CONTEXT & CLIMATE CHANGE
Lessons from Barrow, Alaska

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Thanks to colleagues Amanda H. Lynch, Elizabeth N. Cassano, Leanne Lestak, James Maslanik, Jason Vogel & others in Colorado, to Anne Jensen & Glenn Sheehan in Barrow, to the people of the North Slope, & to HARC at the National Science Foundation for research support

OUR PROJECT
Interdisciplinary & Applied

**SHARED PURPOSE**
- To help the people of the North Slope make more informed decisions in response to climate change & variability

**ORGANIZATION**
- Shared locations at CU and in Barrow
- Shared focus on “Big Storms”
- Shared temporal & spatial context

**PROCEDURES**
- Project meetings in Boulder linked to Barrow
- Meetings in Barrow: Technicals, BASC, KBRW, High School, interviews
- Interdisciplinary Graduate Seminar, Spring 2004
OVERVIEW OF RESULTS
Vulnerability Factors

- Big storms that track near Barrow
  - Frequency & intensity
  - Wind speeds, direction & duration
  - Sea ice concentration & location
- Coastal geography & geology
- Human factors
  - People, property & other things of value
  - Human actions affecting physical environment
- Each storm is different
  - Vulnerability depends on combination of interacting factors
# BIG STORMS
## The Organizing Focus

<table>
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<tr>
<th>Date</th>
<th>Peak wind speed (mph)</th>
<th>Daily Average wind speed (mph)</th>
<th>Dominant wind direction</th>
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<td>11/27/50</td>
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<td>31</td>
<td>9/29/59</td>
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<tr>
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<td>74 (estimated)</td>
<td>10/4/54</td>
<td>31</td>
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BIG STORMS are unusual
ARCTIC-WIDE STORMS
Increased Frequency & Intensity

McCabe, Clark and Serreze 2001
STORMS IN BEAUFORT/CHUKCHI SEAS
Small increase in summer cyclone intensity
Number of high wind events in Barrow, 1950-1998
Figure 1. Large panel: NRTSI-derived sea ice extent and concentration anomalies (in %, see color bar) relative to NASA Standard Team means for 1988–2000. Median ice extent over the same period is shown by the red line. Four boxes (A, B, C, and D) show MODIS validation areas (see Figure 2). Ice extent in the months leading to the September minimum are shown at left. At right, September sea ice extent and concentration anomalies for the four previous minimum extent years.
COASTAL EROSION
Barrow, 1948 – 1997

- Shoreline retreat NE of gravel pit, up to 35 m
- Shoreline growth off Browerville
- Shoreline retreat SW of gravel pit, less than 5 m
PEOPLE & PROPERTY
Barrow, 1964 - 1997

- Population more than tripled to about 4700
- Much more property (shown in purple)
- Utilidor (green) is a major concern
CLIMATE CHANGE EXPECTATIONS
& data from Barrow

- Rising temperatures ✓
- Retreating sea ice ✓
- More frequent & intense storms ?
- More damage to coastal area ✗
  - 1963 storm about $19 million
  - Others less than $7.7 million
- Figures are incomplete
FUTURE IS UNCERTAIN
Barrow as an open system

Scientific uncertainty persists
- Data on this open system are inevitably incomplete
- Models of this open system cannot be validated in principle
- Science cannot be a prerequisite for policy decisions

Science nevertheless can inform policy decisions
- Prepare for a scenario like the October 1963 storm?
- Prepare for more recent, less damaging storms?
- Develop a resilient strategy, incorporating scientific uncertainty?

Context matters in any case
- Barrow’s vulnerabilities are not equivalent to Wainwright’s, Pt. Hope’s
INFORMED POLICY DECISIONS
Task is to broaden the range

- Army Corps of Engineers/NSB Joint Feasibility Study
- Current activities to reduce vulnerabilities
  - Warning to tie down building materials
  - Design of $35 million Global Change Research Facility
  - Location of new hospital
  - Platting of evacuation route, an alternative to coastal road
- For further consideration
  - Increase early warning
  - Retrofit the utilidor for resilience
  - Rollback thru planning & zoning: Let nature decide
  - In general -- reserves, redundancy & resilience
Our Approach to Human Dimensions

- Oldest distinctive tradition within the policy movement
  - Contextual – the particular context always matters
  - Problem-Oriented
  - Multi-method
  - There is a slow convergence on this outlook in the movement

- In practice, respect different roles & responsibilities
  - Community decides, and takes responsibility for those decisions
  - We advise, taking responsibility for limitations of theory & data

- In interpersonal relations, the overriding aim of science is not prediction, but freedom through insight
CONCLUSIONS

Despite strong evidence for environmental change, increases in the frequency of big storms in the vicinity of Barrow are modest at best, and damages from recent storms are less severe.

Nevertheless, the community and things it values are vulnerable because of the retreat of sea ice & permafrost that protect against the damaging effects of storms.

Our research incorporates scientific uncertainty and broadens the range of informed policy decisions beyond those otherwise available.

Barrow is unique: Context matters in climate change policy.
REFERENCES


When the heavy ice is way out, old timers say “I hope we don’t have that storm.”
Kenneth Toovak, Inupiat Eskimo elder