ARCTIC CHANGE: HUMANS AS PASSENGERS AND DRIVERS

Bruce C. Forbes
Arctic Centre
University of Lapland
Rovaniemi, Finland
Key science questions for SEARCH include:

- (1) Are humans merely affected by arctic change (passengers), or are we also causing it (drivers)?

- (2) At what point do climate and environmental change issues become as important to the public as other socio-economic issues - like health and unemployment - that often dominate in the media?

- (3) In addition to indigenous populations and subsistence or mixed economies, there are other human groups (e.g. tourists, non-native residents) and economies (e.g. heavy industry) that can serve as passengers and/or drivers. How should we think about these different groups? Will the effects on each of them be the same?
In terms of linking the natural, physical and social sciences to answer these questions, we need to carefully address scale issues and, in particular, the patterns of recently observed ecological and social impacts. Just as not all sectors of the arctic are currently experiencing a warming trend, there is a geography of anthropogenic drivers such as intensive and extensive land use. Seen here are seasonal and annual average surface temperature trends (°C per decade) over the northern hemisphere (AMAP 1998).
We all have our favorite areas we are most familiar with. For purposes of this talk I will concentrate mainly on terrestrial regions experiencing some warming: N Fennoscandia, NW Siberia and NW North America.
In terms of extensive land use, in northernmost Fennoscandia and NW Russia reindeer (*Rangifer tarandus*) can have profound impacts on ecosystem parameters such as vegetation cover, surface albedo, productivity, soil infiltration and decomposition rates. Visible here is the absence of fruticose lichens due to long-term trampling/grazing on subarctic Finnish fjells.
Not just a matter of lichen cover. Cover and biomass of preferred shrub species are also diminished by long-term heavy grazing. Willow (*Salix lanata*) is a key forage plant.

**Finland:** animals present mainly in summer

**Norway:** animals present only in winter
We know that small-scale, low-intensity disturbances can accumulate in space and time to achieve relevance at the regional scale. As startling as some of the reported climate-related ecosystem changes are, for many indigenous groups in northern Russia they pale next to the social and economic upheaval that has taken place since the collapse of the Soviet Union. The rapid and unfettered industrial development of the Russian Arctic contrasts with the more stringent regulatory environment in North America which, along with drilling technology, helps to reduce physical and chemical impacts by an order of magnitude.
The debate is no longer about ‘if’ Russia’s arctic petroleum can be exploited but, rather, ‘how soon’. Former state monopolies are urgently raising capital now via shares traded in international stock markets.

Getting Russia’s oil out of the wilderness

By Sabrina Tavernise
The New York Times

MOSCOW: With Russian oil exports rapidly becoming the centerpiece of its relations with the world, a debate is raging over how to get the country’s bountiful supplies of crude out of the wilds of Siberia and onto world markets.

Russia’s export routes are reaching capacity as production rises, creating an imminent need to build several major pipelines, ports and storage terminals to break the bottleneck.

One part of the debate is whether to bind Russia’s energy future to China or to Japan. Another is an ideological clash over whether state or private companies should own Russia’s pipelines. Whatever the outcome, the routes chosen will have an impact for decades to come.

Asia is the final destination for two competing Russian pipelines. A route into Asia would be a first for Russia.

The Russian government has yet to say which of the two routes it would prefer.

Until Koizumi’s visit, bets were on a deal with China, where talks are more advanced. Russia would risk tarnishing relations with its powerful neighbor if it pulled out, and Yukos controls the fields at the start of the 400,000 barrel-a-day pipeline.

The Nakhodka line would run nearly twice the distance, for more than double the price, making analysts skeptical of the economics. Nor is it clear that the oil reserves in the little-explored region of East Siberia will be sufficient to fill the 1-million-barrel-a-day pipeline.

Japan’s gesture “might well be a delaying tactic before the Russians sign on the dotted line with the Chinese,” said Philip Vorobyov, a Russia specialist at Cambridge Energy Research Associates. “Maybe it’s a way of saying, ‘We might be able to do something bigger.”
Gazprom set to develop new fields

October 14, 2003 Posted: 22:07 Moscow time (18:07 GMT)

MOSCOW - Gazprom is planning to produce some 72 percent of its gas at new fields by 2020, Gazprom Deputy CEO Alexander Ananenkov declared during his visit to Gazprom gas fields in the period from October 6 to 9, 2003.

In this respect, one of the main tasks of Gazprom over the next several years is to maintain production at current large gas fields by putting into operation new compressor stations, develop current fields on the Yamal Peninsula, explore new fields in the north of Russia and get licenses to develop fields in the east of the country, Ananenkov specified.

He also said that Gazprom was to upgrade almost completely the Russian gas sector over the next twenty years. The gas giant is also to modernize and enlarge the gas transportation system since new production facilities are to be put into operation, the press service of the gas holding reported.
American oil companies want access to Murmansk oil terminal

By Heikki Arola in Murmansk

Russia is planning to construct a large oil pipeline and oil terminal in Murmansk, along the country's northern coast and with access to the Barents Sea. American oil companies are eager to participate in the project. If such cooperation is successful, the project may be completed much earlier than planned. In an energy seminar that was recently held in St. Petersburg, Russia's Economic Development and Trade Minister German Gref observed that in the best-case scenario, Russian crude oil may pass through the Murmansk pipeline and terminal to the United States already in 2007.
New pipeline construction is proceeding quickly across the East European Arctic and Northwest Siberia at the same time as the Northern Sea Route is being opened to tanker shipping. This exemplifies the process of globalization, yet it is far from merely an issue of global economics. Direct and indirect impacts on social and terrestrial ecological systems to date are extremely significant regionally, with great potential for marine/atmospheric feedbacks.

“Building the road to your future”. Billboard in Obskaya, Yamal Region
On the one hand, there is complete physical destruction of the plant-soil cover over vast areas. Sand and gravel quarries often cover several square kilometers.
On the other hand, we see rapid transformation of the hydrological, chemical, albedo and nutrient regimes in otherwise intact vegetation. Here, dust affects moist acidic tundra along roads in Northwest Siberia.
How do we account for the cumulative effect of local impacts? In North America we’ve almost forgotten about patchy kinds of impacts because they’ve been so effectively banned since the 1970’s. A similar ban in Russia is virtually ignored and unenforceable. The resulting damages are cited by both indigenous peoples and scientists as regionally significant.
In addition to these ecosystem impacts, industrial development can also lead to health and demographic problems (Pika & Bogoyavlensky 1995). Compared to their North American counterparts, Russian arctic indigenous peoples lack political clout as well as title to land, perhaps one of the key factors in their cultural survival (Osherenko 2001).
Recently observed changes over large areas and presumed drivers

- Increase in dwarf birch (*Betula nana*) and decrease in cottongrass (*Eriophorum vaginatum*) near Toolik Lake, Alaska (Chapin et al. 1995). Presumed drivers: climate warming and/or drying
- More general increase in shrub abundance across northern Alaska (Sturm et al. 2001). Presumed drivers: climate warming and/or drying
- Increases in the cover of polargrass (*Arctagrostis latifolia*) and arctic lupine (*Lupinus arcticus*), Herschel Island, Yukon Territory (Kennedy et al. 2001). Presumed drivers: climate warming and/or drying
- Increasing ‘grassification’ or ‘meadow-steppe tundra’, coupled with decreases in lichen cover and overall species diversity across significant portions of Northwest and Central Siberia (Shchelkunova 1993; Vilchek 1997). Presumed drivers: tundra disturbance due to industry coupled w/ heavy grazing by semi-domestic and wild reindeer
- Increase in the amount of high-latitude vegetation burned annually throughout the circumpolar North (sources in Zimov et al. 1999). Presumed drivers: climate warming and/or drying
To what extent are these changes seen by indigenous peoples? Some comments on climate-plant changes in NW N America: (Kofinas et al. 2003)

- More woody vegetation (willows) now in the Mackenzie Delta than fifty years ago (Aklavik)
- Lakes and Mackenzie Delta are “drying up”, especially in Crow Flats located north of Old Crow (Old Crow)
- Treeline moving north near Arctic Village (Arctic Village)
- More scrubby-brush (dwarf birch) on south-facing hill tops (Arctic Village)
In order to better characterize the effects of recent trends in high latitude climate, it is necessary to understand not only the burgeoning raft of quantitative data on bio-physical parameters, but also the arguably diminishing pool of traditional ecological or local knowledge. Qualitative data based on participatory approaches to research derive from a time slice of the past 30-50+ years, within the lifetime of active or retired people who have lived their life on the land and sea full-time or seasonally.
However, intimate ecological knowledge is not a universal among all northern peoples, just as not all SEARCH research questions may necessitate, or benefit from, strong stakeholder involvement. That said, SEARCH can and should serve to enhance the dialogue between bio-physical scientists, social scientists and local stakeholders.
Ideally, local/traditional knowledge in regions characterized by more widespread forms of land use can perhaps help to partition the effects of climate change from effects wrought by natural or managed shifts in the abundance and density of living resources.