

Arctic Marine Transport: Today & Tomorrow

Arctic Council
Arctic Marine Shipping
Assessment 2009 Report



*3rd Symposium on the
Impacts of an Ice-
Diminishing Arctic on
Naval and Maritime
Operations*

USNA ~ 10 June 2009



PAME
Partnership of the Arctic Marine Environment

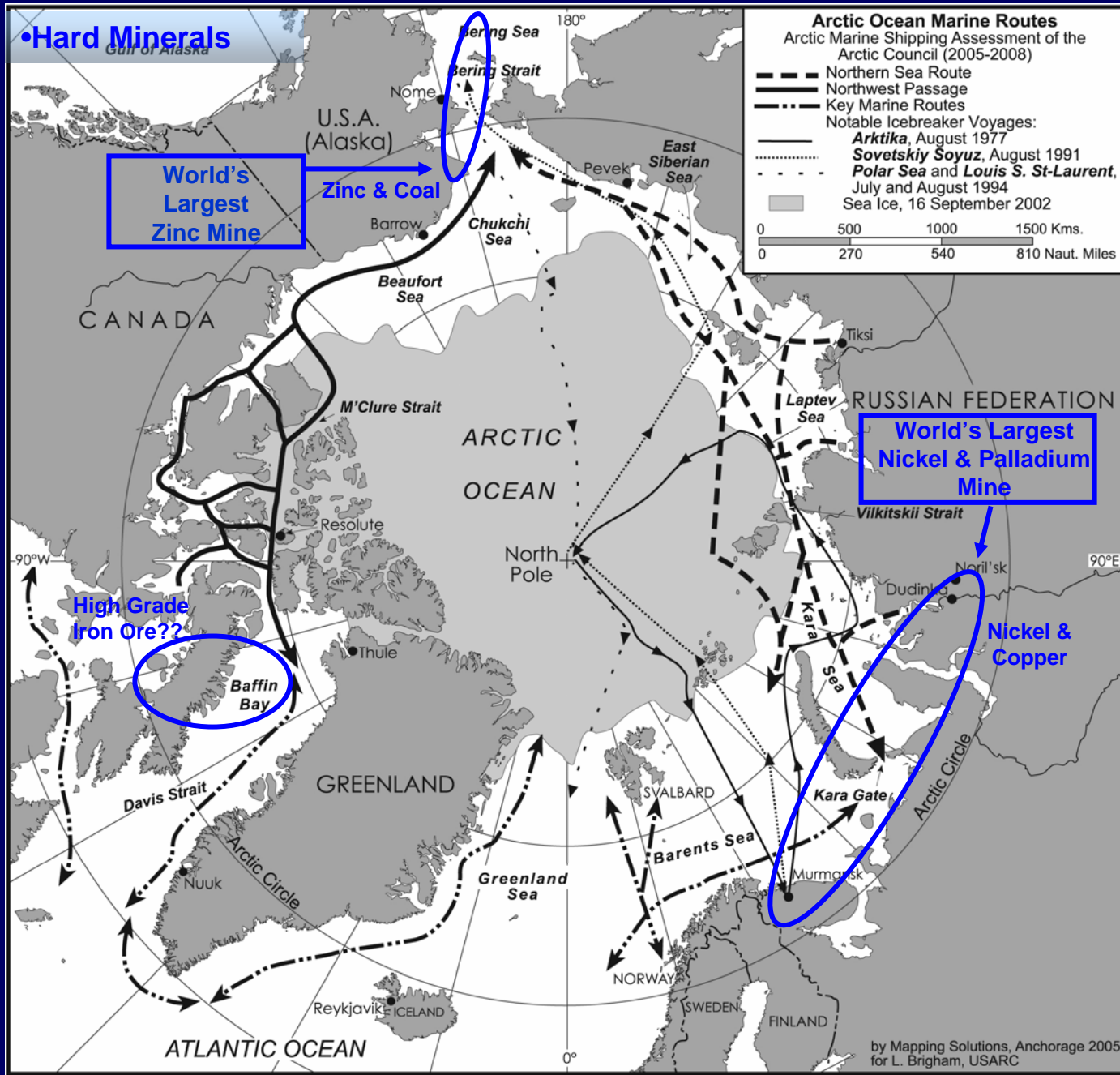
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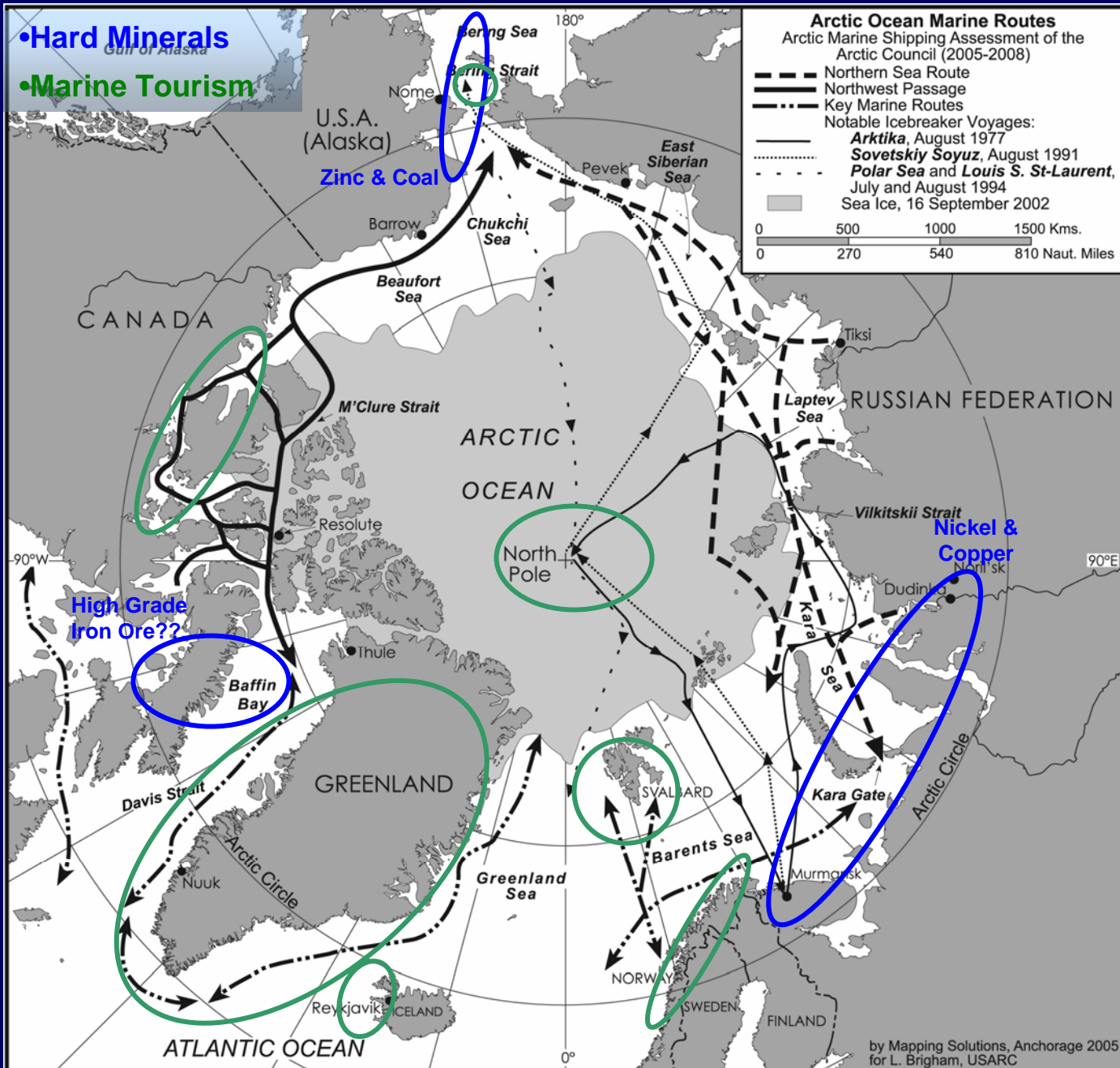
Topics:

- **Brief Review ~ Current Arctic Marine Use**
- **Arctic Marine Shipping Assessment 2009 Report**

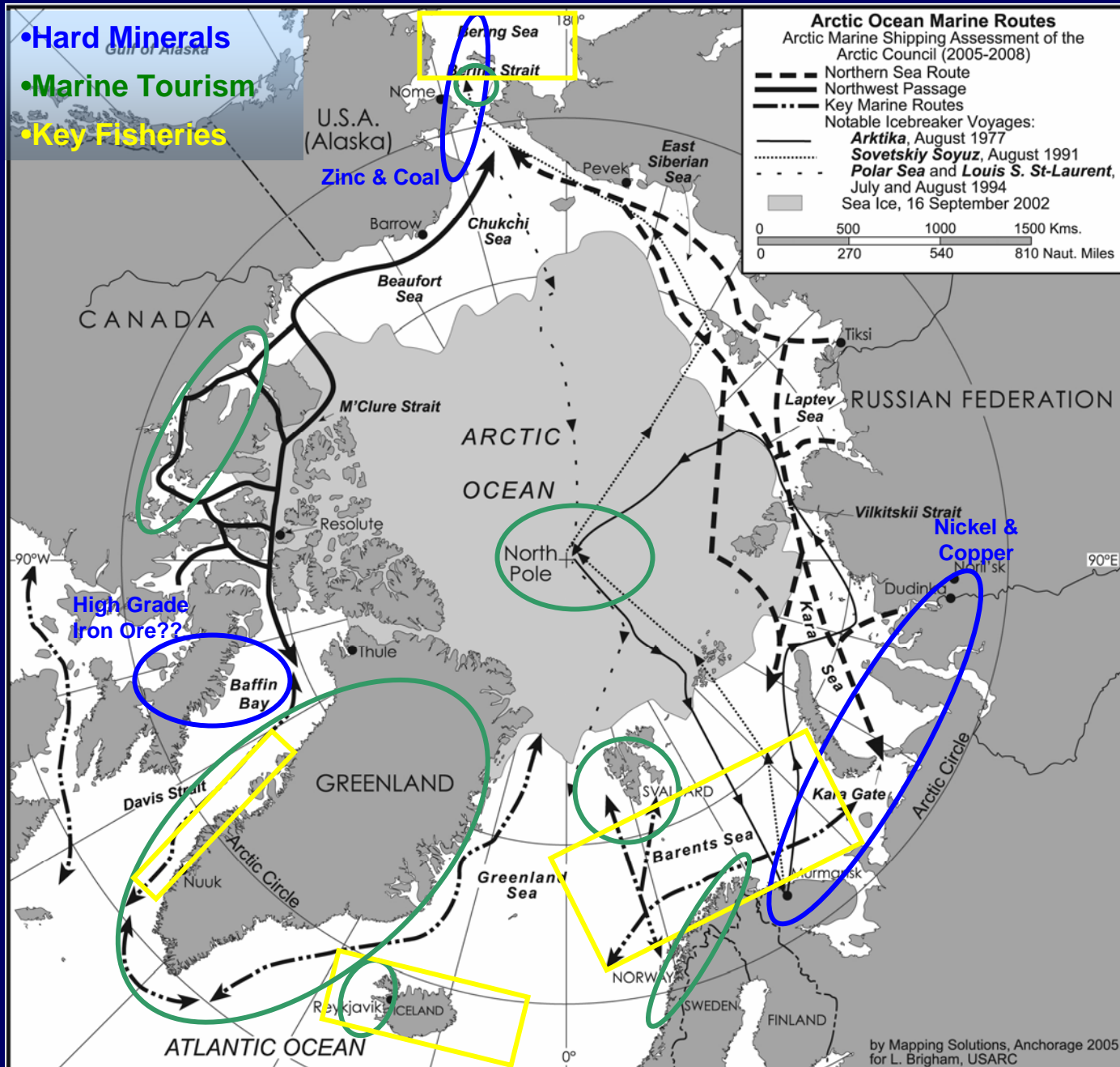
Today's Arctic Marine Use



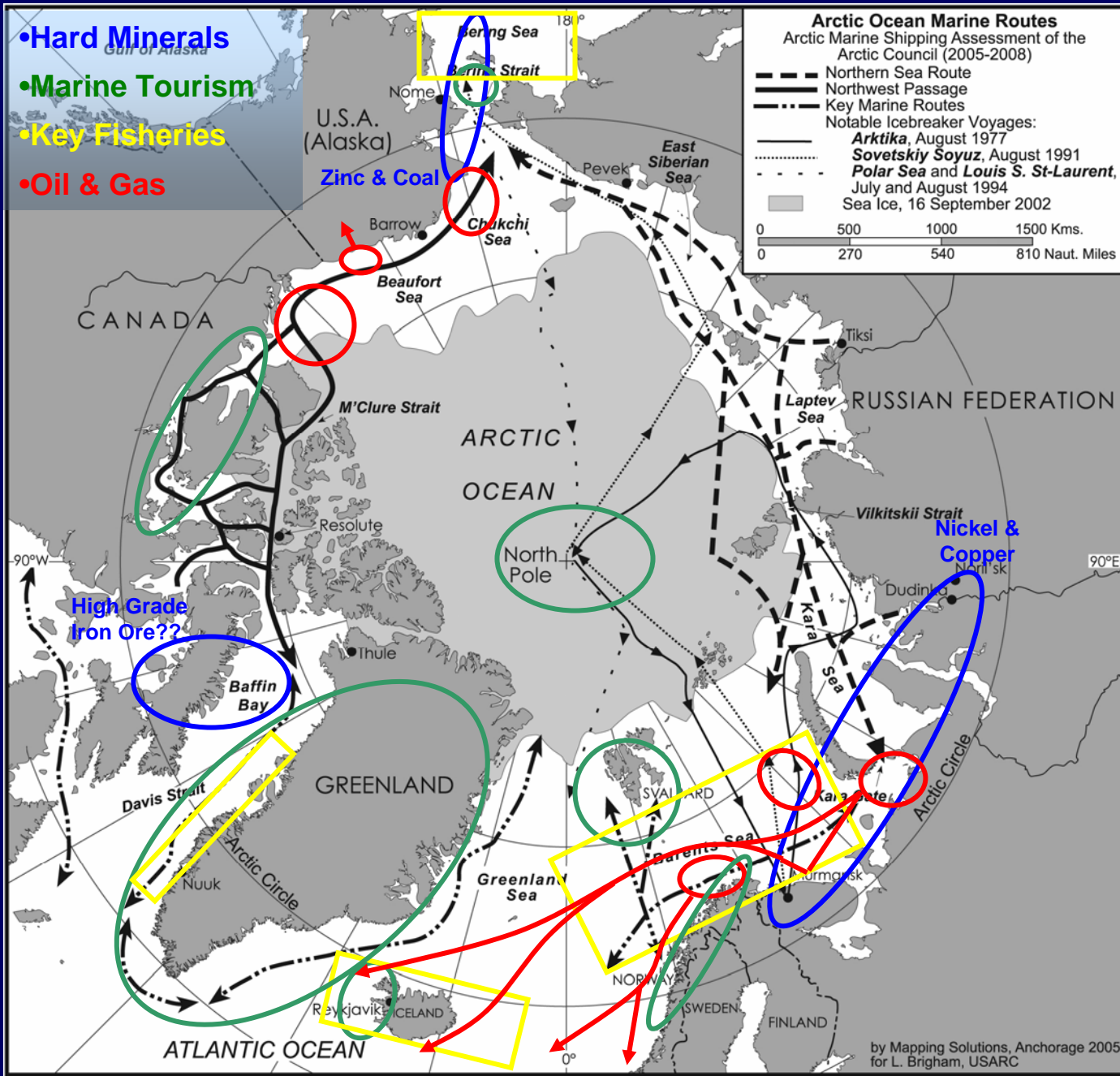
Today's Arctic Marine Use



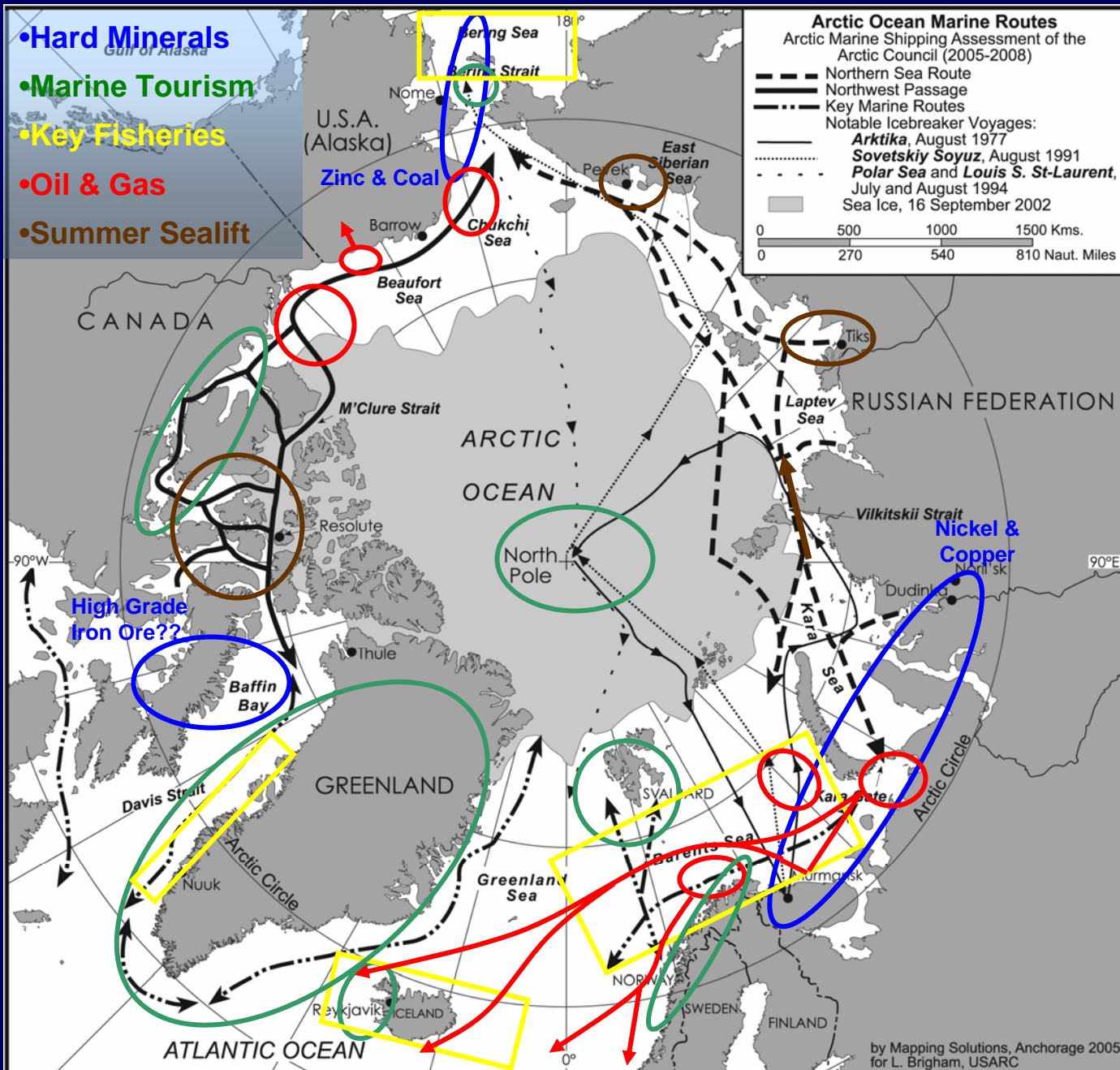
Today's Arctic Marine Use



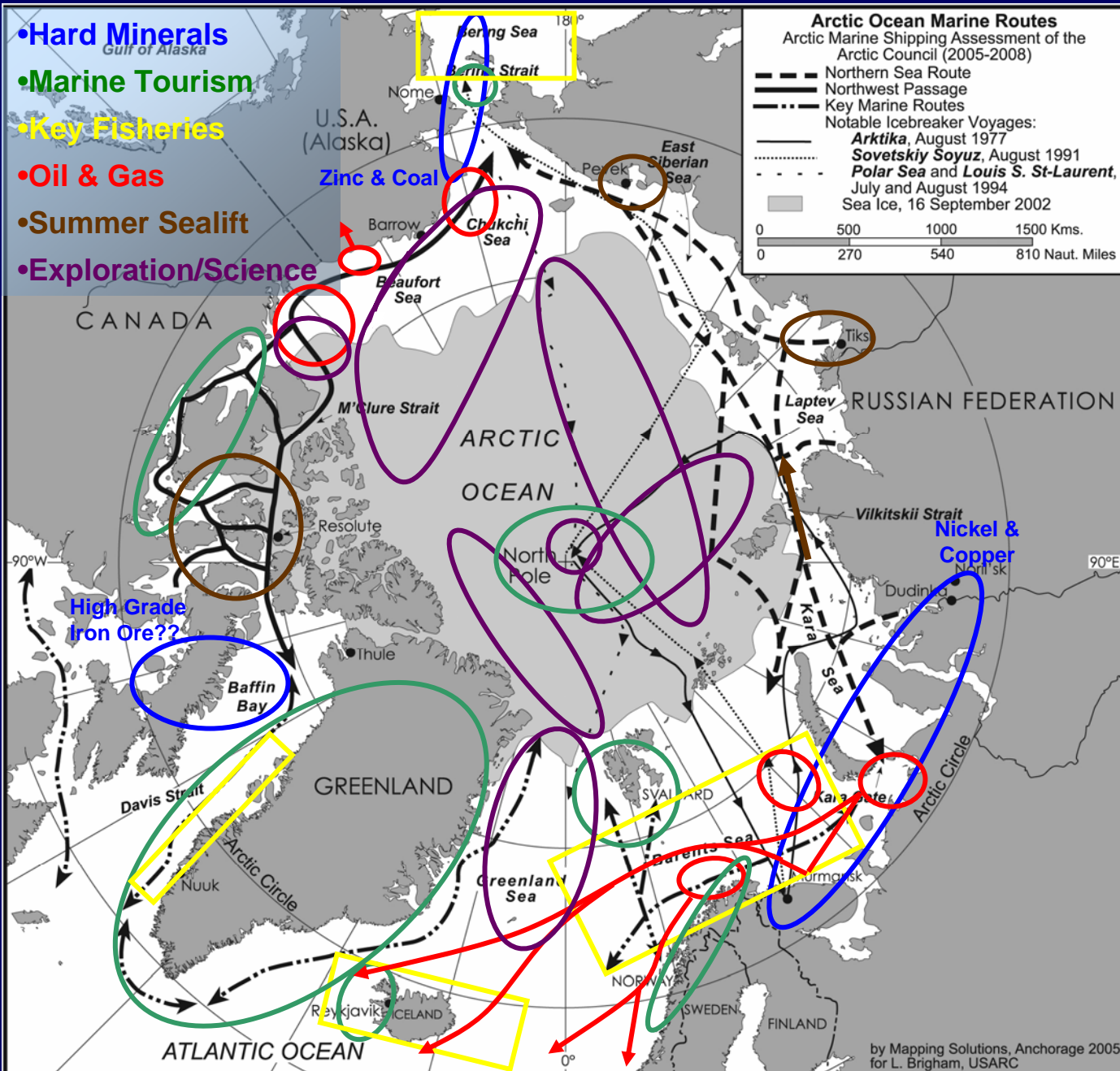
Today's Arctic Marine Use



Today's Arctic Marine Use



Today's Arctic Marine Use





2004 – 2009

Arctic Council ~ Intergovernmental Forum

AMSA Lead Countries for PAME ~ Canada, Finland & USA

AMSA Focus ~ Marine Safety & Marine Environmental Protection

Key Challenge ~ Many Non-Arctic Stakeholders

Table of Contents

Executive Summary with Recommendations

Introduction

Arctic Marine Geography, Climate and Sea Ice

History of Arctic Marine Transport

Governance of Arctic Shipping

Current Marine Use & the AMSA Shipping Database

Scenarios, Futures and Regional Futures to 2020

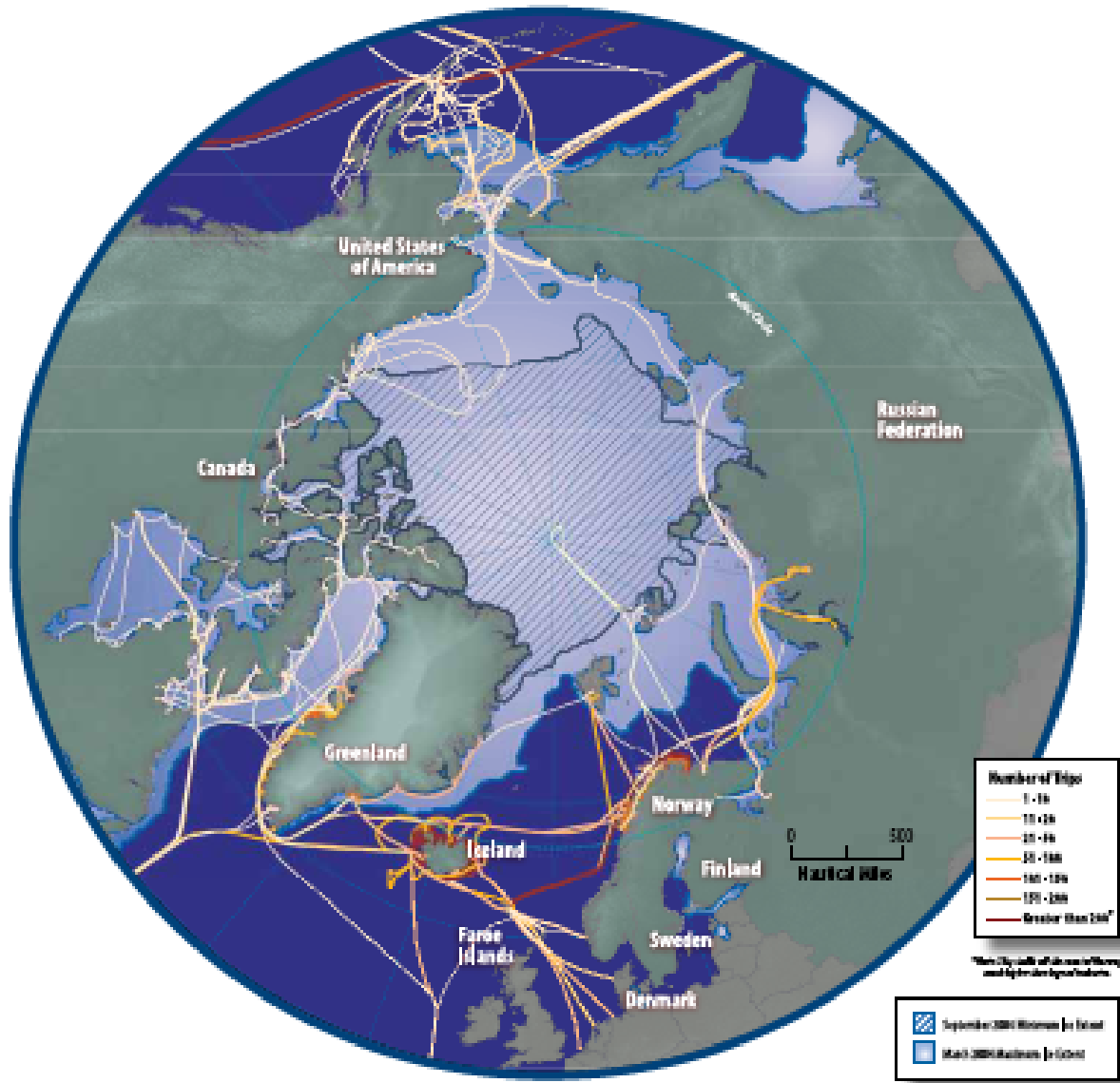
Regional Futures: Bering Strait Region, Canadian Arctic and Northwest Passage, Northern Sea Route and Adjacent Areas

Human Dimensions

Environmental Considerations and Impacts

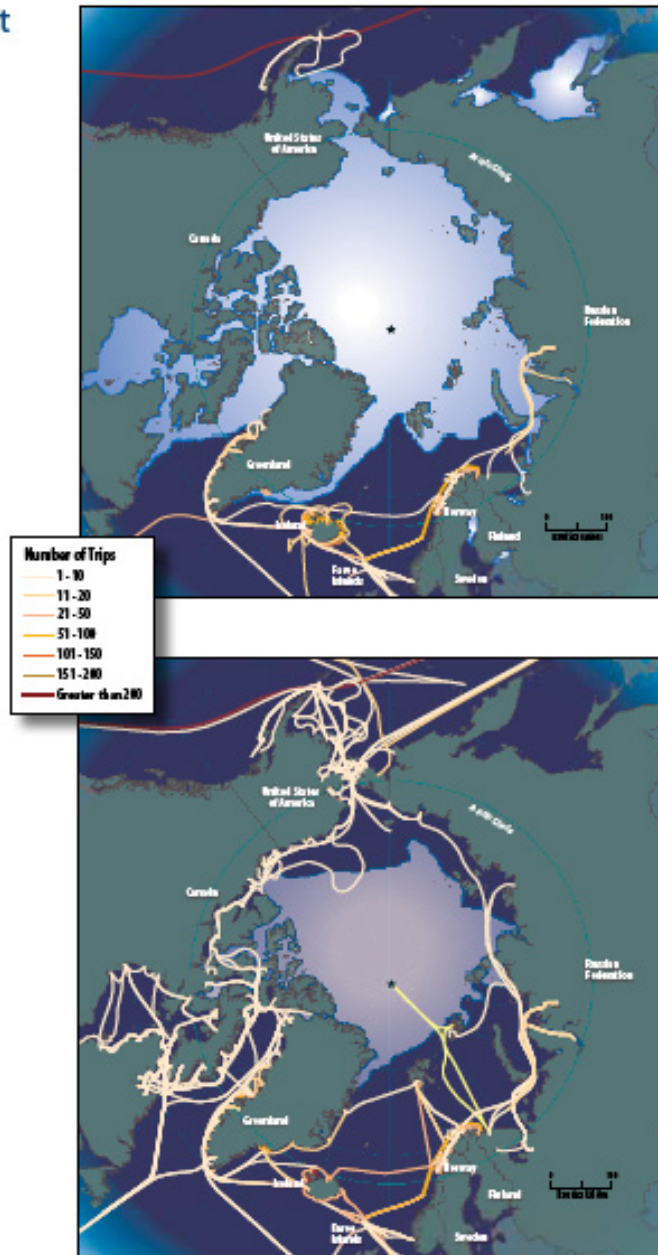
Regional Environment Case Studies: Aleutian Islands/Great Circle Route, Barents and Kara Seas, Bering Strait, Canadian Arctic

Arctic Marine Infrastructure



Shipping traffic in the Arctic for the AMSA Survey year 2004.

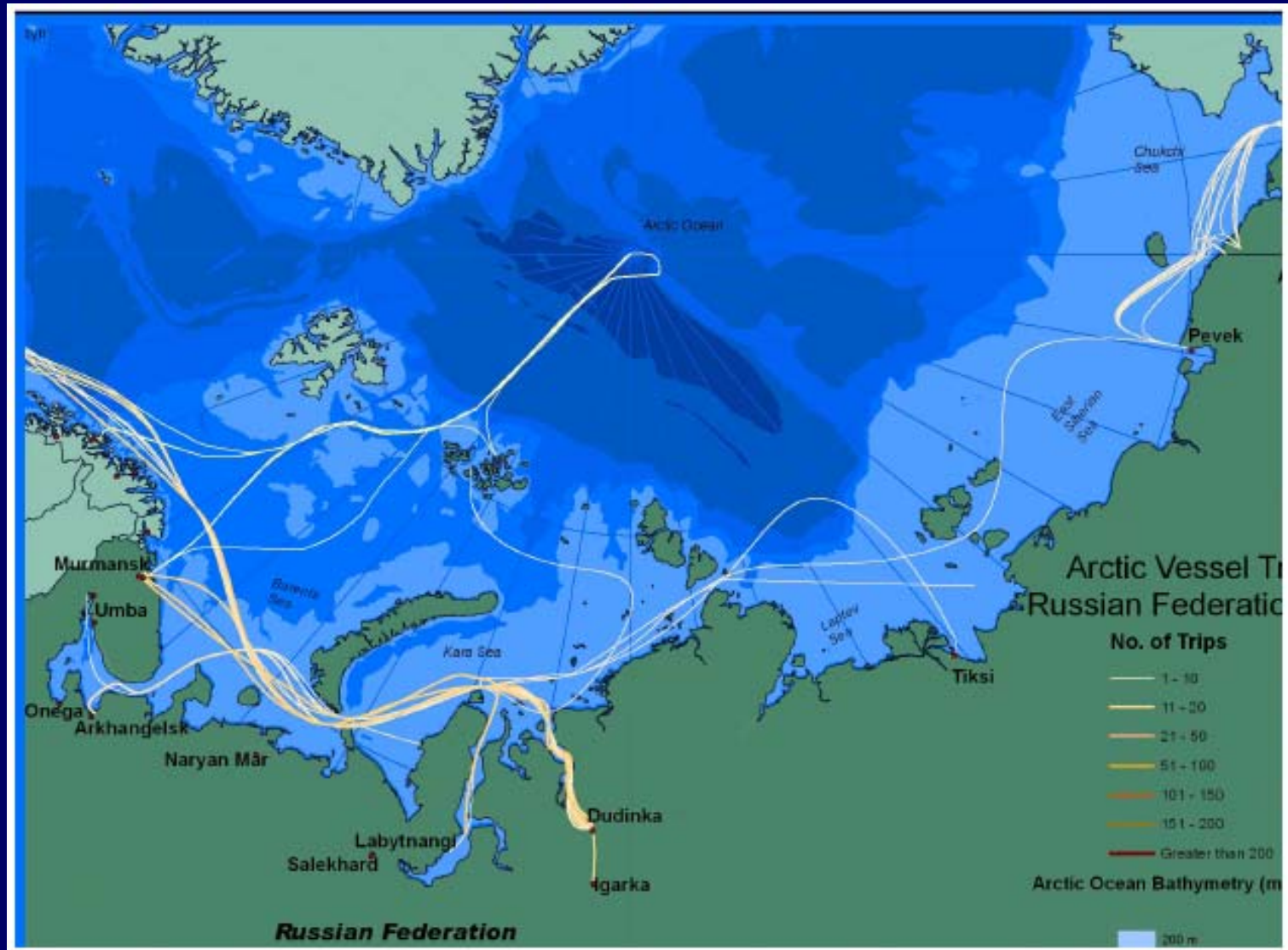
Sea Ice Extent Differences



January 2004 Traffic

July 2004 Traffic

Russian Arctic Shipping 2004



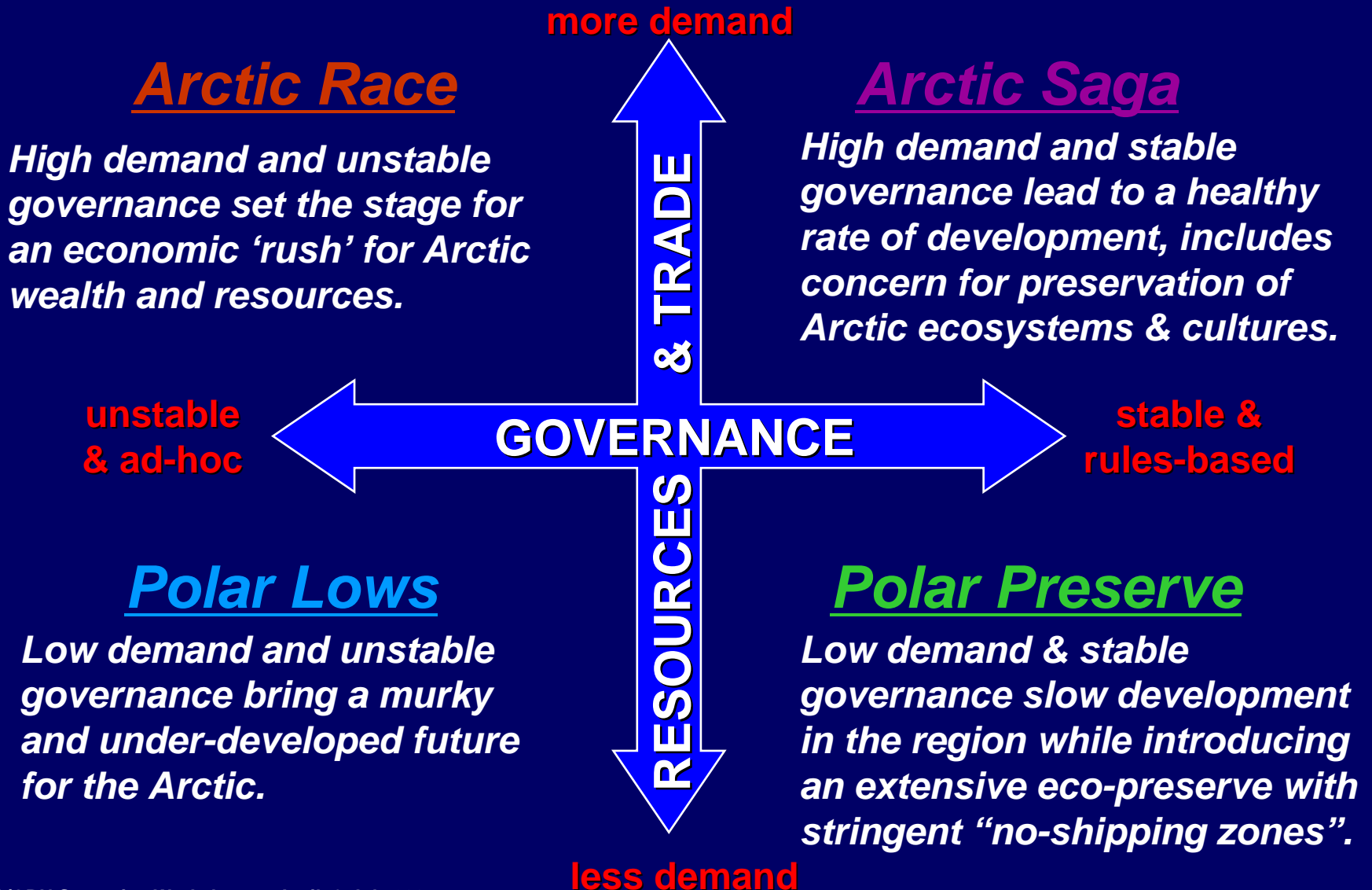
**AMSA Scenarios:
Plausible Futures for Arctic
Navigation to 2050**

~ Complexity ~

AMSA Key Uncertainties for Future Arctic Marine Transportation

- Stable legal climate
- Radical change in global trade dynamics
- Climate change is more disruptive sooner
 - Safety of other routes
- Socio-economic impact of global weather changes
- Oil prices (55-60 to 100-150 USD?)
- Major Arctic shipping disasters***
 - Limited windows of operation (economics)
 - Rapid climate change
 - Maritime insurance industry
- China, Japan & Korea become Arctic maritime nations
 - Transit fees
- Conflict between indigenous & commercial use
 - Arctic maritime enforcement
- Escalation of Arctic maritime disputes
 - Shift to nuclear energy
 - New resource discovery
 - World trade patterns
- Catastrophic loss of Suez or Panama Canals
 - Global agreements on construction rules and standards

Scenarios on the Future of Arctic Marine Navigation in 2050



U.S. Geological Survey Report ~ July 2008

“Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle”

- 13% Undiscovered Oil
- 30% Undiscovered Natural Gas
- 20% Undiscovered Natural Gas Liquids

<http://pubs.usgs.gov/fs/2008/3049/>



Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle

The U.S. Geological Survey (USGS) has completed an assessment of undiscovered conventional oil and gas resources in all areas north of the Arctic Circle. Using a geologically-based probabilistic methodology, the USGS estimated the occurrence of undiscovered oil and gas in 23 geologic provinces the right to be prospective for petroleum. The sum of the resources for each province indicates that 50 billion barrels of oil, 1,669 billion cubic feet of natural gas, and 48 billion barrels of natural gas liquids may remain to be found in the Arctic, of which a proportionally 84 percent is expected to occur in a 50-year time.



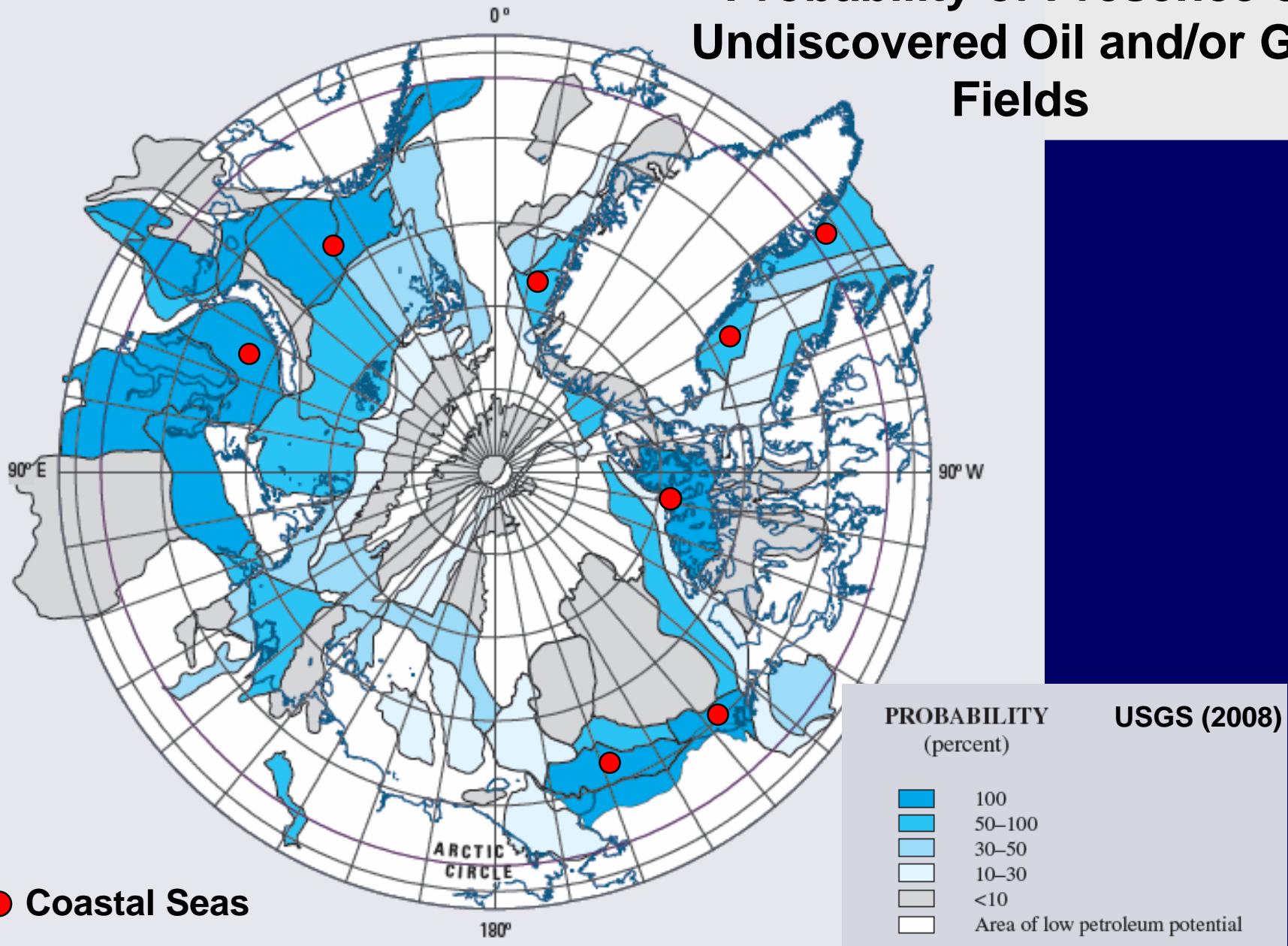
A horizontal rainbow arches over the Laramie Group under a night sky in the new Galbreath Lake, Alaska, summer 2007. USGS photo by David Boushmanoff.

Introduction
In May 2008 as part of U.S. Geological Survey (USGS) activities completed an appraisal of possible future additions to world oil and gas reserves from new field discoveries in the Arctic. This Circum-Arctic Resource Appraisal (CARA) evaluated the petroleum potential of all areas north of the Arctic Circle (66.5° north latitude). Quantitative assessments were conducted in those geologic areas considered to have at least a 10 percent chance of one or more significant oil or gas accumulations. For the purposes of the study, a significant accumulation contains recoverable volumes of at least 50 million barrels of oil and/or oil-equivalent natural gas. The study included only those resources believed to be recoverable using existing technology but with the important assumptions for offshore areas that the resources would be recoverable even in the presence of permanent sea ice and economic water depth. No economic considerations are included in these initial estimates; results are presented without reference to costs of exploration and devel-

opment, which will be important in many of the assessed areas. So-called unconventional resources, such as coal bed methane, gas hydrates, oil shale, and tar sand, were explicitly excluded from the study. Full details of the CARA study will be published later.
A number of onshore areas in Canada, Russia, and Alaska already have been explored for petroleum, resulting in the discovery of more than 400 oil and gas fields north of the Arctic Circle. These fields account for approximately 240 billion barrels (BBOE) of oil and oil-equivalent natural gas, which is about 10 percent of the world's known conventional petroleum resources (cumulative production and remaining proved reserves). Nevertheless, most of the Arctic, especially offshore, is essentially unexplored with respect to petroleum. The Arctic Circle encompasses about 6 percent of the Earth's surface, an area of more than 21 million km² (8.1 million mi²), of which about 6 million km² (2.3 million mi²) is onshore and more than 7 million km² (2.7 million mi²) is on continental shelves under less than 50 m of water. The extensive Arctic continental shelves may constitute the

geographically largest unexplored prospective area for petroleum remaining on Earth.
Methodology
A newly compiled map of Arctic sedimentary basins (Arctic Geos and other, unpublished work) was used to define geologic provinces, each containing more than 1 km² of sedimentary strata. Assessment units (AUs)—mappable volumes of rock with common geologic traits—were identified within each province and quantitatively assessed for petroleum potential. Because of the sparse seismic and drilling data in much of the Arctic, the usual tools and techniques used in USGS resource assessments, such as discovery process modeling, prospect delineation, and deposit simulation, were not generally applicable. Therefore, the CARA relied on a probabilistic methodology of geological analysis and analog modeling. A world geology database (Campuzano and others, 2006) was developed using the AUs defined in the USGS World Petroleum Assessment 2000 (USGS World Assessment Team, 2000). (Continued on back page)

Probability of Presence of Undiscovered Oil and/or Gas Fields



● Coastal Seas

Long known as a storehouse of untapped natural resources, high commodity prices and a growing worldwide demand in recent years have the Arctic poised as a significant contributor to the global economy.



Selected AMSA Findings

**(A)--UNCLOS ~ Fundamental framework & IMO ~
Competent UN agency**

**(B)--Winter Arctic sea ice cover remains & near or
complete disappearance of multi-year ice**

**(C)--No specially-tailored, mandatory IMO
environmental standards for vessels
operating in the Arctic**

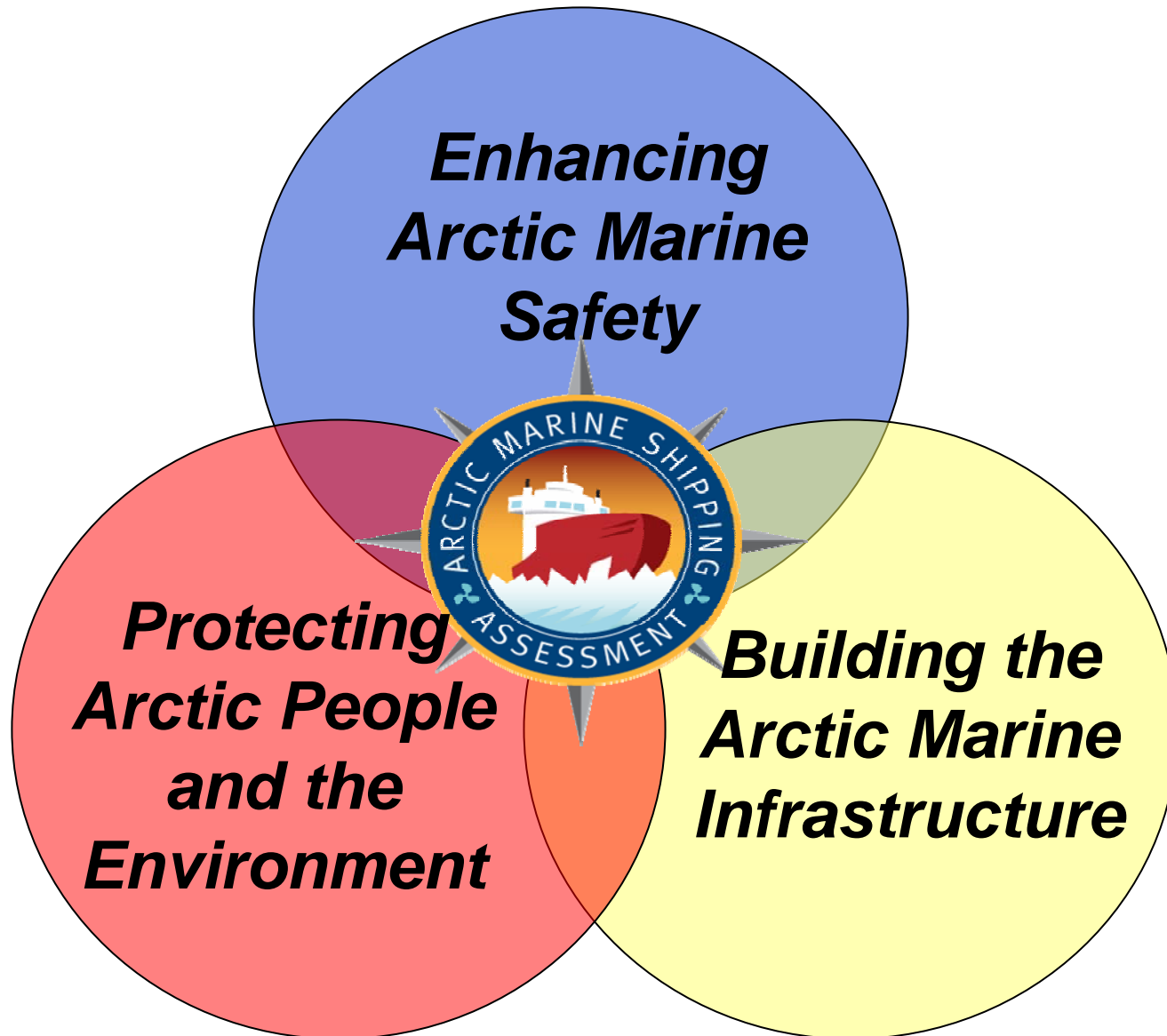
**(D)--AMSA data survey ~ nearly all destination
traffic**

**(E)--Key drivers ~ Natural resource development
& regional trade**

Selected AMSA Findings

- (F)--Many factors of uncertainty influencing future Arctic marine activity**
- (G)--Arctic residents ~ concerns & recognition of benefits**
- (H)--Most significant threat ~ release of oil through accidental or illegal discharge**
- (I)--General lack of marine infrastructure (exceptions: Norwegian coast & northwest Russia)**

AMSA Recommendations: Three Broad, Interrelated Themes



Recommendation Highlights

- **Arctic States Decide** ~ Cooperatively support IMO efforts to strengthen, harmonize & regularly update international standards for vessels operating in the Arctic.
- **Arctic States Decide** ~ Support mandatory application of relevant parts of the IMO *Guidelines*.
- **Arctic States Decide** ~ Development & implementation of a comprehensive, multi-national SAR instrument.
- **Arctic States Recognize** ~ Explore the need for internationally designated areas for environmental protection (one tool: PSSA).
- **Arctic States Should Consider** ~ Ratification of the IMO 'Ballast Water Convention'.

Recommendation Highlights

- ***Arctic States Decide*** ~
 - Enhance Cooperation in oil spill prevention
 - Engage organizations addressing the effects of ship noise, disturbance and ship strikes
 - Improved practices & technologies to reduce current/future air emissions
- ***Arctic States Recognize*** ~ Improvements to Arctic marine infrastructure to enhance safety & environment protection (Arctic marine traffic awareness system)
- ***Arctic States Decide*** ~ Develop circumpolar environmental response capabilities (circumpolar & regional agreements)

AMSA 2009:



- **Baseline Assessment**
- **Arctic Council Policy Document**
- **Strategic Guide**

www.pame.is

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