the ocean help to advance maritime commerce, domestic seafood production, healthy and sustainable fisheries, coastal resilience, energy production,

²⁰ Congressional Research Service. "Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress." Congressional Research Service. October 4, 2019. <https://fas.org/sgp/crs/weapons/RL34391.pdf>

²¹ Cole, Dermot. "Outdated navigational charts are an Arctic maritime disaster in the making." Arctic Today. September 10, 2018. <https://www.arctictoday.com/outdated-navigational-charts-arctic-maritime-disaster-making/>

tourism and recreation, environmental protection, national and homeland security, and other interests. Such activities contribute more than \$300 billion per year of economic activity, 3 million jobs, and \$129 billion in wages.”²² Equally important, improved mapping and charting will help us prepare to operate in a changing Arctic, and to improve our predictive capabilities for better decision making.

3. Ensure the US maintains its competitive edge in Arctic research and development. For decades, the US has supported extensive research on the Arctic, from marine to terrestrial systems, from space to ecosystems. This research, conducted by leading universities across the nation as well as federal agency laboratories, is a core component of America’s competitive edge in the Arctic. The Coast Guard’s icebreakers are host to the science missions conducted aboard to gather direct observations and data about Arctic conditions. America’s scientific enterprise, and research and development capabilities, have long supported both our overall security posture and our global engagement strategies, as well as enabling us to better understand the natural world. Nowhere is this more important than in Arctic research. Today, China, Russia, and others are increasing their research capabilities both within and about the Arctic.

Research helps us better understand the pace of Arctic climate change and prepare for this changed future. For example, as global fish stocks migrate as waters warm toward the poles, we need to better understand how to manage emerging and potential fisheries, and growing potential for illegal and unregulated fishing. The Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean signed in 2018 by multiple nations, including the US, Russia, China, and others is a good example of acting with the precautionary principle in situations in which we do not yet have sufficient knowledge to make decisions about sustainable management of a fishery in this long ice-covered area.²³ Over the next decade, however, many nations will be seeking to develop this knowledge, and we need to ensure there is sufficient scientific knowledge to support sustainable management and prevent some of the worst outcomes of climate change.

The proposed High Arctic Research Center (HARC) facility at Oliktok Point is a great example of a physical location that would greatly complement the development of homeland security and defense missions in the Arctic and support a re-established leadership position in the region for the United States. The proposed Center, “could serve as a physical launch pad for scientists, giving them year-round, multi-domain access for research, development, Arctic technology testing, and domain awareness. . . . Research and extensive real-time observations in the Arctic could help researchers collect data that would fill critical gaps in monitoring, providing real-time information, enhancing forecasting, and creating better simulations for planning purposes to serve security and

²² “Memorandum on Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska.” The White House. November 19, 2019. <https://www.whitehouse.gov/presidential-actions/memorandum-ocean-mapping-united-states-exclusive-economic-zone-shoreline-nearshore-alaska/>

²³ “Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean.” <https://www.mofa.go.jp/mofaj/files/000449233.pdf>

commercial enterprises.”²⁴ The High Arctic Research Center would enable testing and demonstration of technologies for multiple Coast Guard missions.

#4: Leadership on Arctic security is essential to America’s overall security and must be a whole of US government and partnership effort, including allies, communities, private sector, and others, that serve to undergird the rules-based order and support resilience.

The Coast Guard is not alone in the Arctic. The keys to American leadership on Arctic Security are partnerships and unity of effort. This term refers to an inclusive approach that marshals all elements of capability, including the joint and interagency community, state and local government, industry, non-profit and academic organizations. Key partnerships for the US, in particular the Coast Guard, in the Arctic include:

- Native Alaskan Communities: Those who live in the region are often best able to “ground truth” observations and will know what’s happening long before many in Washington do. They observe trends and recognize patterns that may not be distinguishable to others. That is why it is essential to “co-produce” knowledge with those closest to the Arctic domain. I am pleased that both the Coast Guard and other interagency partners have been including the Native Alaskan community in developing both research approaches and improving domain awareness. As the Coast Guard Strategic Outlook states: “Alaska Natives are a critical layer of security in the Arctic.” The Native Alaskan communities are also on the frontlines of climate disruption, from coastal erosion occurring at many villages, to permafrost thaw disrupting traditional livelihoods, to harmful algal blooms (HABs) harming fish stocks and megafauna, to extreme weather storms disrupting the critical supply chain of fuel and food delivery. These changing conditions increase demands for Coast Guard support and response and stretch scarce resources even further.
- Arctic Coast Guard Forum: Another important security layer in the Arctic is the partnership the Coast Guard has with the Arctic Coast Guard Forum. Appropriately characterized as a bridge between “diplomacy and operations,” the Arctic Coast Guard Forum enables the Coast Guards of the 8 Arctic nations both to strengthen working relationships, conduct exercises and combined operations, and coordinate emergency response, which becomes more necessary as climate challenges mount.
- Innovation and Technology: The US has always been a technology and innovation leader. As the Arctic changes, we need to harness that capability to advance low-carbon and sustainable systems for Arctic operations, observations and planning. For example, wind and solar-powered ocean drones are now helping to map the Arctic. Other types of

²⁴ Goodman, Sherri, Peter Davies, Marisol Maddox, Clara Summers. “Research in a Changing Arctic Must be Prioritized.” New Security Beat. October 8, 2019. <https://www.newsecuritybeat.org/2019/10/research-changing-arctic-prioritized/>

autonomous systems and advanced technologies will help keep America' at the forefront of Arctic, low carbon and resilience innovation in the Arctic.

- International agreements and institutions that are the backbone of the rules-based order: America's security in the Arctic depends on key international organizations and agreements. They are even more important in an era of great power competition.
 - **Arctic Council:** The Arctic Council provides an important intergovernmental forum for the 8 Arctic nations, Indigenous People's organizations, observer states and non-governmental organizations to engage on a wide range of Arctic issues (other than military security). It has also developed important agreements on Search and Rescue, Oil Spill Preparedness and Response, and Scientific Cooperation, that serve to strengthen cooperation in uncertain times.
 - **Law of the Sea Convention:** The Law of the Sea Convention (UNCLOS) continues to be an important legal framework for the Coast Guard, the US military and others operating in the region, despite the fact that the United States has not yet ratified it.
 - **International Maritime Organization (IMO):** The IMO's Polar Code, adopted in 2014, establishes important standards for design, construction, equipment, operation, training and environment protection and safety for ships operating in polar regions.

Recommendations

To summarize my recommendations above, here are the key areas where Congressional support and action is needed:

1. Advancing the acquisition of polar security cutters, and structurally equip them to carry out scientific research.
2. Increasing MDA capabilities in conjunction with other agencies.
3. Supporting continued Arctic research and development, demonstration, test and evaluation across multiple agencies.
4. Mapping and charting Alaskan waters and near shoreline for maritime safety.
5. Reducing further climate risk through sustainable and low-carbon approaches across all domains using a Responsibility to Prepare and Prevent approach.

Conclusion: Arctic Leadership for the 21st Century

As the Coast Guard Strategic Outlook appropriately states:

“Arctic Security requires leadership and cooperation across multiple national security areas of interest, including border security, economic security, environmental security, food security, freedom of navigation, geopolitical stability, human safety, national defense, natural resource protection and assertion and protection of US sovereign rights.”

America's leadership on climate security is the other essential element to advancing America's Arctic interests in the 21st century.

The globally-devastating Second World War precipitated the creation of an international system led by the United States, designed to protect the sovereignty of states against external aggression and decrease the likelihood of conflict between nations. This is the world order we are trying to preserve today. However, the rapid rate of climatic change, combined with other global threats, and the increasing stress on security that follows means that this system must adapt – and adapt quickly. The U.S. should lead that effort, just as it led the effort to ensure global stability after the Second World War.

Fortunately, the difference between today and major global disruptions of the past is that we can spot impending disasters earlier and more easily. Though the risks are unprecedented, our foresight is unprecedented as well. Technological developments have given us predictive tools that enhance our ability to anticipate and mitigate threats. In short, we have the ability to make our communities, institutions and individuals more resilient to a broad range of threats. This foresight underscores a responsibility to advance resilient solutions that are commensurate to the threat. That is our “Responsibility to Prepare and Prevent,” which is most evident in what our Coast Guard needs to do to continue operating safely and securely in the changing Arctic. If we don't, we will either have to watch our adversaries take the lead, or failing that, bear witness to an increasingly unstable world.