

Designing an Effective Arctic Observing Network: Collecting Sea Ice System Data to Inform Multiple Stakeholder Concerns

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Cover: An Integrated Seasonal Ice Zone Observing
Network (SIZONET).”

OBJECTIVES

This talk briefly explains the linkages between scientific data production and policy implementation related to sea ice loss in the Arctic.

Our research proposes the most appropriate sea ice observations must be

- (a) *linked to sea-ice system services*
- (b) *multi-scalar*
- (c) *taken in locations where institutional density is thickest in correspondence to the greatest social debate over resource use.*



RESEARCH DIMENSIONS

Our research is informed by four major threads:

- (1) The generation of science in the Arctic*
- (2) The Arctic as creator of social-ecological systems: resource systems (ecological) and ecosystem services (social)*
- (3) Institutional analysis*
- (4) The role of organized interests in society*



ARCTIC SCIENCE

- Complex multi-use systems are the most difficult for which to establish rules of use.
- As sea ice retreats and the Arctic becomes more accessible, a suite of interests in the Arctic Ocean region represents a powerful set of actors who have strong national and international lobbies to promote governmental change
- Science is touted as the mechanism to guide Arctic policy
- But *science itself is not neutrally produced, interpreted or used.*



THE SEA ICE SYSTEM IN THE ARCTIC

- Creates an annual pan-arctic interlinked resources systems which are common pool resources by their nature (diminishing access thresholds, subtractable resources)
 - Marine habitat
 - Land habitat
 - Temperature regimes
 - Albedo processes
- Provides on the local scale services directly used by humans in what we discuss as the **Sea Ice System Services model** (Eicken, Lovcraft, Druckenmiller 2008)
 - Platforms for hunting or drilling
 - Animals for harvest
 - Land and sea -scapes for viewing



PROBLEM EXAMPLE

SEA ICE SERVICES

- Polar Bears depend on sea ice for hunting, denning, and rearing young.
 - Communities depend on the bears for a lucrative hunting (e.g. Nunavut) or tourism industries (e.g. Churchill, Manitoba).
- Petroleum exploration and recovery views sea ice as a hazard and obstacle to development
 - Icebreakers and undeveloped resources
- Scientists recognize sea ice, as well as glaciers and other ice covers as essential to climate regulation.
- In Barrow, for example, sea ice is a platform for whale butchering and ocean access.



ECOSYSTEM SERVICES AND POLICY

- The sea ice system provides “something” to a variety of stakeholders.
- All actors related to sea ice are subject to a variety of scales of rules from the very local use of bear guards in Barrow, AK to national regulations on drilling, to international rules on whaling.
- When we consider the sea ice system we come to understand that there is no comprehensive set of rules to govern the social or geophysical or biological variables that create and recreate this system.
- This alone is not a problem, but *as sea diminishes stakeholder’s needs will come into conflict. How can science best inform the tradeoffs that are inevitable in a shrinking sea ice system?*



PLANNING LONG-TERM EFFECTIVE SCIENTIFIC OBSERVATION SYSTEMS

- The human interest in exploiting the Arctic means science is called upon to provide data for management decisions. In order to maintain levels of ecosystems services desired by society science is turned to a suite of questions that rest upon observing Arctic sea ice. Two key questions arise:
- Under what parameters should observations be taken?
- Where would the resulting information go?



OBSERVATION PARAMETERS

- If we want science to have maximum impact, by which we mean providing pertinent data to the social questions requiring science for decision-making then we have to take measurements where the social debates are the greatest (usually meaning the most polarized)
 - Polar bear habitat versus oil drilling
 - Whale habitat versus seismic exploration
 - Scientific access versus land claims
 - Preservation of wilderness versus tourism
 - Expanding shipping versus invasive species

We can use institutions to guide our observations...



OBSERVATION PARAMETERS (CON.)

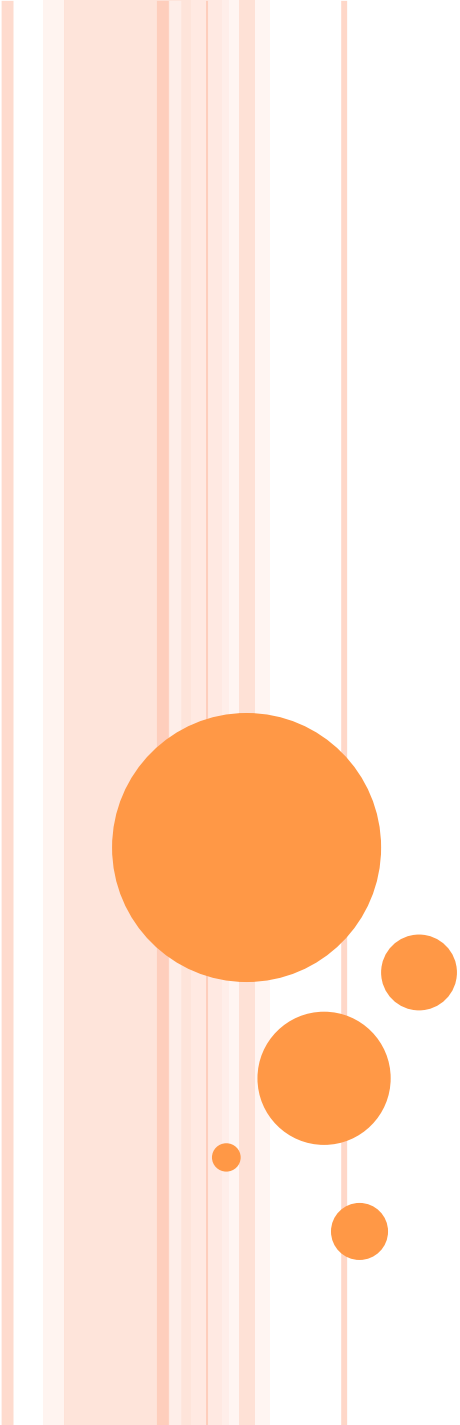
- Rules are the social expression of politics – *Institutions* are bounded rule sets directed toward forbidding or encouraging different behaviors. These rule sets come from governments local to national and as international regimes.
- Institutions can serve as a proxy for what society (1) **values** *and consequently* (2) **debates**
- Furthermore, institutions are attractors of interests; those who are or consider themselves to be stakeholders in the institutional setting.
- Observations must span all interests' scales



WHY NOT JUST CONSIDER GOVERNMENT FUNDING AN INDICATOR OF SOCIAL NEED?

- Some major concerns are not directly addressed by funding agencies. In other words scientists have to be attentive through research to collaborative partners (e.g. sea ice as sound buffer for marine mammals).
- Some data is not fully scalar, we must include the richness and inherently context dependent observations of local and indigenous people.
- There is private science (corporate) taking place alongside public science that is proprietary. This data is important but not governmentally funded as well as a rich source of information that is inaccessible.





**SEA ICE SYSTEM
SERVICES
and their
INSTITUTIONS
and their
INTERESTS**

Type of Institution	Sea Ice System Service	Institution	Scale	Monitoring variable
Resource conservation	Shoreline protection	Coastal Zone Management Act	Cross-scale	?
	Aesthetics of seascapes	Coastal Zone Management Act Alaska Coastal Zone Management Program North Slope Borough coastal plan City of Barrow land use plan	Cross-scale Cross-scale Regional Local	Density of development
	Ice-dependent marine mammals	MMPA Co-management boards	National Regional	Extent and location of summer sea ice, habitat qualities associated with pack-ice, shore-fast ice, marginal ice zone
	Endangered species associated with ice	ESA AEWC	National Regional/Tribal	Ice as sound barrier, Ice edge as habitat for forage food
Resource harvesting	Bowhead whales	International Convention on Whaling MMPA AEWC cooperative agreement Barrow Whaling Captains Assoc. Bylaws	International National Cross-scale Local	Dynamics of leads, timing of ice retreat
	Ice seals	MMPA Ice seals committee co-management agreement	National Cross-scale	Habitat qualities in shore-fast, marginal, and pack ice (e.g. snow depth on shore-fast ice for ringed seals)
	Walrus	MMPA Eskimo Walrus Commission co-management agreement	National Cross-scale	Location of pack ice in relationship to forage food
	Polar bears	Agreement MMPA	International National	Multi-year ice

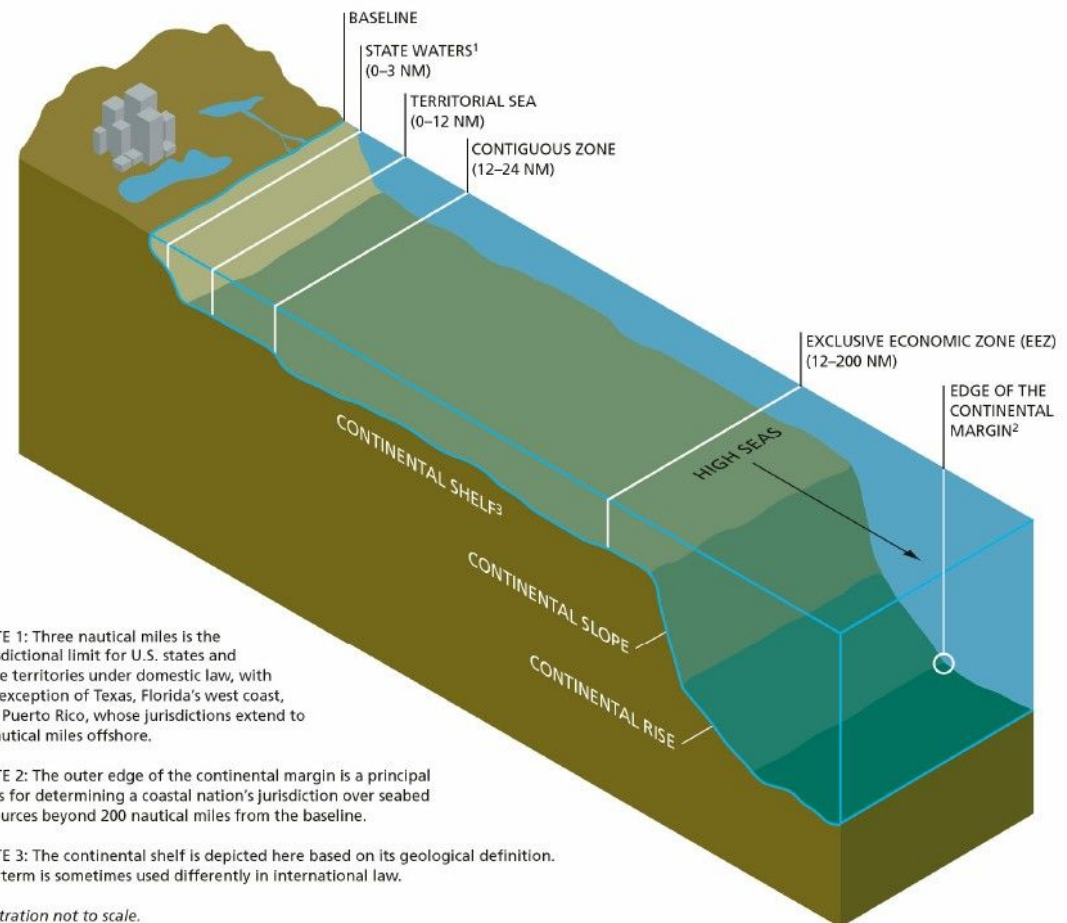
Type of Institution	Sea Ice System Service	Institution	Scale	Monitoring Variable
Hazard reduction	Trajectory of oil spill, encapsulation and biodegradation of oil	Clean Water Act	National	Brine strength, temperature, particulate concentration and microbial communities in brine pockets
		Alaskan version of CWA	State	
	Ice cover as protection from coastal erosion	Coastal Zone Management Act Alaska Coastal Plan North Slope Borough coastal plan City of Barrow	Cross-scale Alaska Regional Local	Thickness, age?
	Reflective surface for climate regulation	Kyoto Protocol Clean Air Act	International National	Albedo
Ecological externality-producing	Platform for activities	OCSLA	National	Thickness, strength, lead distributions, shore-fast ice extent
	Maritime traffic hazards	UNCLOS ?	International National	Barnett Sea Ice Severity Index



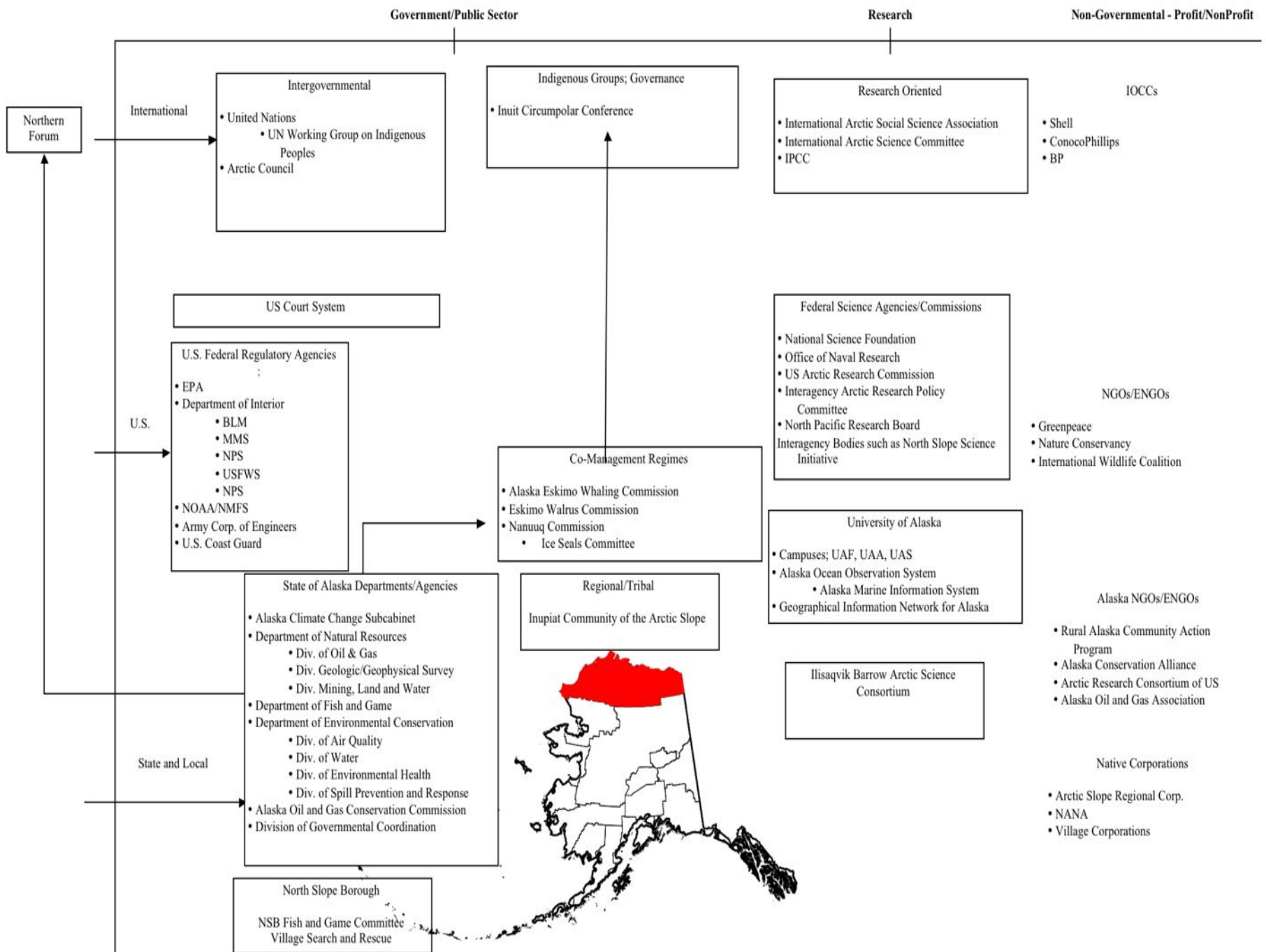
The Arctic coastal zone from a legal perspective

- The coastline is the location of the 0-m isobath at mean high tide, i.e., the line that separates ocean from land. (1-D)
- The coast is the zone that is directly impacted by both processes on land and in the ocean through exchange of matter and energy. (2/3-D)
- Legal definitions: Baseline (line dividing land from ocean - 0 miles); submerged lands act (1953) granting states access to 3 nm coastal zone
- What about the 4th dimension?

Figure P.1 Lines of U.S. Authority in Offshore Waters



Several jurisdictional zones exist off the coast of the United States for purposes of international and domestic law. Within these zones, the United States asserts varying degrees of authority over offshore activities, including living and nonliving resource management, shipping and maritime transportation, and national security. A nation's jurisdictional authority is greatest near the coast.



WHAT WILL HAPPEN TO THE INFORMATION?

- Science will have to trust the democratic process in which organized interests representing large numbers of stakeholders, as well as the general public, press claims on government.
- In order for all the interests to access and be able to use this information, in other words participate in the democratic process of governance of the United States (Canada, Norway etc...) we also suggest this information be translated.
- We suggest the creation of a Sea Ice Index modeled on the Air Quality Index hosted by the EPA.

