

ARCTIC 2050

Towards ecosystem-based management
in a changing Arctic Ocean

12 March 2014, Brussels

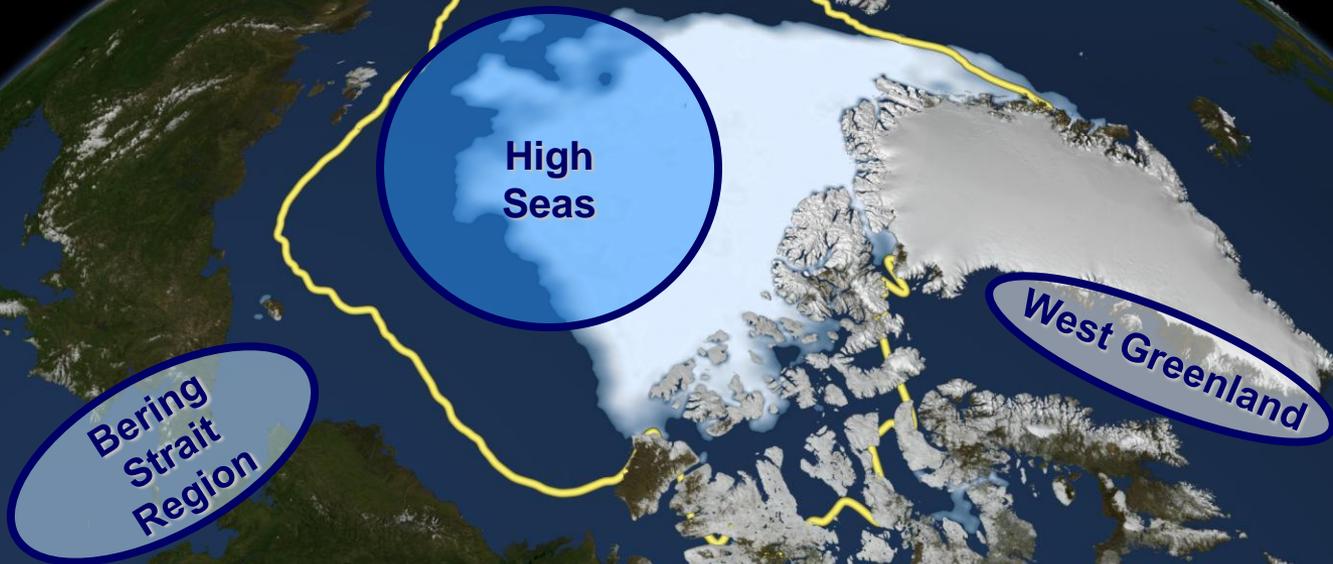


ARCTIC SHIPPING



Prof. Paul Arthur Berkman
University of California Santa Barbara

September 16, 2012



MISSION

To identify development and governance options that balance economic, social, and environmental interests in Arctic coastal-marine systems through an international, interdisciplinary and inclusive process of data analysis.



ARCTIC OPTIONS

Holistic Integration for Arctic Coastal-Marine Sustainability

www.arcticoptions.org

Observations for Arctic Shipping

1. The Arctic Ocean already has undergone an environmental state-change, shifting from a marine system dominated by multi-year sea ice throughout the year to a system that is now dominated by open water during the summer and first-year sea ice during the winter.

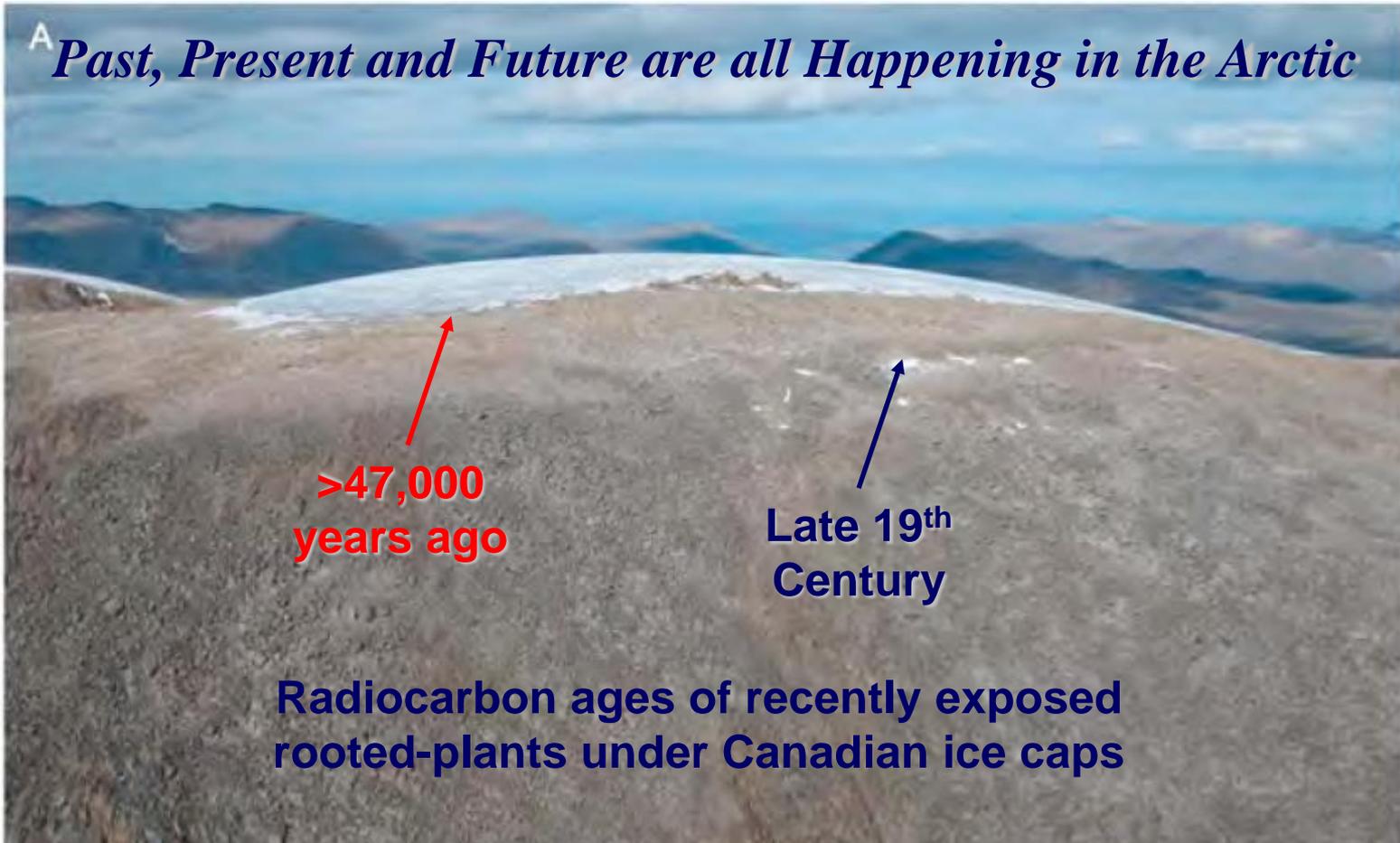
❖ Dominance of first-year sea ice during the winter opens potential opportunities for year-round trade in and across the Arctic Ocean today.

2. Destinal versus transpolar trade in and across the Arctic Ocean appears to be less about environmental conditions or ship capabilities than about the pairing of commodities sold between Europe and Asia in both directions.

❖ Shipping through the high seas, rather than exclusive economic zones, will be a threshold in the economics of Arctic maritime trade.

3. Maritime trade, tourism and other marine transport activities are likely to emerge faster than the necessary infrastructures for safe, secure and reliable shipping in the Arctic Ocean.

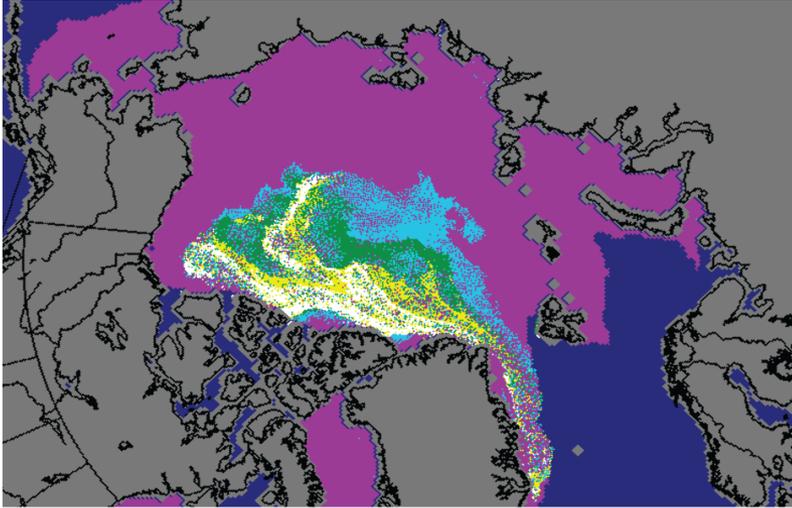
Unprecedented Arctic Change



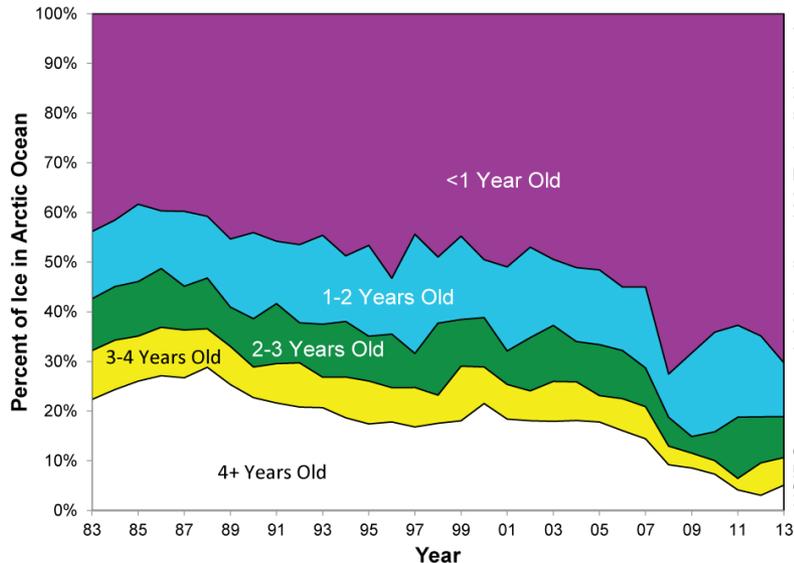
“There has been no intervening century during which summer warmth exceeded that of the last ~100 years.”

Environmental State-Change in the Arctic Ocean

Arctic Sea Ice Age, March 2013



Arctic Sea-Ice Cap
New Boundary = New System
Unprecedented Change over Millennia
Rate of Change: Thickness > Extent
Winter: > 50% First-Year Sea Ice
Summer: > 50% Open Water



NSIDC courtesy J. Maslanik and M. Tschudi, University of Colorado

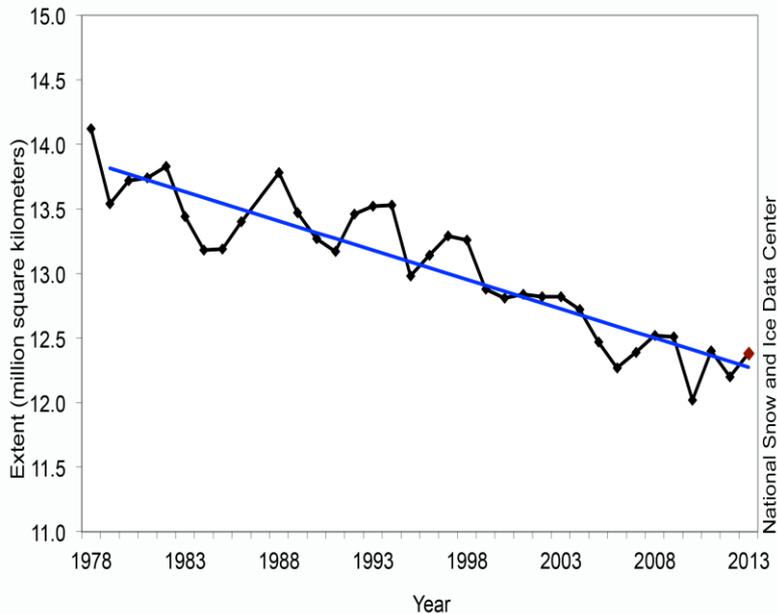
Inherent Risks of Instabilities

- **Political**
- **Economic**
- **Cultural**
- **Environmental**

Commercial Opening of the Arctic Ocean

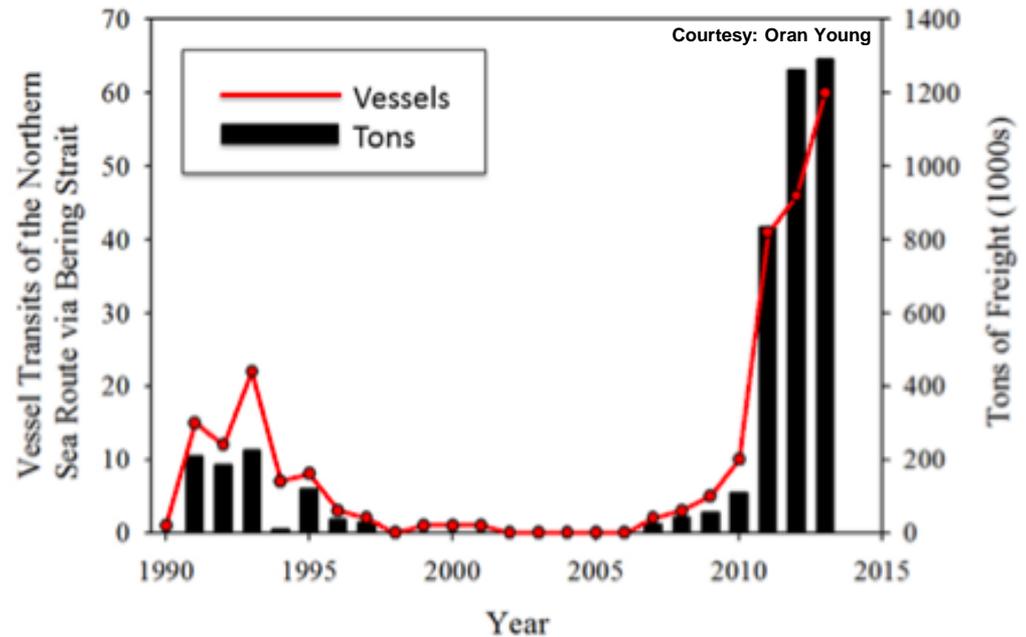
Cause

Average Monthly Arctic Sea Ice Extent
December 1978 - 2013

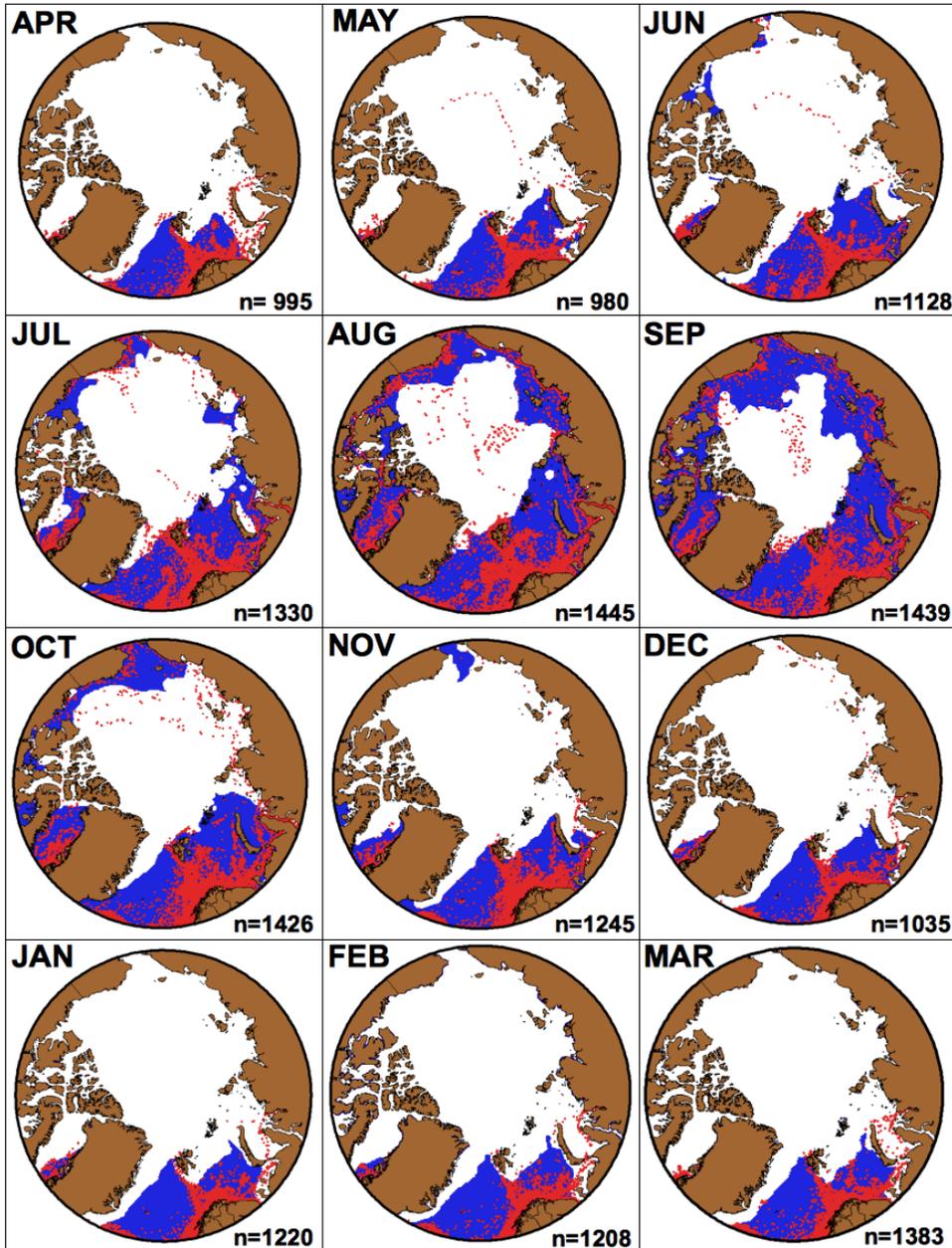


Effect

Transit Traffic on the Northern Sea Route: 1990-2013



Ship Traffic Baseline in the Arctic Ocean



INSTITUTIONAL AWARENESS AND OPERATIONAL DECISION-MAKING

Geographic Information System (GIS) analyses of surface vessel positions (red) that have been aggregated on a monthly basis north of the Arctic Circle (66.5°N) derived from Automatic Identification System (AIS) messages encoded with vessel characteristics from each ship received by the SpaceQuest satellite constellation within every 24-hour period from April 2010 through March 2011. More than 280,000 time-stamped AIS messages were received. Monthly median extent of sea ice (white) and open water (blue) from passive microwave satellite measurements are shown with land (brown) and number of ships (n). The ship identifications reveal more than 3200 distinct vessels with the largest densities in perennially ice-free areas as well as year-round operations in ice-covered areas. These data (Eucker 2011) provide the first real-time baseline for operational decision-making about shipping across the entire Arctic Ocean (Eucker and Berkman unpublished).

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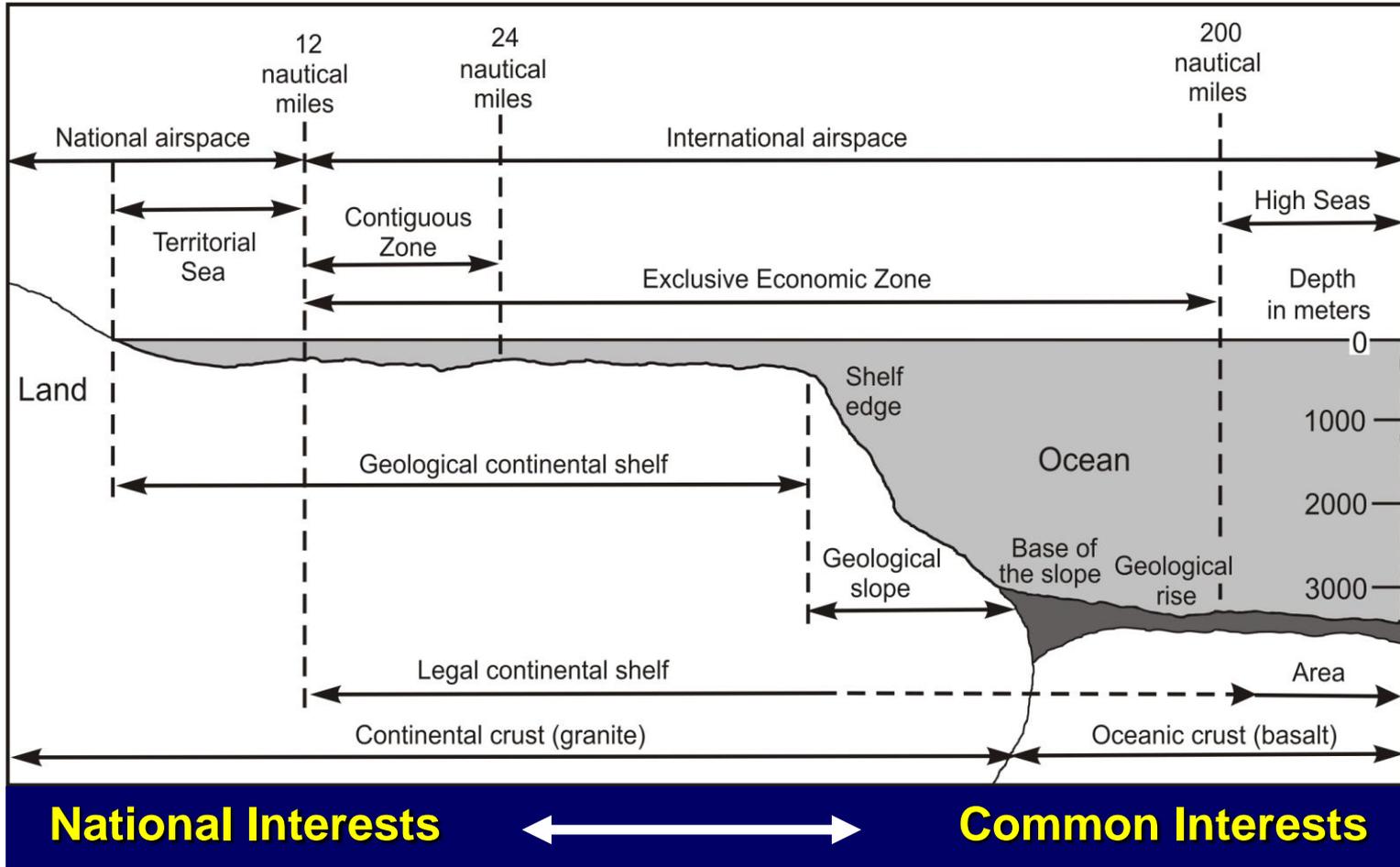
3. Maritime trade, tourism and other marine transport activities are likely to emerge faster than the necessary infrastructures for safe, secure and reliable shipping in the Arctic Ocean.

“...important rights and obligations...”

United Nations Convention on the Law of the Sea

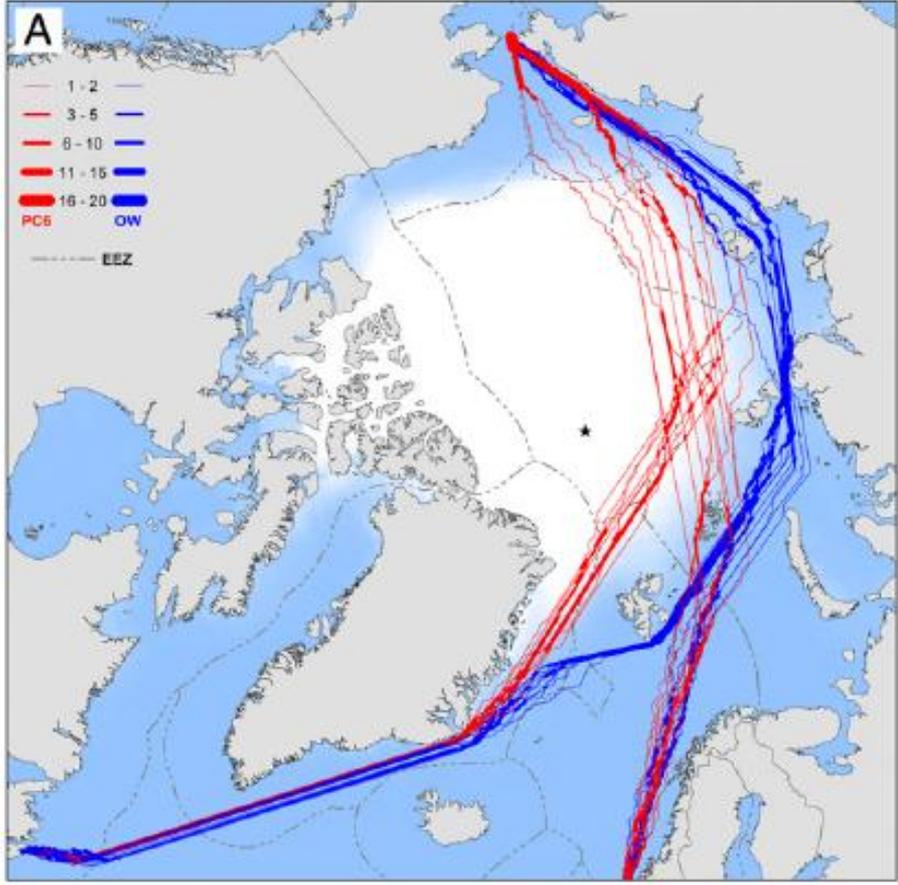
Signed: Montego Bay, Jamaica, 10 December 1982 Entered into Force: 16 November 1994

Ratification, Accession or Succession: 165+ Nations

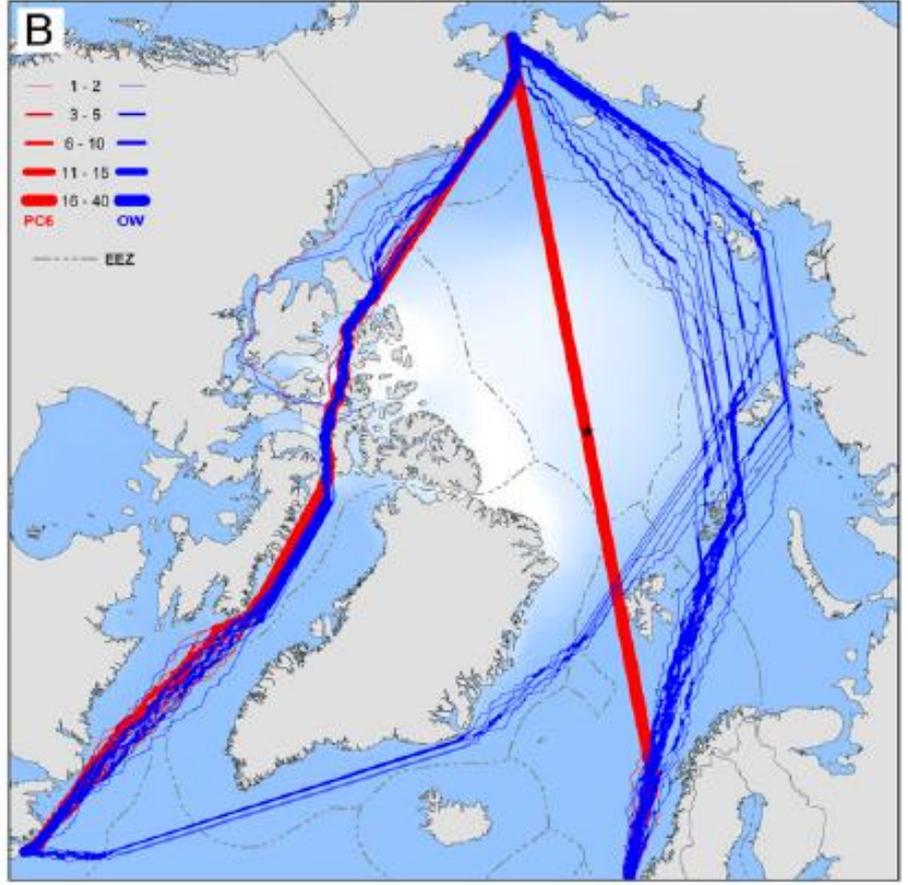


Marine Shipping Projection for the Arctic Ocean

2006 - 2015



2040 - 2059



Smith, L.C. and Stephenson, S.R. 2013. New Trans-Arctic shipping routes navigable by midcentury. Proceedings National Academy of Sciences of the United States. Pp 1-5. doi/10.1073/pnas.1214212110

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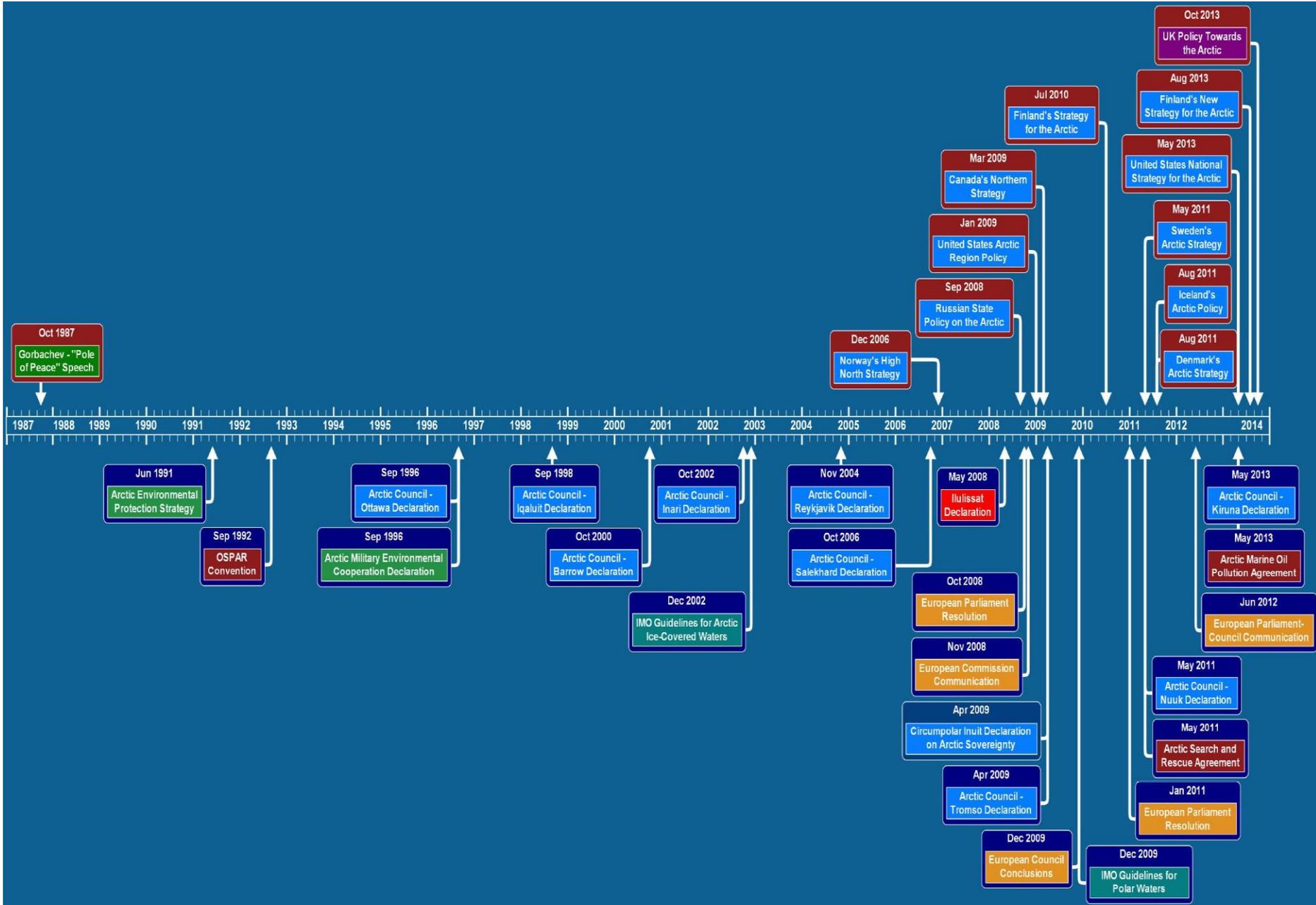
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Arctic Market for Shipbuilders

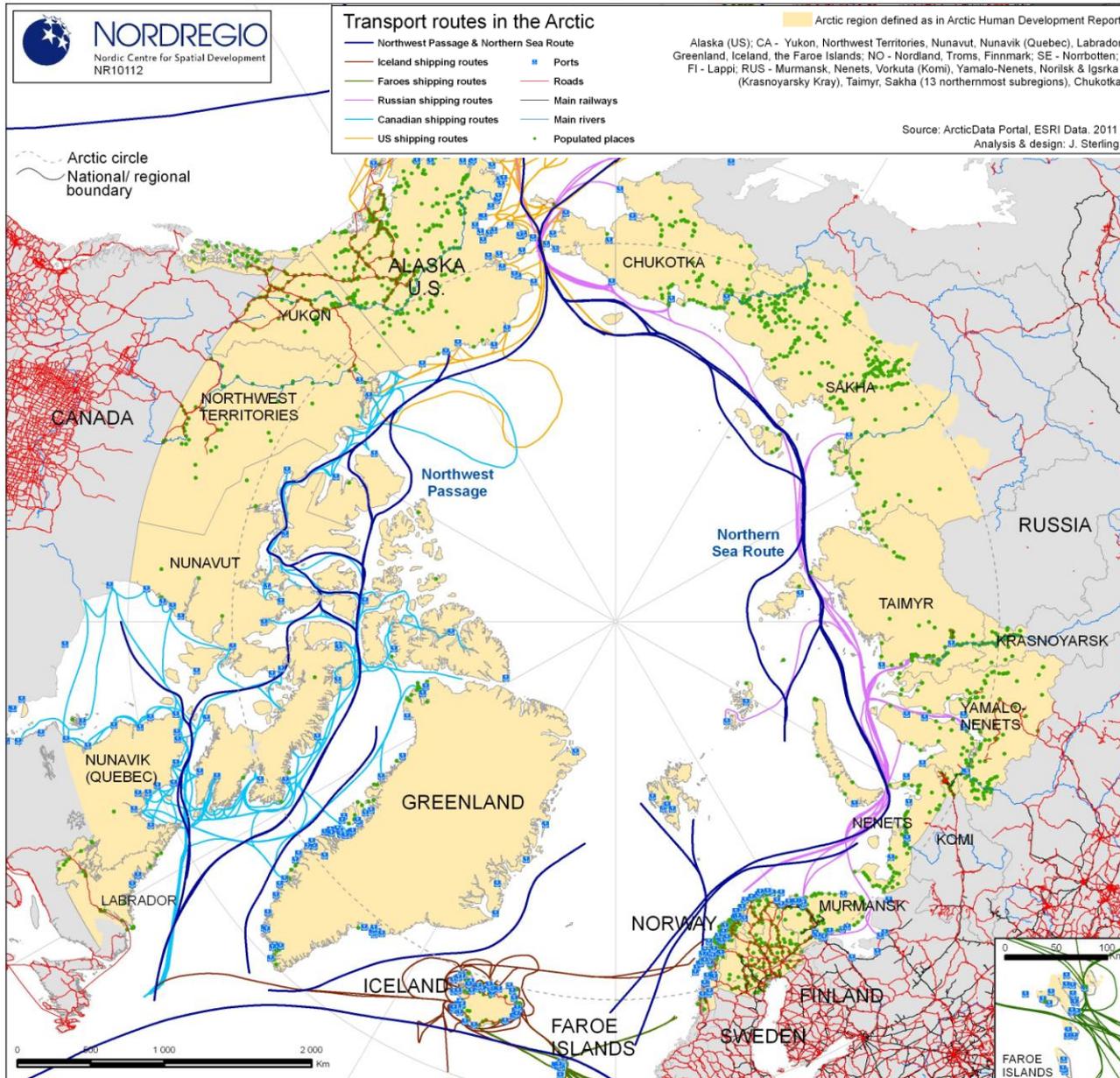


Hyundai Heavy Industry is based in Ulsan, South Korea, with a record of 93,893,700 GT, which includes 1428 ships of various types and sizes (as of 2012). Hyundai wants to double its capacity this decade.

Accelerating Institutional Interplay



Emerging Infrastructure for Arctic Marine Shipping



Workshop on Safe Ship Operations in the Arctic Ocean

International Maritime Organization, London, 28 February 2014



www.arcticoptions.org



Workshop Objectives

Facilitate information exchange among diverse experts to consider issues and strategies for ensuring safe ship operations in the Arctic Ocean, taking into account IMO's ongoing work on the mandatory Polar Code.

Workshop Agenda

Holistic Considerations for Arctic Ocean Shipping

- 
- 09:00** Welcome and opening remarks
Mr. Koji Sekimizu (IMO Secretary-General)
- 09:10** Workshop goals and objectives
Prof. Paul Berkman (University of California Santa Barbara)
- 09:20** Introduction – National Science Foundation (Arctic Options) Project
Prof. Paul Berkman (University of California Santa Barbara)
- 09:25** Introduction – European Commission (ACCESS) Project
Prof. Jean Claude Gascard (Université Pierre et Marie Curie)
- 09:35** Progress with the Polar Code
Dr. Heike Deggim (IMO Marine Environment Division)
- 10:00** Emerging access along the Northern Sea Route
Mr. Yury Melenas (Mission of the Russian Federation to IMO)
- 10:15** Coffee
- 10:45** International cooperation through the Arctic Council
Amb. Hannu Halinen (Finnish Ministry of Foreign Affairs)
- 11:00** Panel and open discussions – Key issues
- 11:45** Lunch

Workshop Agenda

Evolving Context of the Polar Code in the Arctic Ocean

- 13:15** Arctic sea-ice trends
Prof. Peter Wadhams (University of Cambridge)
- 13:30** Arctic Ocean economics
Prof. Lawson Brigham (University of Alaska Fairbanks)
- 13:45** Arctic commercial shipping
Mr. Mads Boye Peterson (Nordic Bulk Carriers A/S)
- 14:00** Arctic shipborne tourism
Ms. Frigg Jørgensen (Assoc. Arctic Expedition Cruise Operations)
Capt. Leif Skog (Lindblad-National Geographic Expeditions)
- 14:15** Arctic peoples perspectives
Hon. Sara Olsvig (Greenland Parliament and Danish Parliament)
- 14:30** Panel and open discussions – Key issues
- 15:15** Coffee

Workshop Agenda

Operationalizing the Polar Code in the Arctic Ocean

- 15:45** Sustaining Arctic observing networks
Prof. Jean Claude Gascard (Université Pierre et Marie Curie)
- 16:00** Insurance industry contributions
Mr. Michael Kingston (Marine, Trade & Energy Group, DWF LLP)
- 16:15** Arctic marine navigation and charts
Mr. Evert Flier (Norwegian Hydrographic Service)
- 16:30** Institutional interplay in the Arctic Ocean
Prof. Oran Young (University of California Santa Barbara)
- 16:45** Panel and open discussions – Summary of key issues
- 17:45** Conclude

Diverse Stakeholder Participation

	Organization
1	The Royal Institution of Naval Architects (RINA)
2	ABS - United States (representing IACS)
3	AECO - Association of Arctic Exp. Cruise Operators - Norway
4	Bahamas Maritime Authority
5	BBC Radio 4
6	BP Shipping
7	Bren School of Environmental Science and Management - University of California
8	British Antarctic Survey
9	Danish Maritime Authority
10	Embassy of Argentina
11	Embassy of Greece
12	Embassy of Italy
13	Embassy of Spain
14	Embassy of the Republic of Korea
15	European Commission
16	Federation of Icelandic Fishing Vessel Owners
17	Fednav Limited - Canada
18	Foreign and Commonwealth Office
19	Foundation for the Good Governance of International Spaces
20	IACS Permanent Secretariat
21	IFSMA - International Federation of Shipmasters' Association
22	ILAMA - International Life-Saving Appliance Manufacturers' Association
23	IMarEST
24	Institute for Advance Sustainability Studies (ASS), The Arctic Institute - Germany
25	International Chamber of Shipping
26	International Chamber of Shipping (ICS)
27	Inuit Ataqatigiit - Denmark
28	Iridium
29	Istanbul Technical University Maritime Faculty
30	IUMI - International Union of Marine Insurance - Germany
31	JSC
32	Korean Register of Shipping
33	Krylov State Research Centre
34	Lindblad Expeditions
35	Marine & Environmental Law Institute - Canada
36	Marine, Trade & Energy Group, DWF LLP

	Organization
37	Maritime and Coastguard Agency - United Kingdom
38	Maritime Faculty - University of Istanbul
39	Maritime Passive Safety Association - France
40	Maritime Zone Solutions Limited
41	MCA (UK Administration)
42	Middle East Technical Univ. Inst. Of Marine Sciences - Turkey
43	Ministry of Enterprise, Energy and Communication (Division of Transport) Sweden
44	Ministry of Foreign Affairs - Sweden
45	Ministry of Foreign Affairs of Finland
46	Ministry of Infrastructure and the Environment - Netherlands
47	Ministry of Oceans and Fisheries of the Republic of Korea
48	Ministry of Transport - Turkey
49	Ministry of Transport and Communication - Norway
50	Mission of the Russian Federation to IMO
51	National Oceanography Centre - United Kingdom
52	Nautical Operations Europe - The Netherlands
53	Nordic Bulk Carriers A/S - Denmark
54	Norwegian Hydrographic Service
55	Norwegian Maritime Authority
56	Norwegian Ministry of Trade, Industry and Fisheries
57	Office of the Coastguard Attaché - Embassy of the Philippines
58	Oil Companies Int. Marine Forum (OCIMF)
59	Republic of the Marshall Islands
60	Royal Belgian Shipowners' Association
61	Royal College of Defence Studies
62	Swedish Maritime Administration
63	The Nautical Institute - Canada
64	The Royal Institution of Naval Architects (RINA)
65	Transport Canada
66	Turkish Naval Forces Command
67	UK Chamber of Shipping
68	Université Pierre et Marie Curie
69	University of Alaska Fairbanks
70	University of Cambridge
71	Voice of Russian radio

Interdisciplinary Perspectives for Arctic Shipping

Sea ice is a common concern among diverse stakeholders, who collectively represent a system to ensure safe ship operations in the Arctic Ocean. However, stakeholders consider sea ice from strikingly different perspectives:

International policymakers look at development and application of international institutions, including the mandatory Polar Code and *United Nations Convention on the Law of the Sea* (UNCLOS), which specifies "*ice-covered areas*" under Article 234;

Nations view their sovereignty, sovereign rights and jurisdictions, which are being impacted by diminishing sea ice, notably along the Northern Sea Route and Northwest Passage;

Scientists discover climatic, ecosystem and societal impacts associated with the 70% loss in sea-ice volume in the Arctic Ocean during the past three decades;

Seafarers look for navigational hazards, recognizing that bergy bits, growlers and ice floes exist in areas that may be classified as open water;

Insurers address risks of ship operations, identifying that an ice regime system would complement the Polar Waters Operational Manual that is anticipated with a mandatory Polar Code;

Environmentalists focus on wildlife and ecosystem impacts from reducing sea-ice coverage and increasing commercial activities in the Arctic Ocean;

Naval architects respond to requirements for classes of ice-strengthened and icebreaking vessels operating in polar waters;

Shipowners consider investments and operations based on market and environmental trends associated with access in the Arctic Ocean; and

Indigenous peoples struggle with impacts from decreasing sea ice and increasing commercial activities, especially with regard to their subsistence livelihoods, and have the most refined appreciation different types of ice..

Polar Code Regulatory Framework



Requirements Affecting Ships Operating in Polar Regions

Safety requirements apply to all ships which are subject to the Convention and operating in polar regions.



Provides the mandatory level environmental protection with zero discharge requirements for Antarctica.

Legal framework governing the rights and responsibilities of nations in their use of ocean space.

Newly adopted guidance and recommendations for training and competency of officers and masters on ships in polar regions.



Part I-A – Safety measures (mandatory)

- General
- Polar Water Operational Manual
- Ship structure
- Stability and subdivision
- Watertight and weathertight integrity
- Machinery installations
- Operational safety
- Fire safety/protection

- LSA and arrangements
- Safety of navigation
- Communication
- Voyage planning
- [Crewing/ manning/ training]

Part I-B Additional guidance (recommendatory)



Part II-A – Pollution prevention measures (mandatory)

- Prevention of oil pollution
- Prevention of pollution from noxious liquid substances
- Prevention of pollution by harmful substances in packaged form
- Prevention of pollution by sewage from ships
- Prevention of pollution by garbage

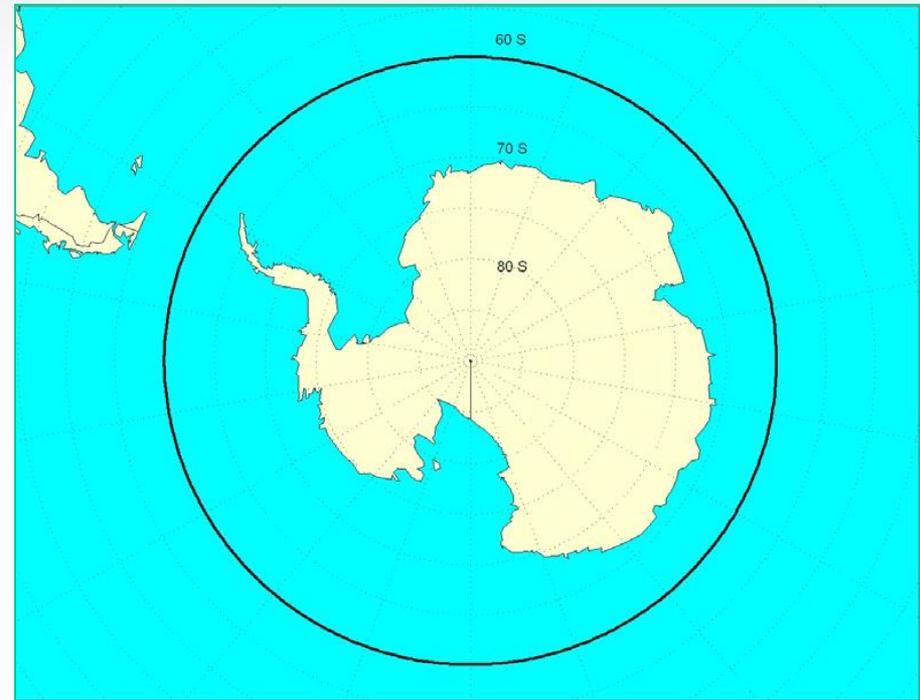
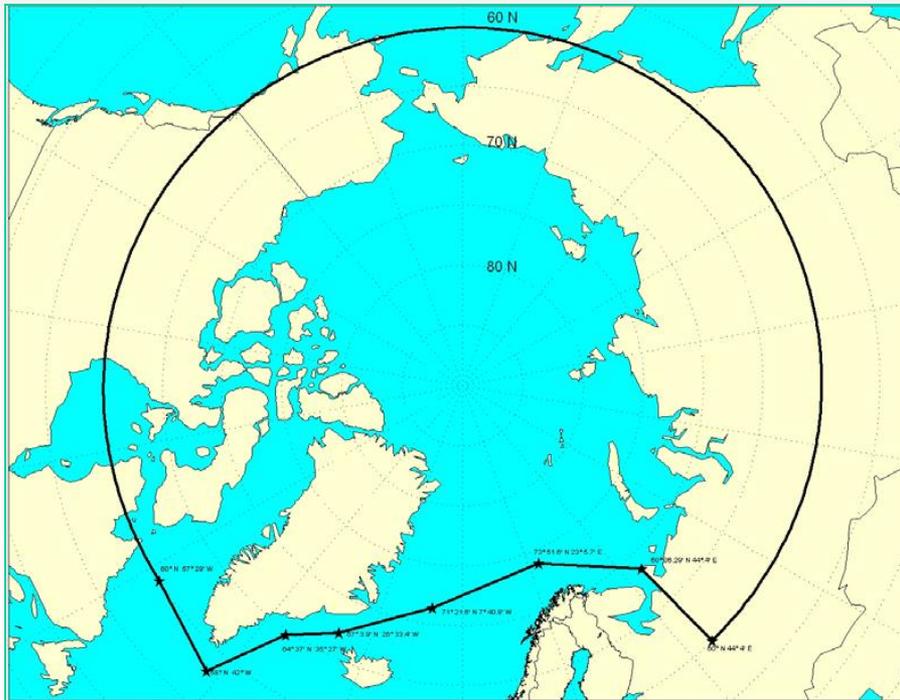
Part II-B Information and additional guidance (recommendatory)

- BWM management
- Anti-fouling
- Bio-fouling

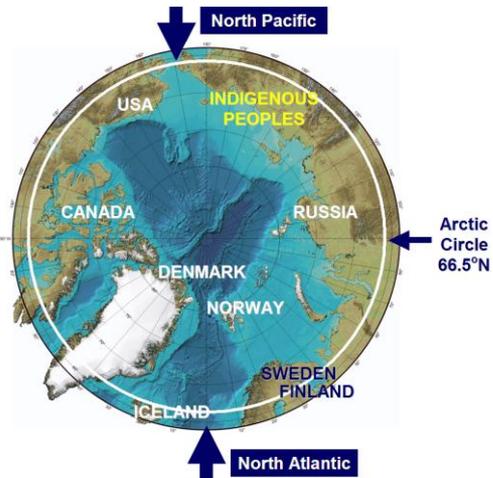
Mandatory Polar Code



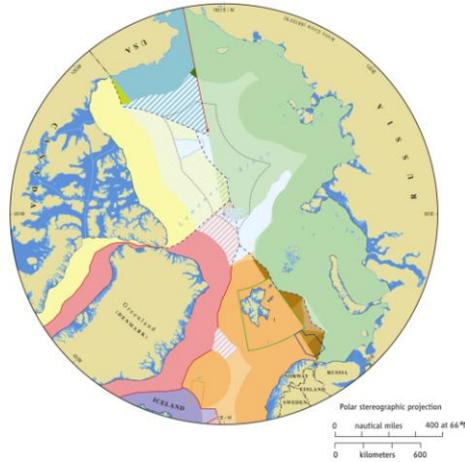
Current geographical boundaries Arctic/Antarctic (as set out in Polar Guidelines)



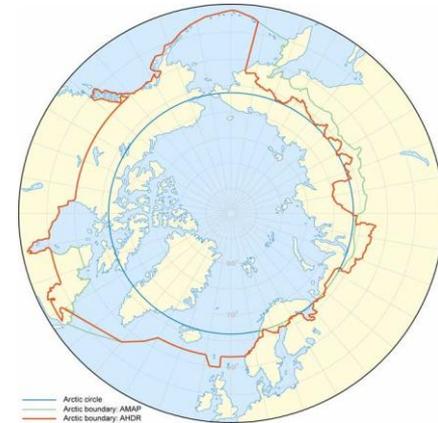
Integrating Diverse Stakeholder Perspectives



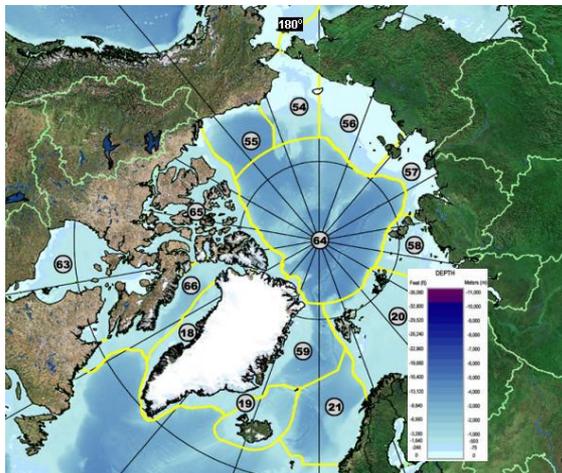
Earth System



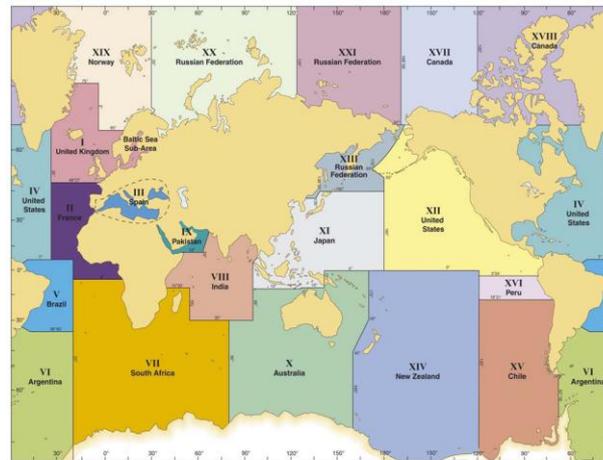
Law of the Sea
Sea Floor
Water Column



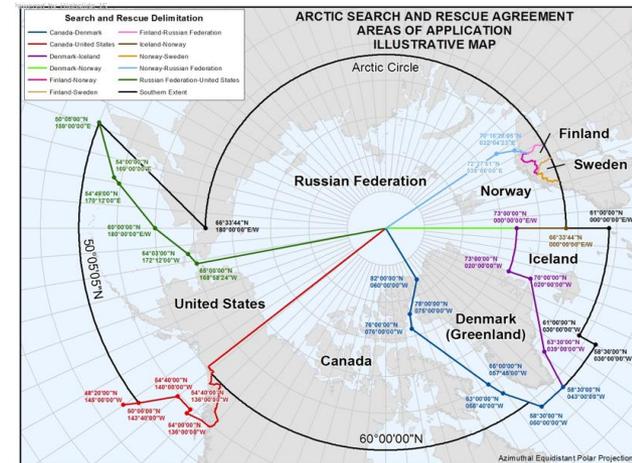
Arctic Peoples



Marine Ecosystem



Meteorological
Navigational



Search and Rescue

Developing a System of Arctic Stakeholders

TABLE 1: INTERNATIONAL PARTICIPATION IN ARCTIC ORGANIZATIONS AND INFORMATION NETWORKS

STATES	ARCTIC ORGANIZATION																
	AC	AMEC	BEAC	FARO	IASC	MOPP	NACG	NAFO	NC	NEAF	NF	OSPA	PB	SAR	SCAP	SPIT	NATO
Australia																X	
Bulgaria								X		X						X	X
Canada	X		X	X	X	X	X	X			X		X	X	X	X	X
China	X			X	X						X					X	
Denmark	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X
Finland	X		X	X	X	X	X		X		X	X		X	X	X	
France	X		X	X	X		X	X				X				X	X
Germany	X		X	X	X		X					X				X	X
Iceland	X		X	X	X	X	X	X	X	X	X	X		X	X	X	X
India	X															X	
Italy	X		X	X	X											X	X
Japan	X		X	X	X			X			X					X	
Netherlands	X		X	X	X		X					X				X	X
Norway	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Poland	X		X	X			X									X	X
Republic of Korea	X			X	X			X			X						
Russian Federation	X	X	X	X	X	X	X	X		X	X			X	X	X	
Singapore	X																
Spain	X						X			X		X				X	X
Sweden	X		X	X	X	X	X		X			X	X	X	X	X	
United Kingdom	X	X	X	X	X		X					X				X	X
United States	X	X	X	X	X	X	X	X			X		X	X	X	X	X
Number of States	20	4	15	17	16	8	20	13	5	8	8	15	5	8	8	42	28

AC (1996 Arctic Council); **AMEC** (1996 Arctic Military Environmental Cooperation Programme); **BEAC** (1993 Barents Euro-Arctic Council); **FARO** (1998 Forum of Arctic Research Operators); **IASC** (1990 International Arctic Science Committee); **MOPP** (2013 Agreement on Cooperation on Marine Oil Pollution, Preparedness and Response in the Arctic); **NACG** (2007 North Atlantic Coast Guard Forum); **NAFO** (1978 Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries); **NATO** (1949 North Atlantic Treaty); **NC** (1952 Nordic Council); **NEAF** (1980 Convention on Future Multilateral Cooperation in North-East Atlantic Fisheries); **NF** (1991 Northern Forum); **OSPA** (1992 Convention for the Protection of the Marine Environment of the North-East Atlantic); **PB** (1973 Agreement on the Conservation of Polar Bears); **SAR** (2011 Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic); **SCAP** (1994 Standing Committee of the Conference of Arctic Parliamentarians), **SPIT** (1920 Treaty Concerning the Archipelago of Spitsbergen, and Protocol)

Thinking Inclusively about the Arctic Ocean



Revealing Options for Sustainable Arctic Shipping

There is an urgent need to strengthen all forms of infrastructure to make the Arctic safe for increased shipping. However, public agencies do not have the resources needed to provide this infrastructure as a public service. For example:

There has been a 30% decline in funding for hydrographic services that would produce and improve bathymetric charts, which currently cover only 8-11% of the Arctic Ocean.

Moreover, Arctic states have created an unfunded mandate for their stewardship and investments, as reflected by the 2011 *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* and 2013 *Agreement on Cooperation on Marine Oil Pollution, Preparedness and Response in the Arctic*.

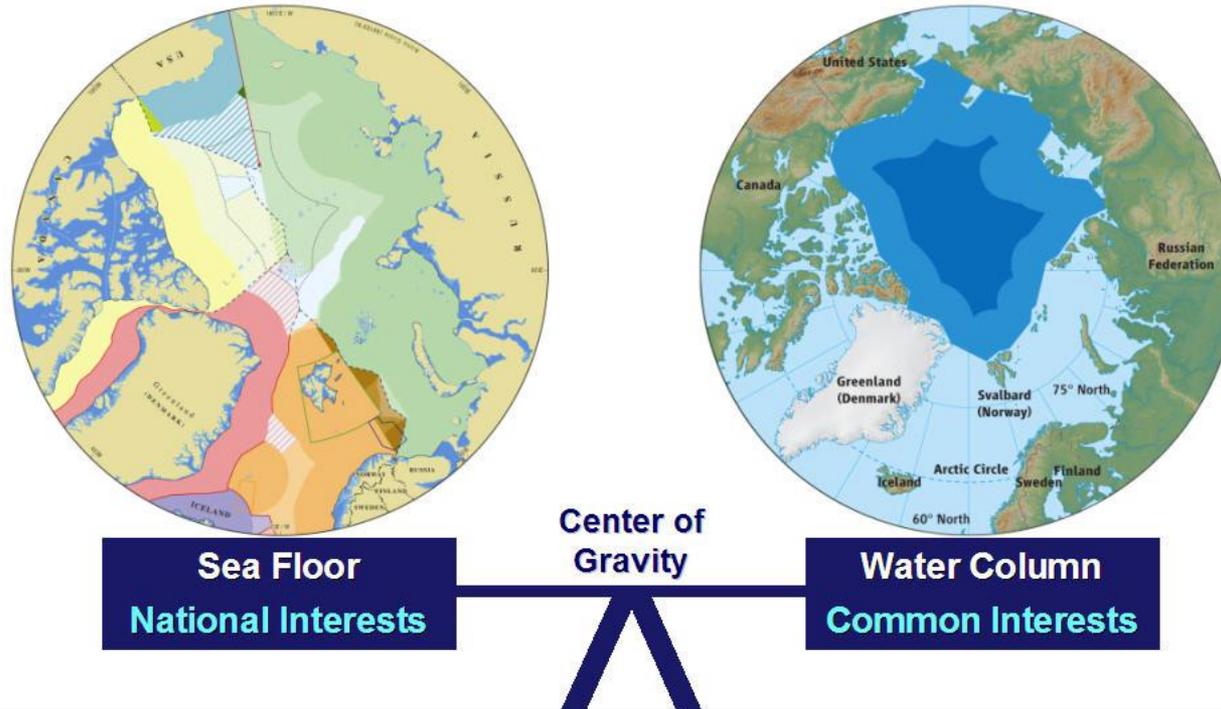
Support for infrastructure implementation to ensure safe ship operations in the Arctic Ocean is beyond the capacity of individual stakeholders.

An important implication of these observations is the need for innovative public-private partnerships to strengthen infrastructure for safe ship operations in the Arctic Ocean.

Such partnerships would involve investments and sharing of assets as well as collaborations, such as crowd-sourcing from diverse ships to collect bathymetric data.

Sustainable Infrastructure Requires Balance

A working definition of infrastructure is: fixed, mobile and other physical assets (including observing, communications, research and information systems) as well as regulatory, policy and other governance mechanisms (including insurance).



Environmental Protection, Economic Prosperity and Social Equity
Needs of the Present and Needs of the Future
National Interests and Common Interests



ARCTIC OPTIONS

Holistic Integration for Arctic Coastal-Marine Sustainability

www.arcticoptions.org