"Critical Environmental Intelligence as a Force-Multiplier for Arctic Stewardship"

5th Symposium on the Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations
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Thanks/acknowledgements

I am delighted that Senator Murkowski, Senator Begich and Lt. Governor Treadwell are participating in this symposium.

And I want to extend a warm welcome to the Chair of the Arctic Council, Minister Riordan from Canada, and thank her for her leadership and the work of the Council.

My congratulations and thanks to Dr. Pablo Clemente-Colon, and everyone at the National Ice Center and the U.S. Arctic Research Commission for putting this event together.

I am proud to be joined by a number of NOAA experts who will be speaking at the symposium.

On behalf of the entire NOAA team, I extend greetings to our wonderful partners across the federal, state and international family, industry and academia. Partnerships are key to everything NOAA does in the Arctic, so I am especially pleased to have them here, where we all can share ideas, challenge each other, and enhance our common efforts toward shared goals in this critical region.

Rapid change in the Arctic: science -> society

The rapid pace of change in the Arctic brings urgency to our common work.

- Last year the historic benchmark of 400 ppm CO2 was reached at 6 of the 7 Arctic observatories.
- Summer sea ice melted to a new historic low, the second "historic low" in 5 years.
- Minimum extent of multi-year sea ice has diminished by 50 % in area and 75% in volume, compared to 1970s climatology.

Recent analyses indicate we can expect to see a nearly ice-free summer Arctic by 2050 – sooner than many previously thought.

The upshot is abundantly clear: With an ice-free summer ocean nearly upon us, the Arctic is quickly becoming more accessible, accelerating the need for environmental information and operations-oriented readiness, response and assistance. The implications for NOAA are significant: increasing requests for comprehensive, up-to-date nautical charts; for more-detailed Arctic weather forecasts and

severe storm warnings; for better short- and long-term sea ice forecasts; for integrated environmental impact assessments.

What's needed = CEI

All of these products - Weather forecasts, severe storm warnings, short and long-term sea ice forecasts, updated nautical charts, scientific assessments (such as NOAA's Arctic Report Card) - are examples of CRITICAL ENVIRONMENTAL INTELLIGENCE: timely, actionable information, developed from reliable and authoritative science, that can give us foresight about future conditions; that can inform the myriad decisions we confront each and every day as we live our lives and craft our livelihoods on this very dynamic planet … decisions that determine our comfort and our safety, and affect both the immediate profitability and long-term sustainability of communities and businesses. Just like the "intelligence" of the security world, so too this environmental intelligence is a combination of data, analysis, modeling, and assessment.

This morning I will:

- Highlight a few of the many ways that NOAA, along with our many domestic and international partners, collects, produces, and uses CEI;
- Look at the role of CEI in some of our newer, innovative partnerships, as illustrated by recent oil and gas activities;
- Close with reflections on the role that CEI plays in promoting the kind of Arctic management envisioned in recent federal policy frameworks for the U.S. Arctic region

NOAA's mission and CEI

NOAA's roots go back to Thomas Jefferson's establishment of The Survey of the Coast in 1807. Our coming of age as an agency was the result of the Stratton Commission, which foresaw the nation's need for a single agency that worked both science and policy across the air-sea boundary. Today, NOAA's mission is one of science, service, and stewardship of the nation's oceans and coasts. True to our roots, science underpins all that we do. The crux of our mission is to build rich understanding of the Earth, especially atmospheric and oceanic processes, and to transform that understanding into CEI.

NOAA Arctic Vision and Strategy

Recognizing the rapid pace of change in the Arctic and the implications for our mission, NOAA formulated its Arctic Vision and Strategy in 2010.

Our historic roots shine through this Vision and Strategy: climate and weather; oceans, coasts and fisheries; foresight and stewardship; resilient ecosystems, communities and economies. This is a view in which humans are integral to – not separate from - global ecosystems. The ocean feeds us, fuels us, and underpins a major fraction of our economies on local to global scale.

NOAA's Arctic Vision and Strategy identifies six priority areas of focus, each of which and all of which contribute to improving the science that informs decision-making and supporting our goals of enhancing services and stewardship. They are:

1. Forecast sea ice
2. Strengthen foundational science to understand and detect Arctic climate and ecosystem changes
3. Improve weather and water forecasts and warnings
4. Enhance international and national partnerships
5. Improve stewardship and management of ocean and coastal resources in the Arctic
6. Advance resilient and healthy Arctic communities and economies

These goals provide the information, knowledge, and services that people need to live and operate safely in the Arctic, while supporting healthy, productive and resilient communities and ecosystems.

NOAA CEI in This Symposium

1. Climate - Ice - Ecosystems

As I said, science provides us with the foresight to help us understand and anticipate Arctic change.

In this arena, NOAA's climate observations program, along with similar efforts by partners from the federal family, academia, and around the world, capture the changing Arctic oceans and atmosphere. These observations allow us to analyze the status and trends of key variables in the Arctic atmosphere, ice, ocean and marine ecosystems. You'll hear more about this work from NOAA's ***Kathy Crane***, ***Jim Overland***, and ***Pablo Clemente-Colon.***

We are only just beginning to understand ecosystem-wide impacts of these changes. Until we have that greater understanding, it is prudent to take a precautionary stance, especially when actions may trigger changes that are irreversible or that may affect huge areas or last for decades to centuries. A case in point comes from the North Pacific Region Fishery Management Council, which decided in 2009 to prohibit expansion of commercial fishing in U.S. federal waters in the Beaufort and Chukchi Seas until a sounder scientific basis for fisheries management exists.

To improve our understanding of these ecosystems and the impact of climate change, and now ocean acidification, on ocean ecosystems, NOAA is involved in 15 ecosystem research projects throughout the Pacific Arctic. These include: surveys of fisheries and marine mammals; oceanographic process studies; studies of habitat use and ecosystem structure and function; and the collection of long time-series to detect change. All of these studies are linked, to provide integrated ecosystem research – trans-disciplinary research that links the physical and chemical changes in the ocean with changes in biological systems and processes.

NOAA's ***Ed Farley*** will present findings from some of this work, looking at connections between declining sea ice and marine fisheries – one of the main pieces of integrated assessment needed for ecosystem-based fisheries management in the Arctic.

The Russian-American Long-term Census of the Arctic – aka RUSALCA - has been observing sea ice extent and ocean processes through the Pacific Gateway and monitoring indicators of climate change since 2004. This work is a long-term collaboration between NOAA, the Russian Academy of Sciences, Roshydromet and the U.S. Fish and Wildlife Service.

I want to salute ***Mr. Sokolov***, who is joins us from the Russian Federation Embassy. This is the first time we have had the pleasure of welcoming Russia to this symposium.

More recently, we began focusing our attention on biological 'hotspots' along a latitudinal gradient – via what we call Distributed Biological Observatories, or DBOs. DBOs are regions exhibiting high productivity, biodiversity, and rates of change that we sample repeatedly through time. Again, this is an international collaboration of the Pacific Arctic Group, comprised of Russia, China, Korea, Canada, Japan. NOAA's ***Kathy Crane*** will have more to say about the findings of the recent DBO data workshop. The data acquired at the DBOs are integral to every goal in NOAA's Arctic Vision and Strategy.

As we all know, data are necessary but not sufficient. Analysis and synthesis are needed to make data actionable; to transform data into the scientific understanding that can inform management practices and decisions. This kind of synthesis is the objective of SOAR, the Synthesis Of Arctic Research, a partnership between Pacific Marine Arctic Region Synthesis, NOAA and the Bureau of Energy Management's (BOEM) Alaska Region. SOAR's overarching goal is to apply analytical and modeling approaches to data available from a cross-section of Arctic research activities, in order to test hypotheses that cross scientific disciplines. SOAR connects results across a spectrum of science projects and scales of observations, and communicates findings to resource managers, local Arctic residents, national and international science societies and the general public. Reflecting best practices of participative and holistic management, SOAR is guided by an independent Scientific Steering Committee comprised of local residents and federal and state research scientists.

One of the biggest challenge facing all of us in our Arctic endeavors is the sparseness of environmental observations in this huge region. Observations of sea ice; of weather; of water levels and currents; shorelines; of physical, oceanographic, atmospheric and chemical variables; of living marine resources. New platforms, like Unmanned Aerial Systems and Wave Gliders, promise to boost capacity and are helping us to reach previously unobserved regions. NOAA's ***Robbie Hood*** will be talking about our work with Canada on unmanned aerial systems.

Whatever the technologies and platforms, it is clear that meeting the emerging CEI demands in the rapidly-changing Arctic will require denser observations, sustained observations and higher spatial and temporal resolution for many measurements. These are essential to meeting NOAA's goals of improving weather and sea ice forecasts, storm surge and oil spill trajectory models, nautical charts for safe navigation and assessments of human impact on marine ecosystems, mammals and protected resources. They are essential to everyone with interests in the Arctic, be they economic, environmental, social or political; national, tribal or commercial.

2. Sea ice forecasts: CEI for energy security – BOEM/Shell example[1]

Last year's exploratory drilling observations in the Alaskan Arctic provided some dramatic lessons in the importance of robust observations, sound research and timely CEI.

Sea ice formation in the Arctic Ocean is a complicated process, related to many environmental factors: winds, temperatures, and radiation; surface and sub-surface ocean temperatures, water salinity, ocean currents; and antecedent ice conditions. Considerable uncertainties exist for seasonal sea ice forecasting. These, plus the rapidly changing baseline in the Arctic make it difficult to provide a precise date for the timing of sea ice freeze-up in the open water or for the many communities along Alaska's coastline.

The problem is that sea ice forecasts – specifically, freeze-up date forecasts – are of increasing importance. They are crucial to setting the "trigger date" for ending the drilling season at any particular drilling site. The "trigger date" is the date 38 days prior to the forecasted freeze-up date. This 38 day window ensures there is adequate time, while ice-free conditions still exist, to respond to a potential oil spill. This time frame is based on a review of historical data indicating when the site would freeze over.

But freeze-ups can occur suddenly. We saw this during the 2012 drilling season, when an area of the Chukchi Sea the size of Pennsylvania froze in less than 48 hours, surprising everyone and causing quite an operational scramble in response. NWS Alaska forecasters, at BOEM's request, had been providing BOEM with weekly sea ice forecasts from September onward. Based on these weekly updates, BOEM resisted pleas to extend the drilling period and maintained the original September 23 trigger date. The flash freeze occurred on October 31-November 1 - exactly the 38 days protected by the "trigger date" window.

This example illustrates how CEI can play a critical role in providing foresight for safe Arctic operations, in this case for Shell's offshore energy business, and for Arctic stewardship.

But other important lessons come out of this episode.

- The first lesson? Another lesson in the precautionary principle: We must err on the side of precaution when high uncertainty exists. And high uncertainty does exist for seasonal sea ice forecasting.
- The second lesson is again about observations. We believe that the Chukchi October/November flash freeze may have been triggered by a region of shoal water being exposed to a particular set of wind and circulation patterns. Clearly, we need a broad array of sustained observations - from bathymetry to weather parameters and oceanic parameters - as building blocks of CEI for this decision-critical sea-ice forecasting. The corollary? We shouldn't fool ourselves into thinking we can buy observations of just one or two types and declare victory.

Gene Petrescu (peh-TRES-q) from the Weather Service Alaska region will give you an eyewitness, blow-by-blow account of this forecasting story on Thursday.

[1] Example provided by Amy Holman

Everyone learned a great deal from this surprising event, and it has led to some productive changes. Within the Federal family, for example, NOAA's Weather Service now works much more closely with the leasing and safety units within the Department of the Interior, on projected ice forecasts, situational awareness of weather and sea ice conditions in the Chukchi and Beaufort Seas through the open-water season, and general outlook information for summer 2013. The Department of Interior is using this information to make science-based decisions regarding Arctic drilling that promote our national energy goals while also ensuring protection of one of our most unique environments.

The role of partnerships in CEI

No nation can go it alone on CEI. Neither can a single agency, company or commercial sector really go it alone when it comes to CEI in a rapidly changing Arctic. NOAA understands this. We have always relied on partnerships, and have recently developed some innovative new ones.

One example is the partnership we developed recently with a consortium of Arctic energy companies, aimed at filling the huge observational gap we all face in the Arctic. Under this agreement, NOAA and Shell Exploration & Production, ConocoPhillips, and Statoil USA E&P Inc. now share weather and ocean observations, biological information, and sea ice and sea floor mapping studies. NOAA saw a 50% increase in Arctic marine weather observations just in the first four months of this agreement. These additional oceanic and meteorological data will enhance the Arctic regional climatology analyses and the historical, quality-controlled World Ocean Database developed by NOAA scientists.

CEI is a central thread in our many partnerships; the foundation needed to achieve many mutually-beneficial outcomes, such as: sustained observations; ecosystem research; data sharing; safer oil exploration; tools for oil spill response and spill response training; species protection; and dialog for shared decision-making involving diverse stakeholders.

A partnership with DOI's Bureau of Safety and Environmental Enforcement (BSEE) expedited and enhanced development of ERMA (Environmental Response Mgmt App), the same interactive online mapping tool used in the Gulf of Mexico during the Deepwater Horizon oil spill response.

Arctic ERMA was at the center of a workshop conducted in Kotzebue, Alaska to provide details on how a natural resource damage assessment would be carried out in the aftermath of an Arctic oil spill.

NOAA continues to work with our partners, including BSEE and indigenous communities, to identify new data sets and to share information on how ERMA can best support an emergency response and help protect the unique lifestyle and resources of the region.

In short: CEI can be a focus for collaborative partnerships that help to build understanding of the changing Arctic. It is something that people want and need to inform critical decisions that affect communities, businesses, and ecosystems. It is a potent force-multiplier for science, services, and stewardship in the Arctic region.

Recent policies & CEI

CEI is the foundation not only of NOAA's work , but also of recent national policies affecting US activities in the Arctic region and our collaboration with Arctic nations. The new National Strategy for the Arctic Region, released in May, signals the President's attention to the Arctic, and points to the strategic position the Arctic occupies for our national security, the importance of pursuing responsible stewardship of its resources and environment, and the criticality of international partnerships to success in these areas. The Strategy also identifies informed decision making as a guiding principle for each of these objectives, and includes a specific call for integrated management of arctic resources. Across all of these lines of effort, the Strategy recognizes and affirms the need to make our management decisions rationally, through an integrated approach, and from a position informed by the best available science or, as we have been talking about it here, CEI.

You will hear more about the U.S. National Strategy for the Arctic Region from ***Brendan Kelly*** of the White House Office of Science and Technology Policy, later this afternoon, and, tomorrow, ***David Kennedy***, NOAA's Deputy Under Secretary for Operations will provide an overview of how NOAA is moving out to respond to this new strategy, our changing needs and mission in the arctic, and other relevant federal policies such as the National Ocean Policy.

Summary and Closing

Since the 2011 symposium, national policy frameworks are beginning to catch up to the realities of climate change and the rapidly-changing conditions in the Arctic. However, all Arctic nations and partners still wrestle with insufficient critical environmental intelligence - in many instances even basic data needed to have more accurate and timely sea-ice and weather forecasts, disaster warnings, nautical charts, tide and current data, and so on. We urgently need more robust, sustained, multi-disciplinary observations, new observation technologies and platforms, research and syntheses, and right-scaled models of climate ecosystem dynamics, if we are to live and work wisely and well in this newly-opening environment. We must improve our capacity to generate CEI, and our use of it to inform decisions facing us today and in the future.

Each of us here today is part of a larger Arctic community. We cannot forget that the people of the Arctic should have a strong voice in their future. We must call upon that local knowledge as well as the best available science to inform our decision making.

Our community can grow stronger and more resilient though lasting partnerships, committed stewardship, and foresightful leadership – all of which can be informed by CEI.

The ways we choose to work together, plan together, and make decisions together will do much to shape the future of the Arctic. But what happens in the Arctic doesn't stay in the Arctic. Our planet's

natural systems are richly interconnected, as are the economic, political and social systems in which we live. And so we must also remember that our decisions and actions in the Arctic also shape our world and our planet, and so affect all of the seven billion people who share it. This reality should inspire - and compel - each of us to strive to insure that we arm ourselves with the best possible environmental intelligence and use it wisely in the emerging Arctic of the 21st century. ###