Changing Conditions in the Arctic
Strategic Action Plan
Full Content Outline

Objective: Address environmental stewardship needs in the Arctic Ocean and adjacent coastal areas in the face of climate-induced and other environmental changes.

I. Overview of the Priority Objective

- Address environmental stewardship needs in the Arctic Ocean (including contiguous Bering, Chukchi, and Beaufort Seas) and adjoining coastal areas in light of climate and environmental change, as well as increasing accessibility to human activity.
- Improve efforts to conserve, protect, and sustainably manage Arctic marine resources, effectively respond to the risk of increased pollution and other environmental degradation on humans and marine life, and adequately safeguard living marine resources.
- Develop new collaborations to better monitor and assess environmental conditions and to devise procedures to respond to emergencies such as environmental accidents.
- Achieve consistency and coordination with the implementation of the United States Arctic Region Policy as promulgated in the National Security Presidential Directive 66/Homeland Security Presidential Directive 25 (2009).
- Improve the scientific understanding of the Arctic system and how it is evolving in response to climate change and other forcers.

II. Context and Continuity

- The Arctic is a frontier. While it is considerably less developed than other U.S. maritime areas, access to the region is increasing rapidly. To achieve National Ocean Policy goals, the U.S. will require fundamental research, improved coordination, and new infrastructure.
- Alaska Native communities rely on the Arctic environment for important cultural, subsistence, and ceremonial practices. Identification and implementation of the strategic actions in this plan will be undertaken with their active engagement.
- Seven themes were identified as focus areas for this action plan:
  - An integrated Arctic observing network.
  - Arctic climate and environmental change (understand, forecast, predict).
  - Arctic mapping and charting.
  - A safe, secure, and reliable Arctic Marine Transportation System.
  - Stewardship of the Arctic marine environment and sustainable development of resources.
  - Resilient and healthy Arctic communities and economies.
  - Domestic and international policy and partnerships in the Arctic.
- As one of nine national priority objectives “Changing Conditions in the Arctic” is unique. It is the only one that is place-based, or focused on a single region. As a result, many topics in the Arctic strategic action plan are also addressed in other plans, or are even their primary focus. To be

fully successful, the actions in the Arctic plan must be considered and implemented within the broader context of the other eight objectives.

- This Strategic Action Plan outline is consistent with other efforts, including the U.S. Global Change Research Program Strategic Action Plan.

III. Body of the Plan

A. Action 1: Improve Arctic environmental response management.
Develop management systems and procedures to protect communities and ecosystems from oil spills and other accidents associated with resource extraction (oil and gas) and Arctic marine transportation (e.g., commercial shipping and tourism). Specifically, inform the development and implementation of response coordination mechanisms such as the Environmental Response Management Application (ERMA®), a geospatial decision-support tool.

1. Why Do This
   - Exploration and development of natural resources in the Arctic, and a rise in marine traffic will increase the probability of accidents.
   - Taking action to prevent, prepare for, and respond to environmental emergencies will better protect communities and ecosystems.
   - To protect subsistence resources which provide the nutritional benefits and cultural practices of Alaska Native communities.
   - Procedures to respond to Arctic Ocean oil spills are specifically called for in the "Report of the National Commission on the BP Deepwater Horizon Oil Spill."
   - Responds to the National Ocean Policy goals to "respect and preserve our Nation's maritime heritage, including our social, cultural, recreational, and historical values," and, "support sustainable, safe, secure, and productive access to, and uses of the ocean, our coasts. . ."

2. Timeframe – Mid-term

3. Outcomes
   - Better protection of sensitive areas of the U.S. Arctic through more efficient resource management and emergency preparedness.
   - Increased coordination among Federal agencies in cooperation with state agencies, local, and Tribal governments, and international bodies.
   - Specific plans and understanding of responsibilities to prepare and respond to emergencies related to resource development and marine transportation.
   - Community participation in the development of oil spill prevention planning and response measures and coordination mechanisms.
   - Well-coordinated sharing of resources and information related to pollution response within the U.S. and across the Arctic.

- Scientific support for prevention and management of a large pollution event in the Arctic is well coordinated among Federal and state agencies and local and Tribal governments.
- A comprehensive understanding of the impacts of a large pollution event in the Arctic on traditional livelihoods, sensitive ecosystems, economies, and security.

4. Milestones

- Complete the development and implementation of ERMA® to prepare for Arctic oil spill response, assessment, and restoration.
- Finalize and test contingency plans to ensure adequacy of response equipment, trained personnel, and nearshore protection strategies. Use existing response preparedness efforts, such as the Aleutian Island Risk Assessment.
- Cross-train emergency responders (for example, response to oil in sea ice).
- Assess and compile scientific research as well as traditional knowledge related to the impacts of resource development and pollution applicable to the Arctic.
- Integrate Federal efforts to study oil spilled in ice-covered waters.
- Support substantial U.S. participation in efforts to create an Arctic-wide agreement on oil spill preparedness and response that may ultimately lead to international standards for maritime activities including oil and gas operations in the Arctic.
- Participate in joint training and workshops with other Arctic nations on oil spill prevention and response mechanisms and procedures, including deployment exercises in Arctic conditions.
- Develop cooperative agreements with Tribal, local, State, Federal and other Arctic nations' governments for sharing response assets and resources across the Arctic in the event of a large pollution event, including: (1) worldwide inventory of equipment available for deployment in the Arctic; (2) command, control and communications strategies, and; (3) international guidelines for spill response in broken-ice and ice-covered environments.
- Partner with industry to ensure the development of oil spill prevention, containment, and response infrastructure, plans, and technology that are proven effective in ice-covered seas.

5. Gaps and Needs in Science and Technology

- Better spill containment technology that is suited for operation in the Arctic environment.
- Increased coordination among scientists, resource managers, and constituents on the potential effects of a large pollution event in the Arctic; for example, marine mammal biologists and scientists studying ice flows working together on impacts of oil in an ice environment or scientists working more effectively with resource managers to better articulate information needs facilitating better emergency response.
- Increased sharing across agencies of tools such as ERMA®.

- Participation of U.S. Federal scientists in development of spill containment technology already taking place within industry.
- Local community training and education related to the impacts of resource development.
- International participation in Arctic-wide spill response efforts.

B. Action 2 – Observe and forecast Arctic sea ice.
Observe, predict, forecast, and ultimately project the extent, thickness, and age of summer and winter sea ice in the Arctic Ocean and contiguous seas. The timeframe and extent of the forecasts will be designed for a variety of stakeholders, and will support safe operations and ecosystem stewardship.

1. Why Do This
   - Sea ice forecasting is the most urgent and timely ocean issue to address in the Arctic region; continued rapid loss of sea ice will be a major driver of changes across the Arctic. The loss of sea ice affects marine access, regional weather, global climate, marine and terrestrial ecosystems, and coastal communities.
   - This action advances ocean stewardship, the economy, and national security by providing situational and domain awareness, and improves foundational science to understand and detect climate and ecosystem change.
   - Improving daily to weekly sea ice forecasts will benefit community activities (e.g., safer subsistence hunting, storm preparation/defense), support the management of protected marine resources, and improve the safety of general maritime activity.
   - Longer-term sea ice forecasts are needed for infrastructure planning, ecosystem stewardship under rapidly changing conditions, and projection of global climate impacts forced by changes first occurring in the Arctic.
   - All-season observations from platforms and ice camps on and under Arctic sea ice will improve our understanding of Arctic environmental variability.

2. Timeframe – Long-term

3. Outcomes
   - Accurate, quantitative, daily forecasts to decadal predictions of sea ice support safe operations and ecosystem stewardship.

4. Milestones
   - Conduct workshop on sea ice forecasting to prepare initial implementation plan.
   - Initiate interagency activity to improve application of remote sensing and buoy/mooring data to sea ice forecasting (DOD funding pending).
   - Initiate cataloging for U.S. Arctic Sea Ice Atlas.

- Train and expand Volunteer Observing Ship and coastal community participation in sea ice observation program; catalogue user requirements for sea ice products, services and delivery.

5. Gaps and Needs in Science and Technology
   - Improved applications of remote sensing and buoy/mooring data for sea ice characteristics and sea ice vector analysis.
   - New real-time *in situ* observational technologies for atmosphere, ice, and ocean variables that control sea ice movement, melt, and growth.
   - Coordination with and access to charter and non-charter vessels capable of working in Arctic areas during spring, summer, and fall seasons.
   - Improved understanding of the links between sea ice an oceanography, such as through heat flux and circulation.
   - New sea ice models that: assimilate advanced observing data; output sea ice thickness, concentration, location with time at higher temporal and special resolution; and couple ice/ocean/atmospheric processes.

C. Action 3: Establish a distributed biological observatory.
Implement an international distributed biological observatory (DBO) in the Pacific Arctic sector focused on six locations along a latitudinal gradient from the northern Bering to the western Beaufort seas.

1. Why Do This
   - Scientific research will provide a better understanding of how climate change affects Arctic biology, and what steps will be necessary to improve stewardship of the Arctic marine ecosystem.
   - Changes in location and timing of the seasonal ice edge can have profound effects on benthic and pelagic marine ecology and human activity. These same changes also affect the ability of ice-dependent marine mammals to reproduce and rear young on ice.
   - Planktonic changes can affect distribution and abundance of baleen whales that are important to subsistence cultures. Likewise, stranding of ice-dependent species on land likely reduces their survival or reproductive rate and may make the animals less available to subsistence hunters.
   - Relationships between ice edge retreat, changes in plankton dynamics, loss of summer sea ice, and foraging success of whales and ice dependent species is poorly understood, as are the effects of these changes on Alaska Natives who depend upon these species.
   - Acidification of Arctic Ocean surface waters is projected to be greater than for any other marine waters on the planet, with largely unknown consequences.
   - The DBO will address the large uncertainties in the responses to climate and ecosystem changes in the biological domain including plankton, fish, birds, marine mammals and invasive species.

- The DBO will provide baseline information necessary to assess and mitigate potential impacts to subsistence activities of offshore resource development.

2. Timeframe – Long-term

3. Outcomes
- Biological information gained from an Arctic biological observatory network will improve the ability of all participating agencies to determine the effects of their actions on marine resources, resulting in improved conservation, protection, and management of Arctic coastal and ocean resources.
- Improved understanding of how Arctic ecosystem and climate changes will affect subsistence cultures in the region.
- New collaborations and partnerships formed in implementing this network will increase our ability to monitor and assess environmental conditions under changing climate scenarios.

4. Milestones
- DBO partners conduct DBO research cruises.
- Pacific Arctic Group (PAG) meeting to review results from 2010 and 2011 pilot activities, plan for 2012 pilot activities.
- DBO partners conduct DBO research cruises.
- PAG meeting to review all pilot activities, plan for 2013.
- International report on DBO activities and results to date.
- DBO partners conduct DBO research cruises.
- PAG meeting to review pilot activities; plan for 2014.
- Updated DBO concept and implementation plan for longer-term implementation.
- DBO partners perform DBO plans and prepare annual assessments on physical and ecological state of Pacific Arctic marine environment.

5. Gaps and Needs in Science and Technology
- New technologies for continuous, year-round, real-time observations of key physical, chemical, and biological variables.
- Coordination with and access to charter and non-charter vessels capable of working in Arctic areas during the spring, summer, and fall.
- Improved use of community-based observations and instrumented animals.
- Ecological implications of increasingly early ice edge retreat, absence of summer sea ice, increased severity of storms during the ice-free season.
- Ecological implications of ice-dependent species forced to spend time on land, including impacts of human disturbance.
- Ecological implications of ocean acidification on Arctic marine ecosystems, especially plankton and calcareous benthic organisms important as prey items to subsistence species.

D. Action 4: Improve Arctic communication.
Participate in cross-cutting efforts to improve existing maritime communication networks/architecture with a focus on support for scientific research, environmental risk reduction and incident management, and sustainable, safe, secure, and productive access to and uses of the Arctic.

1. Why Do This
   - Significant gaps exist in Arctic communication systems that increase the risk of environmental damage and loss of life and property at sea.
   - Effective communication systems are a cornerstone for devising "early warning and emergency response systems" to "respond to emerging event in the Arctic Region such as environmental disasters."
   - Ability of users, vessels, and aircraft to communicate with each other and to receive information, such as real-time weather and sea ice forecasts, will significantly decrease the risk of environmental damage and loss of life and property at sea.
   - Leverages similar efforts being undertaken for other national interests in the region, including implementation of National Ocean Policy as promulgated in Executive Order 1357, and National Security Presidential Directive 66/ Homeland Security Presidential Directive 25 (§§ III(B), (E), (F) and (H)).

2. Timeframe – Long-term

3. Outcomes
   - A system that addresses the most urgent gaps in communications and meets relevant user needs in the Arctic region.
   - Prevention of/Response to allisions, collisions, and groundings.
   - Prevention of/Improved Response to environmental disasters and loss of life and property at sea.
   - Minimize injury to marine mammals from vessels strikes and entanglement in fishing gear.

4. Milestones
   - All to be developed in coordination with other interagency efforts:
     - Inventory of existing communication capabilities and gaps.
     - Baseline of the performance capabilities of MF/HF/VHF/UHF communications systems to air and surface vessels in the Arctic.
     - Baseline of the performance of air, surface, and available shore-based sensors.
     - Analysis of communication capabilities and gaps in the Arctic Region.
     - Analysis and recommendations for the most cost-effective means to reduce communication gaps and boost capabilities in the Arctic Region.

- Implementation of recommendations to reduce communication gaps and boost capabilities in the Arctic Region commensurate with available resources and user needs.

5. Gaps and Needs in Science and Technology
   - Analysis of Arctic communications environment.
   - Analysis of alternatives.

E. Action 5: Advance Arctic marine mapping and charting.
This action will support accurate hydrographic surveys and biological/shoreline mapping that is essential for up-to-date nautical charts of U.S. Arctic waters and the Alaskan coastline, and for habitat characterizations for ecosystem stewardship and restoration.

1. Why Do This
   - Compared to the rest of the nation, the Arctic geospatial reference system (geodetic control, water level, hydrology, and shoreline) is poorly known.
   - This action contributes fundamental data essential for:
     - Nautical charting for safe navigation;
     - Sustainable, secure and productive access to the Arctic maritime environment;
     - Environmental management and emergency response planning;
     - Sea level change impact assessments;
     - Inundation modeling;
     - Biological assessments;
     - Awareness of environmental conditions in the Arctic domain;
     - Coastal community adaptation strategies for increased resilience to storm hazards and climate change impacts; and
     - Improve the resiliency of ocean economies and commerce.

2. Timeframe – Long-term

3. Outcomes
   - Improved maritime safety in the Arctic.
   - Resilient ocean economies and commerce.
   - Better tools for coastal communities to develop adaptation strategies and disaster planning.
   - Improvement to the underlying geospatial framework of data that supports scientific research and economic decision-making in the Arctic Ocean region.

4. Milestones
   - Complete airborne gravity data collection over the State of Alaska to help correct meters-level errors in positioning to centimeter level.

- Explore potential partnerships to establish Continuously Operating Reference Stations and water level stations for accurate datums and positions.
- Conduct Waterway Analysis and Management System (WAMS) assessments and Port Access Route Studies (PARS) of the Arctic region, focusing on areas indicted by risk/return analysis, to support decisions on mapping and charting priorities and waterways management.
- Prioritized list of Arctic maritime regions and shorelines for surveying.
- Establish mapping guidelines and/or standards to facilitate integrated ocean and coastal mapping.
- Coordinate mapping operations for maximal efficiency and coverage.
- Acquire Arctic hydrographic and shoreline data for accurate nautical charts and storm surge models.
- Update nautical charts, environmental sensitivity indices, and other Arctic feature maps.
- Archive data at national data centers to facilitate additional uses and scientific study.
- Continue to work with the International Maritime Organization to develop safe and secure shipping and prevention of marine pollution by ships in the Arctic.

5. Gaps and Needs in Science and Technology
   - New *in situ*, underwater, airborne, and satellite observing technologies able to withstand the rigors of the Arctic environment to fill gaps in hydrographic, shoreline, and biological datasets.

F. Action 6: Improve coordination on Arctic Ocean issues.

Implementing this strategic action plan requires coordination of scientific research, natural resource management, and national and international marine stewardship policies concerning the Arctic Ocean. The roles and responsibilities of Arctic interagency policy groups must be clearly defined to efficiently share information.

1. Why Do This
   - To clarify the sometime overlapping efforts of the following Arctic interagency policy groups within the Federal government: the Interagency Arctic Research Policy Committee (IARPC), the Arctic Policy Group (APG), and the Arctic Region Interagency Policy Committee (ARIPC) associated with NSPD-66/HSPD-25.
   - To support, as appropriate, U.S. participation in the working groups of the Arctic Council and to clarify the links between domestic and international Arctic activities.
   - Helps leverage existing resources, capabilities, and knowledge among agencies; shares information to reduce duplication and increase interagency coordination; and increases government efficiency by using established groups.
   - This action will be coordinated with the Coordinate and Support SAP.

2. Timeframe – Near-term

3. Outcomes

- Increased sharing of data and information to improve understanding of the changing Arctic Ocean and natural resource management decision-making.
- Clear communications among Federal agencies, the State of Alaska, Alaska Native communities, and international organizations through IARPC, APG, ARIPC, and bilateral activities with Arctic states.
- Incorporation of traditional and local knowledge into scientific research and decision-making.
- Integration of a wide-range of data types (satellite, *in situ* observations, charts).
- Coordination and leveraging of agencies' Arctic Ocean resources.
- Increase awareness of Arctic Ocean activities.

4. Milestones

- IARPC report released by the National Science and Technology Council that clarifies interagency roles, responsibilities, and mechanisms for coordinated decision-making.
- IARPC proposed structure for information sharing aligned with open.gov.
- Routine coordination with regional groups including the Alaska Climate Change Executive Roundtable (ACCER), North Slope Science Initiative (NSSI), Landscape Conservation Cooperatives (LCCs), Arctic Ocean Observing System (AOOS).
- Integrate national and international efforts by increasing coordination among IARPC, APG, and ARIPC.

5. Gaps and Needs in Science and Technology – None.