The Rapidly Changing Arctic: Why does it matter?

Fran Ulmer
US Arctic Research Commission
National Academy of Science
January 14, 2016
Rapidly changing environment...

- Warming temperatures (twice the global rate)
- Declining sea ice (50% area, 75% volume in 30 yr)
- Evolving ecosystems
- Thawing permafrost/carbon release
- Increasing human activity
- International interest
RECORD LOW ARCTIC SEA ICE

Median Sea Ice Extent 1979-2000
2.72 million square miles

Previous Record Low Sept. 16, 2007
1.61 million square miles

New Record Low Sept. 15, 2012
1.32 million square miles

Source: The National Snow and Ice Data Center Sea Ice Index
Records are for 5 day running averages
“The opening of the ‘fifth ocean,’” the Arctic, for longer periods of time, will provide new access to resources, migration of fishing stocks and eventually new trade routes, that can’t be overstated.”

-Former Chief of Naval Operations
Adm. Gary Roughead (retired)
Changing economics

- Shipping: increasing traffic
- Fisheries: sustainable management (moratorium)
- Tourism: continues to expand (w/o rescue)
- Mining: global demand
- Oil and gas: significant resources
Increased Arctic shipping
“Crystal Serenity” Expedition in summer 2016

- 900 passengers
- 32 days
- $21K to $150K per person

Proof of $50K worth of emergency evacuation Repatriation insurance required

Arctic Tourism
Commercial fishing in the Arctic
Alaska Feeds the Nation

Largest private sector employer in Alaska

US Domestic Commercial Fisheries

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight of catch (million metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>Rest of US: 4, Alaska: 1</td>
</tr>
<tr>
<td>1996</td>
<td>Rest of US: 4, Alaska: 1</td>
</tr>
<tr>
<td>1998</td>
<td>Rest of US: 4, Alaska: 1</td>
</tr>
<tr>
<td>2000</td>
<td>Rest of US: 4, Alaska: 1</td>
</tr>
<tr>
<td>2002</td>
<td>Rest of US: 4, Alaska: 1</td>
</tr>
<tr>
<td>2004</td>
<td>Rest of US: 4, Alaska: 1</td>
</tr>
</tbody>
</table>
Arctic has much of world’s remaining “undiscovered” oil and gas

13% oil
30% natural gas
20% natural gas liquids

2009 USGS CARA report
High cost to develop in the Arctic

- Cold, dark, remote, storms
- Lack of infrastructure
- Supply chain complexity
- Need for specialized vessels, facilities
- Protection of structures and wells from ice
- Limited charting, communications, response

Photos: ExxonMobil
Law of the Sea and its impact on future development

- Nations have “exclusive economic zone” to 200 miles offshore (or to maritime boundary).
- Sovereign rights over the resources on & under the seabed in “extended continental shelf” beyond EEZ.
- US Senate has yet to ratify UNCLOS (~160 countries have done so including all other Arctic).
What does a warming Arctic mean to local residents and communities?

Impacts to subsistence foods and cultural practices

Impacts to coastal villages and basic infrastructure
Community instability and village relocations

- Increased storms, unpredictable weather, extreme events
- Less sea ice to act as a blanket on ocean means bigger waves
- Thawing permafrost weakens the soil and foundations
- Combined impact on infrastructure from erosion, thawing permafrost, rising sea level
Ocean acidification risk assessment for fisheries

Mathis et al., Progress in Oceanography, 2015
Arctic climate change impacts global weather

Changes in Arctic ice/snow cover can impact weather thousands of miles away through effects on the jet stream.

Blistering cold air from the Arctic plunged southward during the winter of 2013/2014, breaking US temperature records. On January 6, 2014, alone, approximately 50 daily record low temperatures were set, from Colorado to Alabama to New York, according to the National Weather Service. Credit: NASA's Goddard Space Flight Center. Image courtesy of NASA/JPL.
Sea level is rising

Complete melting of Greenland’s ice sheet would raise global sea level by 7 meters.
Storms are increasing in intensity and frequency.

Erosion along the Arctic coast is increasing due to: decreased sea ice, melting permafrost and changes in storm activity.
Since 1990, natural disasters have affected about 217 million people every year.

The number of geophysical disasters has remained fairly stable since the 1970's, while the number of climate-related (hydro-meteorological) disasters has greatly increased.
A warming Arctic matters to the...

• 4 million people who live there
• Consumers of fish, oil & gas, minerals
• Companies who develop its resources
• Explorers, tourists, and researchers
• People who live in or near coastal regions
• Rest of the planet’s weather
• Stability of societies
Trillion Dollar Arctic Issues

- Sovereignty, defense, ownership
- Resources: fish, O&G, minerals
- Global trade: trade and tourism
- Stewardship: culture & conservation
- Research and technology
- Climate change: mitigation/adaptation
USA Interests in the Arctic

- National defense
- Sovereign rights & responsibilities
- Energy and economic benefits
- Environmental stewardship
- Indigenous peoples: their rights & cultures
- Preservation of the uses and freedom of the sea as reflected in international law
- Maritime safety
- Scientific research
**New this week** Meeting of the Standing Committee of the Conference of Arctic Parliamentarians (CPAR), December 16-17, 2015 (Strasbourg, France). The European Parliament is the host of this Arctic Parliamentarians meeting. The Arctic Parliamentarians are expected to hear presentations on the European Union's Arctic policy, University of the Arctic and the Arctic Economic Council. The Standing Committee will also decide dates for the next year's Conference of Parliamentarians of the Arctic Region which will take place in Russia.

Fall meeting of the American Geophysical Union, December 14-18, 2015 (San Francisco, California). The 48th meeting of the union brings together nearly 24,000 attendees, and lots of Arctic research results. The scientific program is here. There will be several Arctic-related "Town Hall" meetings, including those sponsored by NASA, DOE, NSF, ISAC, IARPC, and SEARCH.

Today's Congressional Action:
The House and Senate are in session. The House is expected to consider continuing appropriations legislation.

Media

After 35 Years, US Set to Finally Build More Icebreakers. After a 35 year hiatus, the U.S. Coast Guard is set to build a new heavy endurance icebreaker. The head of the sea service's acquisition office believes production on a new ship could start in five years—and will cost at least a billion dollars. According to USNI News, acquisition chief Rear Admiral Mike Haycock said the Coast Guard has finalized plans to buy a ship to replace the Polar Star, the service's only heavy icebreaker. Popular Mechanics

This is What Happens When the Arctic Warms Twice as Fast as the Rest of the Planet. For a second straight year, the Arctic is warming faster than any other place in the world, and walrus populations in the area's Pacific and Atlantic ocean regions are thinning along with the ice sheets that are critical for their survival,
Thank you.