U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HEARING CHARTER

Amplifying the Arctic: Strengthening Science to Respond to a Rapidly Changing Arctic

Tuesday, September 20, 2022

10:00 a.m. ET – 12:00 p.m. ET

2318 Rayburn House Office Building and Online via Zoom

PURPOSE

With the Arctic warming two to four times faster than the rest of the planet, the purpose of this hearing is to discuss the Interagency Arctic Research Policy Committee's Arctic Research Plan 2022-2026, which is informed by the U.S. Arctic Research Commission. The hearing will explore gaps in research and analysis, needed improvements to federal science capabilities, research vessels and infrastructure, and barriers to strengthening our response to local and global climate change impacts, such as carbon and methane emissions released from permafrost thaw. Additionally, we will discuss gaps in Arctic system monitoring, observing, modeling, and prediction efforts. Importantly, we will examine the role of traditional knowledge holders and equitable practices in the coproduction of research, especially in critical areas such as food security and biodiversity. Finally, the hearing will be an opportunity to discuss the impact of geopolitical tensions on science diplomacy in the Arctic and challenges for future international collaboration in key research including boreal forest fires, sea ice melt and land ice loss, particularly the Greenland Ice Sheet.

WITNESSES

- **Dr. Larry Hinzman,** Assistant Director of Polar Sciences, White House Office of Science and Technology Policy and Executive Director, Interagency Arctic Research and Policy Committee
- **Dr. Mike Sfraga**, Chair, U.S. Arctic Research Commission
- **Ms. Vera Kingeekuk Metcalf**, Executive Director, Eskimo Walrus Commission
- **Dr. Susan Natali,** Arctic Program Director, Woodwell Climate Research Center

Overarching Questions:

1. How did IARPC identify the priorities in the latest 5-year research plan? Why is the two-year implementation plan necessary? What discussions are taking place to consider longer-term research planning for the Arctic?
2. What outstanding research questions remain to be answered to improve our understanding of climate change impacts in the Arctic? What research infrastructure, vessels, capabilities, and partnerships are necessary to support this work? What is the status of the U.S. Arctic Observing Network?

3. What guidelines exist to help researchers improve communication and collaboration in Arctic communities when carrying out field work? How is the science community addressing barriers to coproduction of knowledge?
4. How are geopolitical tensions from Russia's war on Ukraine impacting domestic Arctic research under IARPC and international research through the Arctic Council? What are the future considerations for scientific collaboration in the Arctic?

The Arctic

The U.S. is an Arctic state by virtue of Alaska. The Arctic is home to about 4 million people and the boundaries of this area are defined in multiple ways, with the simplest definition being the land, sea, and ocean area north of the Arctic Circle (66º34' N).[1] In the United States, the *Arctic Research and Policy Act* (ARPA) of 1984 [P.L. 98-373] (15 U.S.C. 4108) defines "Arctic" to mean "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; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas; and the Aleutian chain." Definitions of the Arctic may also be based on climate-related factors such as average temperature, northern tree line, extent of permafrost on land, extent of sea ice on the ocean, which could encompass different areas over time because of climate change.[2]

The rapid rate warming of the Arctic compared to the global average is a phenomenon known as Arctic amplification. The 2014 "Arctic in the Anthropocene: Emerging Research Questions," report by the Polar Research Board of the National Academies of Sciences, Engineering, and Medicine described the need for our Arctic response as follows:

> "What happens in the Arctic has far reaching implications around the world…The climate, biology, and society in the Arctic are changing in rapid, complex, and interactive ways, with effects throughout the region, and increasingly, the globe. If we as a global society are to respond effectively to these challenges, understanding the Arctic system has never been more important… the ability to identify and predict the ways in which the loss of sea ice affects climate, biology, and society will help us better prepare and adapt, in the Arctic and beyond."[3]

Arctic Research and Policy Act (ARPA) of 1984

ARPA provides for a comprehensive national policy addressing research needs and objectives in the Arctic. It was last amended in 1990 [P.L. 101-609]. It established the U.S. Arctic Research Commission and the Interagency Arctic Research Policy Committee.

[1] https://www.crs.gov/Reports/R41153?source=search&guid=bc5b6db978814e3bb87a66ecf3e53c71&index=0
[2] https://www.crs.gov/Reports/R41153?source=search&guid=62ed4276fb9f46c88043d5ab49634f34&index=0
[3] https://nap.nationalacademies.org/read/18726/chapter/2#2

U.S. Arctic Research Commission (USARC)

The U.S. Arctic Research Commission (USARC or the Commission) is responsible for helping develop and recommend a national Arctic research policy. It is also required to coordinate with the Interagency Arctic Research Policy Committee (IARPC) to establish an implementation plan for the Arctic research policy. The Commission is composed of seven members appointed by the President. The National Science Foundation (NSF) serves as an ex officio member. Four members represent academic or research institutions with Arctic expertise in areas including physical, biological, health, environmental, social, and behavioral sciences. One member is to be appointed from among Indigenous residents of the Arctic and two members are to represent industry. The President designates one of the seven members as chairperson. The Commission also publishes an annual statement of goals and objectives to guide IARPC and an annual report on the Commission's activities and accomplishments.

Interagency Arctic Research Policy Committee (IARPC)

ARPA designated NSF as the lead agency responsible for implementing Arctic research policy and directed the President to establish an Interagency Arctic Research Policy Committee (IARPC) to develop a comprehensive national Arctic research policy. In 2010, Executive Order 12501 redefined IARPC as a Working Group under the National Science and Technology Council (NSTC) of the Office of Science and Technology Policy. ARPA designated the following agencies to be represented in IARPC: NSF (chair), Departments of Commerce (National Oceanic and Atmospheric Administration – NOAA), Defense, Energy, Interior, State, Transportation, Health and Human Services, the National Aeronautics and Space Administration (NASA), and the Environmental Protection Agency (EPA). Other agencies that contribute to IARPC work are the Departments of Agriculture and Homeland Security, the Marine Mammal Commission, the Denali Commission, the Smithsonian Institution, the Office of Management and Budget, and the Office of Science and Technology Policy.

IARPC is directed to determine priorities for future Arctic research and to work with the Commission to develop and establish an integrated national Arctic research policy, develop comprehensive 5-year plans to implement the Arctic research policy, and develop guidelines for Federal agencies for awarding and administering Arctic research grants for adherence to each 5-year research plan. Additionally, IARPC is required to provide coordination, data, and assistance for the preparation of a single multiagency budget request for Arctic research. ARPA also directs OSTP to review agency budget requests related to the Arctic and directs OMB to consider all agency requests as one integrated, multiagency request and review it prior to submission of the budget for adherence to the 5-year research plan.

Finally, IARPC is required to facilitate cooperation between the Federal government and State and local governments, including the State of Alaska, facilitate international research cooperation, and facilitate Federal interagency coordination of all Arctic research activities. The activities and accomplishments of IARPC and the Commission is due to Congress in a biennial report.

2022-2026 Arctic Research Plan

OSTP published the 2022-2026 Arctic Research Plan developed by IARPC in December 2021. The four priority areas under the plan are:

> 1) Community Resilience and Health: Improve community resilience and well-being by strengthening research and developing tools to increase understanding of interdependent social, natural, and built systems in the Arctic;
>
> 2) Arctic Systems Interactions: Enhance our ability to observe, understand, predict, and project the Arctic's dynamic interconnected systems and their links to the Earth system;
>
> 3) Sustainable Economies and Livelihoods: Observe and understand the Arctic's natural, social, and built systems to promote sustainable economies and livelihoods; and
>
> 4) Risk Management and Hazard Mitigation: Secure and improve quality of life through research that promotes an understanding of disaster risk exposure, sensitivity to hazard, and adaptive capacity.

The impetus for these four categories was to be responsive to priorities identified by Arctic communities, Federal agencies with a presence in Alaska, the state of Alaska, and other non-Federal entities. This plan is intended to support basic, use-inspired, and applied research to ensure emerging challenges of the next five years are addressed.

Federal Agency Arctic Research

Many agencies carry out Arctic-related science, including NSF, NOAA, DOE, and NASA, each of which is part of IARPC. In addition to its role as chair of IARPC, NSF carries out Arctic research under two agency programs. The Office of Polar Programs under the Geosciences Directorate maintains an Arctic Sciences office with a budget of $105 million annually that funds research grants and logistics. Additionally, NSF budgets $30 million a year to carry out cross-agency work under the Navigating the New Arctic (NNA) program, part of the agency's 10 Big Ideas in 2017 to support convergence research. NSF also maintains Summit Station in Greenland, which is the only high altitude, high latitude, inland observing station in the Arctic. Finally, NSF and NOAA also support Arctic Observing Network programs. The IARPC 5-year research plan prioritizes more robust observation capabilities. Additionally, the FY 2023 House CJS Appropriations includes a directive to OSTP to submit a report on the need to establish and maintain an Arctic observing network.

NOAA's Arctic enterprise contributes to IARPC work through its goals of expanding climate services and products, supporting the New Blue Economy, and equity in services and workforce. The agency supports short-term weather and long-term climate monitoring and observation and advancing modeling and prediction. It also provides critical information for subsistence harvests and decision support for unique Artic hazards, including river ice breakup, coastal flooding, landslide-based tsunami risks, and fires. NOAA maintains three non-ice capable research ships and has facilities and observational assets across Alaska. Its annual funding estimate for research, products, and services in Alaska and the Arctic is $100 million.

DOE's Arctic Energy Office (AEO) was reestablished in 2020 to serve as a principal advisor to the Under Secretary of Energy on all domestic Arctic issues, including energy, science, and national security. AEO coordinates activities across the Department's program offices and national laboratories. Some of its crosscutting activities includes work on hydrokinetics, supporting microgrid efforts, a zero-emission shipping corridor proposal, solar research, legacy nuclear reactor monitoring, earth systems field work and monitoring, and other areas.

NASA also carries out important Arctic research, including research related to terrestrial ecology and the cryosphere, under its Earth Science Division. Started in 2015, the Arctic-Boreal Vulnerability Experiment (ABoVE) under the Terrestrial Ecology Program, is conducting an 8–10-year field campaign in Alaska and western Canada to better understand the vulnerability and resilience of ecosystems and society to climate change impacts such as permafrost thaw, boreal forest fires, coastal erosion, and changes to the wildlife habitat that supports subsistence lifestyles of Arctic Indigenous peoples. Additionally, NASA gathers critical remote sensing observations with aircraft and satellites, such as Ice, Cloud, and land Elevation Satellite (ICESat-2) to monitor sea ice loss, thickness, and changes, including Greenland Ice Sheet loss, to inform Earth system science and Arctic research modeling. NASA also coordinates field work with NSF in Greenland.

In 2021, the Biden Administration reactivated the Arctic Executive Steering Committee to advance U.S. Arctic interests, coordinate Federal actions in the Arctic, and reinforce collaborative partnerships with Alaska Native communities to harness science and Indigenous knowledge to inform management and policy.

Finally, another important area of research is carbon and methane emissions from permafrost thaw and Arctic wildfires. These Arctic feedbacks are not fully accounted for in climate models that inform global emissions budgets. The Woodwell Climate Research Center has significant expertise in this area of research and has funding by private donors. The Center's Arctic Program Director is testifying at this hearing.

Co-production of Knowledge

Improving the collaboration between Indigenous knowledge systems and western science is an ongoing challenge to research in the Arctic. In 2018, IARPC published, "Principles for Conducting Research in the Arctic," that includes respecting Indigenous knowledge and cultures and building and sustaining relationships. The Inuit Circumpolar Council of Alaska also published "A framework for the coproduction of knowledge in the context of Arctic research" and a 2022 report, "Circumpolar Inuit Protocols for Equitable and Ethical Engagement." Co-production is a major priority in the 5-year plan. A group of Alaska Native Tribal organizations sent a letter to NSF regarding the NNA program in 2020 and a follow-up letter in 2021 expressing concern about the continuing disconnect between resource managers, policymakers, academics, agencies, and local Alaskan communities. The letters describe a lack of access by traditional knowledge holders to inform the research process, including limited opportunity to weigh in on research needs and questions that are funded. One recommendation by co-production of knowledge experts is consultation with and access to research grant funding by co-

management organizations, such as the Eskimo Walrus Commission (EWC). Co-management organizations enter into cooperative agreements with Federal agencies to conserve marine mammals and provide co-management of subsistence use by Alaska Native organizations. The EWC is represented on the NSF-funded Study of Environmental Arctic Change (SEARCH) as a co-principal investigator. SEARCH is a collaboration of scientists, Indigenous People, and decision-makers established to communicate research findings to diverse audiences. The Executive Director of the EWC is testifying at this hearing.

Research Vessels and International Collaboration

The R/V *Sikuliaq*, owned by NSF and operated by cooperative agreement with the University of Alaska Fairbanks, is the only ice-capable Global Class research vessel in the U.S. academic research vessel fleet.[4] Ice-capable vessels can break 2 ½ feet of ice at 2 knots. It became fully operational in 2016 and supports national and international research. NSF research missions can also be conducted on the U.S. Coast Guard (USCG) Cutter *Healy*, a multi-mission medium polar icebreaker equipped with science capabilities that operates in the Arctic. The *Healy* can break 4 ½ feet of ice continuously at 3 knots[5] and is one of the nation's two operational polar icebreakers. The other is a heavy icebreaker, the *Polar Star*, which operates in the Antarctic. In 2020, a fire in one of the *Healy's* main propulsion motors rendered it inoperable, and it has undergone extensive repairs.[6] It is now back in service.

Arctic research missions are often collaborative with the U.S. partnering with international scientists and conducting research on vessels flown under a different flag. For example, the 2019 NSF-funded Northwest Passage Expedition was a U.S./Canadian team of scientists and students that conducted research aboard the Swedish Icebreaker *Oden*, which departed from a U.S. Air Base in Greenland.[7] Another example is the 2019 Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) expedition on the R/V *Polarstern*, a German vessel. This was an international effort with leadership by Germany, the U.S. and others.

Geopolitical impacts on Science in the Arctic

The Department of State leads U.S. participation in the Arctic Council and collaborates with agencies, including science agencies, that lead delegations of Arctic Council working groups. These agencies include the EPA, National Nuclear Security Agency, NOAA, U.S. Fish and Wildlife Service, and U.S. Global Change Research Program, as well as other federal agencies with Arctic interests. The Arctic Council, established in 1996, is the leading intergovernmental forum promoting cooperation in the Arctic, including science supporting sustainable development and environmental protection.[8] In addition to the U.S., the other seven Arctic states are Canada, the Kingdom of Denmark, Finland, Iceland, Norway, the Russian Federation, and Sweden. There is a 2-year rotating chairmanship, which is currently chaired by Russia until

[4] https://www.unols.org/ships-facilities/unols-vessels
[5] https://www.pacificarea.uscg.mil/Our-Organization/Cutters/cgcHealy/
[6] https://www.crs.gov/Reports/RL34391?source=search&guid=8abb8f6db38a4399bf7bc08b947a3adc&index=6#fn14
[7] https://northwestpassageproject.org/
[8] https://www.arctic-council.org/

2023. The Arctic Council operates on a consensus basis and paused all activities since Russia's invasion of Ukraine. The U.S. held the chairmanship from 2015-2017 and will next chair 2031-2033. The Arctic Council also includes six Indigenous organizations as Permanent Participants and 38 non-Arctic observer states and organizations, including China, which claims it is a "near-Arctic" state. This is not an internationally recognized status.

In the U.S., and many other countries, Russian scientists have been prohibited from attending international science meetings and collaborating on Arctic projects. In addition, data collected by Russian scientists during international expeditions, such as the MOSAiC, is inaccessible for U.S. researchers, which is significant considering roughly half of the Arctic Ocean coastline is Russian.

Additionally, the National Academies of Sciences, Engineering, and Medicine and science academies around the world joined in denouncing the war.[9] The Academies makes efforts to support scientists across the world displaced by conflict, including Ukrainian scientists and researchers.[10]

[9] https://www.nationalacademies.org/news/2022/03/we-stand-with-our-colleagues-in-ukraine-say-u-s-national-academies-presidents

[10] https://www.nationalacademies.org/news/2022/06/international-science-academies-meet-in-poland-to-explore-how-to-support-ukrainian-science-and-researchers?utm_source=NASEM+News+and+Publications&utm_campaign=f588718f49-EMAIL_CAMPAIGN_2022_06_06_03_41&utm_medium=email&utm_term=0_96101de015-f588718f49-103694093&mc_cid=f588718f49&mc_eid=15ea17c53d