Challenge, Risk, and Opportunity
The Human Dimensions of a Changing Arctic

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Changing Perspectives on Research in the North

Robert Peary Sledge Party, posing with flags at the North Pole, 04/07/1909

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Members of the international Siku-Inuit-Hila (Sea Ice-People-Weather) project on the sea ice near Qaanaaq, Greenland. Photo credit: Andy Mahoney
Arctic Peoples and Environmental Change

Arctic Environmental Change of the Last Four Centuries


A compilation of paleoclimate records from lake sediments, trees, glaciers, and marine sediments provides a view of circum-Arctic environmental variability over the last 400 years. From 1840 to the mid-20th century, the Arctic warmed to the highest temperatures in four centuries. This warming ended the Little Ice Age in the Arctic and has caused retreats of glaciers, melting of permafrost and sea ice, and alteration of terrestrial and lake ecosystems. Although warming, particularly after 1920, was likely caused by increases in atmospheric trace gases, the initiation of the warming in the mid-19th century suggests that increased solar irradiance, decreased volcanic activity, and feedbacks internal to the climate system played roles.

HUMAN ADAPTATION TO ARCTIC ZONES

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INTRODUCTION

The study of human adaptation to polar areas has engaged scholars in many fields since the late nineteenth century. The first two scientific monographs on the Eskimo were published in 1888 (16,55), and were soon followed by useful reports (2,39,99,110). Since then much work has been undertaken, and efforts at a synthesis are now under way. Tundra ecosystems were recently a focus of research efforts by the International Biological Program (IBP), and students with interest in the human ecology of this region now have a rich and rapidly growing literature. The Swedish component of the IBP/Tundra Biome has published a useful collection of papers on the structure and function of tundra ecosystems (102).

A group of Copper Inuit in the central Arctic dressed in winter clothing. Photograph by J. J. O’Neill during the Canadian Arctic Expedition, 1913-1916. (CMC neg. no. 38466)
Recognizing the Breadth of Change

“The Arctic is the barometer of the globe’s environmental health. You can take the pulse of the world in the Arctic. Inuit, the people who live farther north than anyone else, are the canary in the global coal mine.”

Synthesis and Assessment

ACIA
Arctic Climate Impact Assessment

AMAP
Arctic Monitoring and Assessment Programme

Arctic Human Development Report
Land Use Changes

Settlements in arctic Canada ca. 2000 BP

Hunting Territories in Interior Alaska ca. 1978 (Patterson 2010).

Ilulissat, Greenland, 2009
Broadening the Landscape Concept

Ice Road on the Lena

Community Garden, Nenana, Alaska.
Northern Food Security

Potato farmer Ferdinand Egede: His grandfather was a hunter, his father a livestock farmer and his son now harvests crops.

Kenneth Høegh, the chief consultant to Greenland's agricultural administration -- standing here next to a cold-resistant potato variety.

Domestic fowl, small farm, Fairbanks, Alaska.
In the long term, potential for livestock may improve if adequate precipitation allows forage and grain production. Wood bison from Canada were recently imported as part of a restoration effort and to reestablish a wild grazing system, but it will be at least a decade before small numbers may be harvested. In the short term, in-state livestock production might expand to serve local markets (especially on the road system) as the cost of imported meat increases. Ranching of elk and plains bison at low density may hold promise because of broader foraging ability, but fencing costs are a challenge. Some residents already raise goats and northern sheep breeds for home use on predominantly native forage, including shrubs.

Game production occurs mostly on public lands and uses solar energy—meaning that game animals feed on plants that use the sun as energy; they don’t require other energy inputs, unlike most agricultural crops. Moose habitat generally benefits from frequent fire disturbance or logging if willows or deciduous trees regenerate. However, game production is less reliable than livestock—animals are often dispersed relative to settlements and there is limited control of production factors, which are controversial (e.g., predator control or prescribed fire). Currently one of every three moose harvested in Alaska comes from the region around Fairbanks and Delta. We expect it will remain difficult to engage the public on agricultural policy until the price of food becomes a substantially larger proportion of annual income for Alaskans. As population expands, residential development on lands with agricultural potential near urban centers may warrant discussion of zoning for food production.

Red meat production in Alaska (annual average 2001-05, % of total above bars)

From Paragai et al. in press, Ak Farm Bureau Report
Moving to the Pan-Arctic Scale

Licenses for cod sea-cage farming in Norway (red circles), 2007. Data from Norw. Direct. of Fisheries. Interactions between escaped farmed and wild cod. Research supported by the Norwegian Research Council (2006-09, Projects 'Interactions' and 'Vertical').
Arctic Demographics

2007 Summer Sea Ice Minimum
Immediate and Cumulative Impacts

Feedbacks from changing environmental conditions and global processes

- Distance traveled
- Cost of fuel
- Success of harvest
- Cost of purchased goods
- Needs for wage labour
- Out migration
- Impacts on health

*Butchering seals on the ice at Shishmaref, Alaska. Photo: K. Stenek*
Links to Development
Major Achievements

Unikkaaqatigiit: Perspectives from Inuit in Canada

Putting the human face on climate change

Barrow Arctic Science Consortium (BASC)
Science for Society in the Pan-Arctic

ARCTIC RAIN-ON-SNOW AN INCREASING CHALLENGE TO WILDLIFE, FORECASTERS

Bulletin of the American Meteorological Society, Oct 2008 by Rennert, Kevin J, Roe, G, Putkonen, J, Bitz, C M
The Future