Challenges to Arctic Infrastructure

Panel 14: Threats and Resiliency in the Arctic

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There is no single definition of 'The Arctic'

- North of 66º 33´N Latitude
- Southern extent of tundra
- Northern extent of trees
- Area of continuous permafrost
- North of 10º C isotherm
- Geopolitically

Focus here is on Alaska & its territorial waters

Climate Dynamics
(warming and thawing)

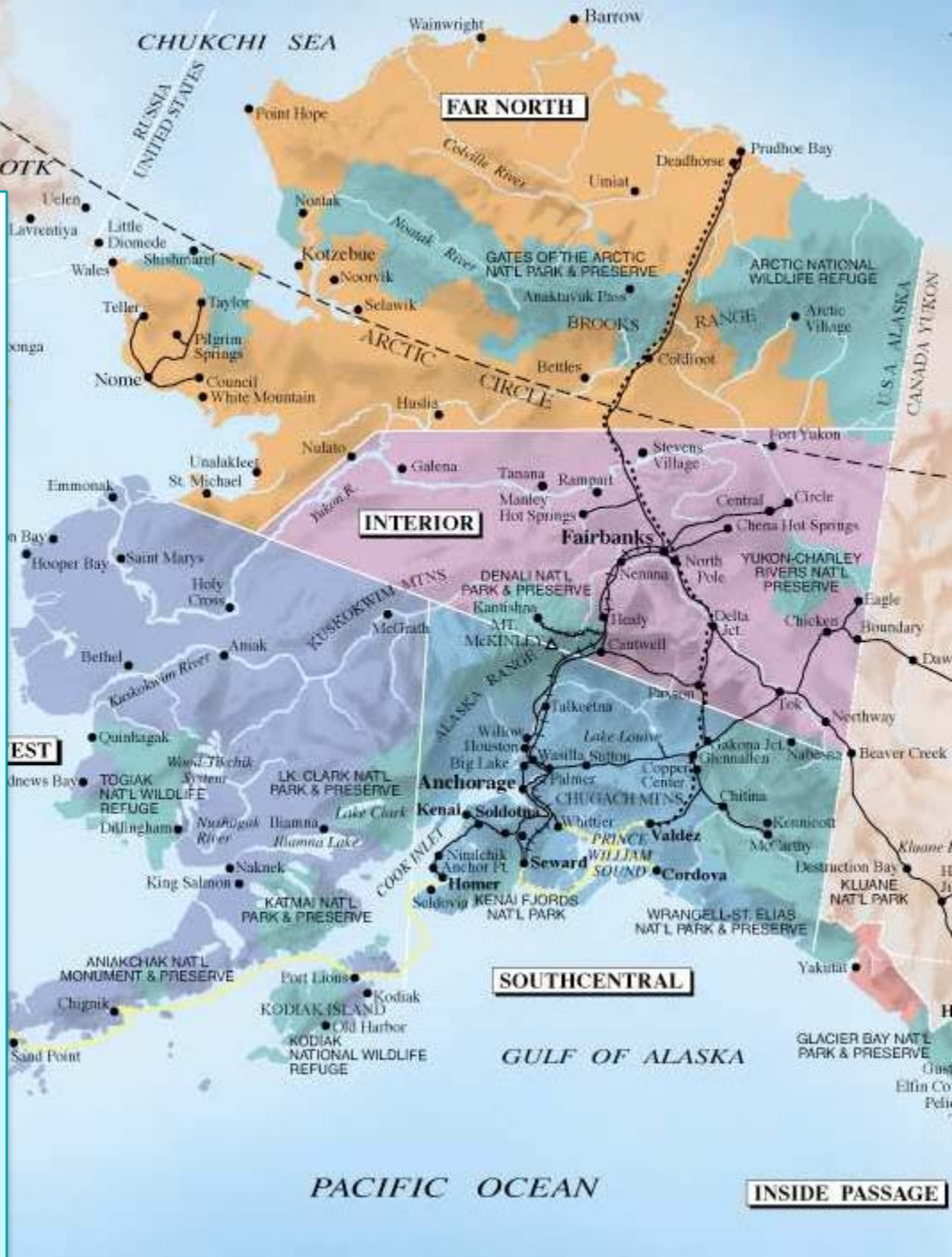
Remoteness
(limited response infrastructure)

Limited knowledge
(environment & how to build to it)


Seattle
Barrow
Minneapolis
Kotzebue
Boston
New York City
Nome
Fairbanks
Chicago
San Francisco
Denver
Washington DC
Anchorage
Juneau
Dillingham
Los Angeles
Sitka
Kodiak
Attu
Ketchikan
Unalaska/Dutch Harbor
Houston
Miami

Most AK population coastal (80%)

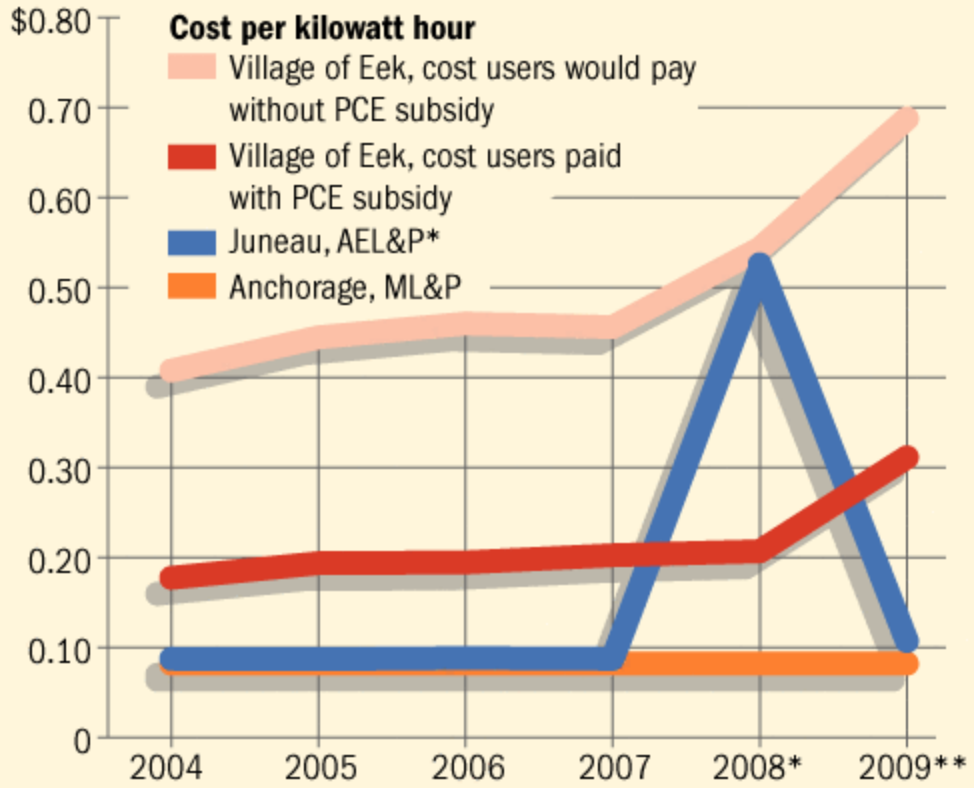
- ANC largest (250k)
- FNSB next (87k)
- Juneau (32k)
- Several large communities
  - Sitka (9000)
  - Ketchikan (7700)
  - Kenai (6800)
  - Wasilla (6400)
  - Kodiak (6100)
  - Bethel (6000)
  - Homer (5400)
  - Valzez (4500)
  - Unalaska (Dutch Harbour - 4300)
  - Barrow (4200)
  - Nome (3500)
  - Kotzebue (3100)
  - Seward (2600)
  - Dillingham (2300)



Accessible only by air, with boat/barge for part of the year

Village power costs soar

Comparing Eek, Juneau and Anchorage power costs



Note: Power Cost Equalization (PCE) is state rural electricity subsidy
*Juneau used diesel generators in May, 2008 after avalanche wiped out transmission line from usual hydroelectric source.
**Estimates

Sources: AVEC, ML&P, AEL&P

RON ENGSTROM / Anchorage Daily News

Climate Warming

Sea ice retreat & Permafrost thawing

Coastal Erosion & Collapse of Structures

Maintenance of infrastructure
Nunam Iqua (*D. Atkinson*)

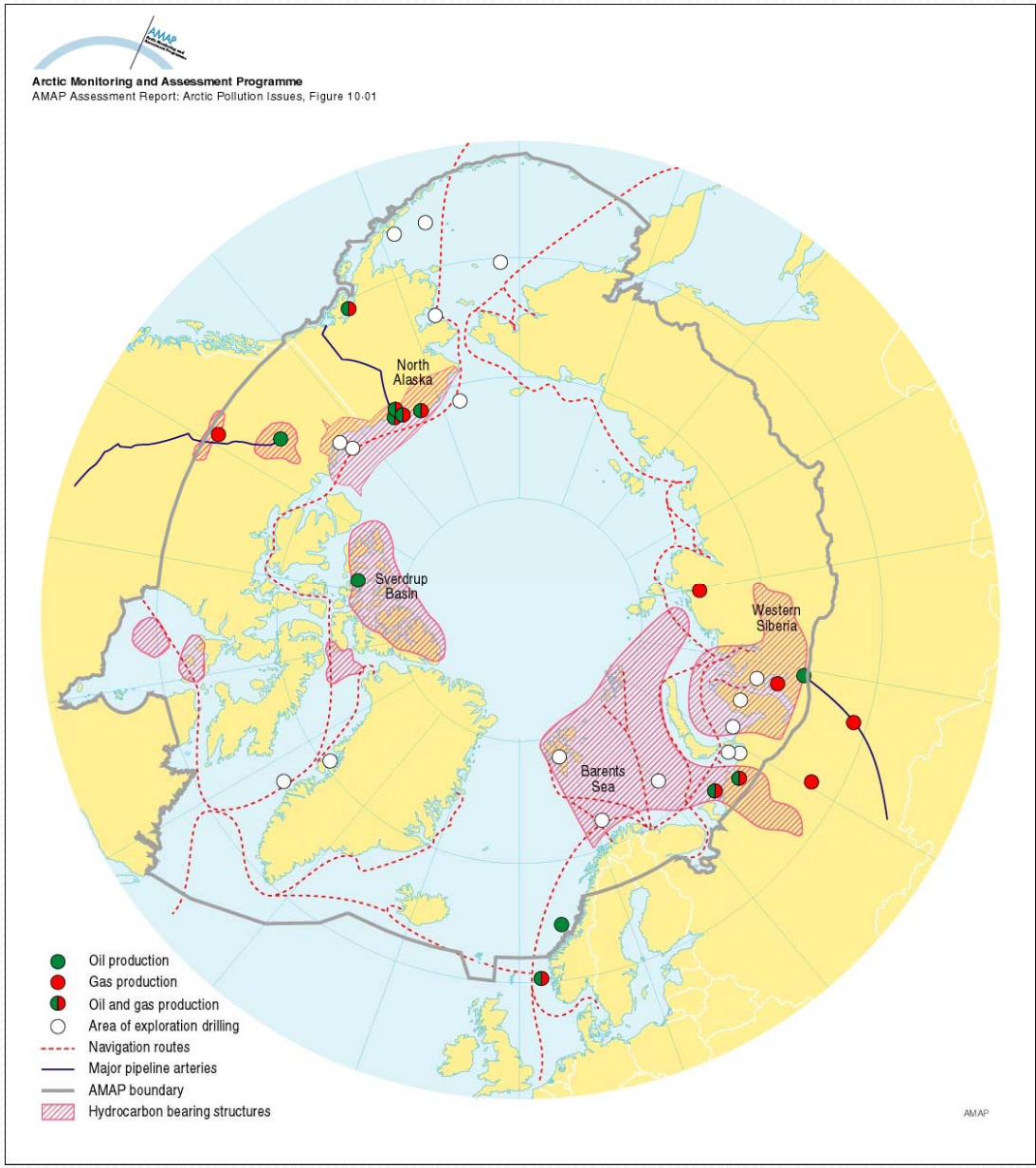
Coastal erosion following Fall storm, October 2004 (*D. Atkinson*)

Development of unexploited resources will bring new risks and rewards

Recent estimates indicate that ~22% of the world's undiscovered, recoverable oil and gas lie above the Arctic Circle:

- 90 BB oil (13% world reserve)
- 1,670 TCF gas (30%)

- 84% lies offshore

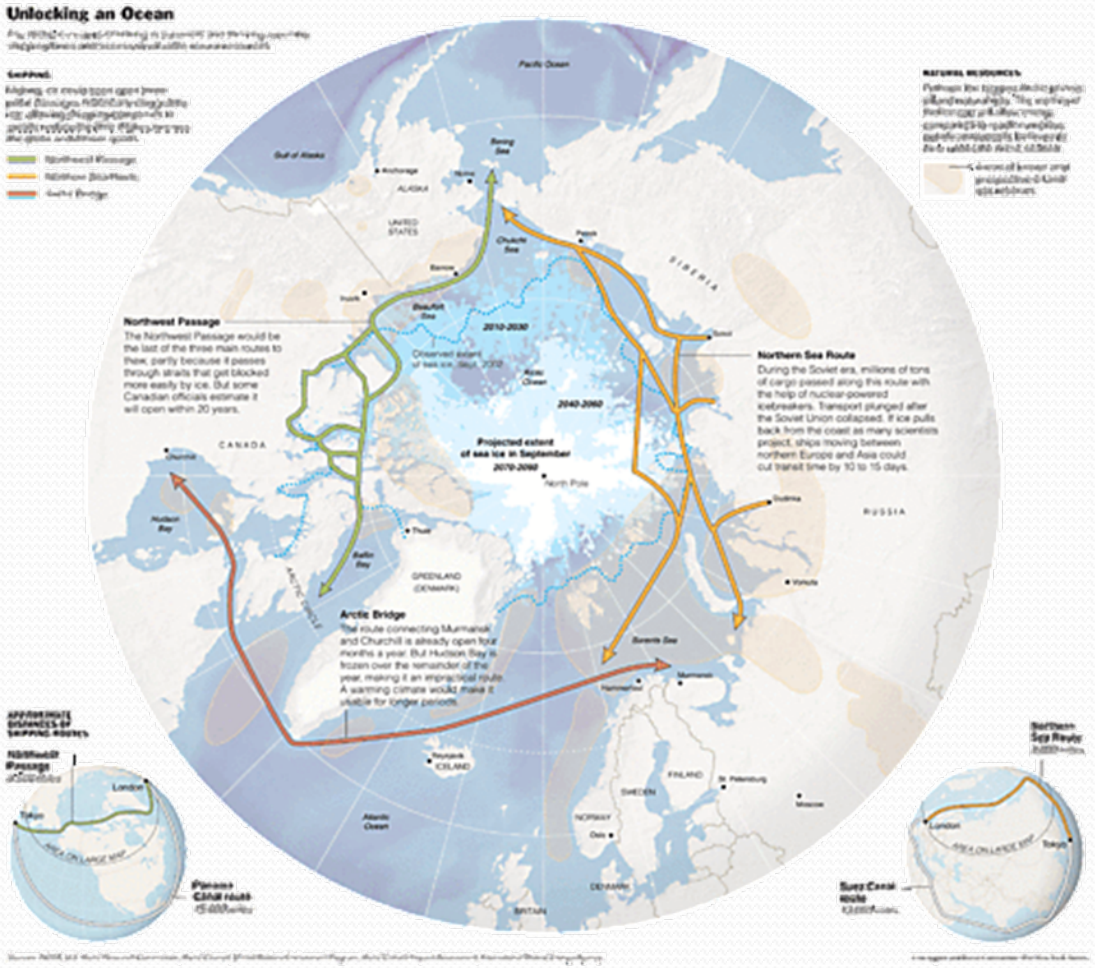


Retreating sea ice will open new shipping routes across the Arctic

Increased traffic also poses serious risks:

- **Cargo spills in ice-laden waters**
- **Invasive species and pollutants**
- **Heightened geopolitical tension and potential of terrorism**

Threats are worsened by inadequate communication and response infrastructure



M/V Selendang Ayu

December 2004

Building for Resilience

Baseline meteorological, oceanographic, and sea ice data required to build offshore structures to sustain harsh Arctic conditions are inadequate or not available for many parts of the Chukchi and Beaufort Seas.

- *Wind speed range*
- *Air temperature range*
- *Current ranges*
- *Tidal ranges*
- *Wind-induced surge range*
- *Water depth range*
- *Rafted ice thickness, sail height*
- *Ridged ice keel depth*
- *Seabed geotechnical data (e.g., water depth, ice gouge depth)*

- **Petroleum and natural gas industries — Arctic offshore structures DRAFT INTERNATIONAL STANDARD ISO/DIS 19906 (2009)**

Correcting this deficiency through monitoring, modeling, and technology development would be a valuable focus of DHS University Program research