Arctic Observation Network Social Indicators Project: Boulder AON PI Meeting Project Report

Project Summary
The Arctic Observation Network Social Indicators Project (OPP0638408) is intended to contribute to the development of the Arctic Observation Network and to the science goals of SEARCH in two ways: (1) develop and make available to the science community relevant datasets; and, (2) identify gaps in the existing observation system and recommend appropriate actions to fill those gaps.

The SEARCH Implementation Plan identified the following arenas of human activity likely to involve climate-human interactions: (1) subsistence hunting; (2) tourism; (3) resource development and marine transportation; and, (4) commercial fishing. This project seeks to develop and assess data sets in these four areas.

Again drawing from the SEARCH Implementation Plan priorities, the project also seeks to develop and assess data sets measuring social outcomes. In collaboration with the Arctic Council’s Arctic Social Indicators working group, this builds on the recommendations of the Arctic Human Development Report by focusing on data sets in six areas: (1) material well-being; (2) cultural continuity; (3) education; (4) health and demography; (5) ties with nature; and, (6) fate control.

In anticipation of the long-term goal of integrated analysis of social, natural, and physical science data sets, we are working in collaboration with the Arctic RIMS project to structure data in a regional geography that is embedded in the ArcticRIMS GIS system. The Arctic, using the Arctic Human Development Report definition as a guide, consists of 75 regions. Recognizing that individual communities within the same region often differ in the climate-human interactions, the project is also compiling a limited set of place level databases. The target time period is 1980 to the present and the target time step is annual. All databases share a common record structure of location (region or place) and year.

Science and Technology Highlights
Subsistence Hunting:
- Most comprehensive harvest surveys are community-specific. It is seldom possible to generate regional estimates. Since communities within the same region (e.g. coastal and inland) often differ in the composition of subsistence harvest, community-specific data is highly relevant to understanding arctic change.
- To understand climate-subistence interactions it is necessary to take into account changes in the total resource harvest. Variations in the harvest of individual resources are large from year-to-year. Harvesters try to compensate for low harvests of one resource with harvests other resources. Multi-year changes in harvest of an individual resource coupled with changes in the total resource harvest are of particular importance to social outcomes.
- The project’s Alaska-Northern Canada database consists of 1,521 place/year records of which 631 records include estimates of harvest of all resources as well as harvests of specific resources. Separate harvest reports are available for 131 species and seven resource categories (e.g. large land mammals, salmon) as well as total harvest. Harvests are expressed as kilograms of edible harvest per capita.
- From 2000 to 2006 103 comprehensive harvest surveys have been conducted compared with 110 in the 1990s. There are 50 instances where it is possible to compare harvest amounts in the 1990s and 2000s. Thirty of these observation sets are separated by four years or less.
- There is no existing network of comprehensive harvest studies in arctic North America.
• Analysis of 631 comprehensive community harvest surveys shows that measuring harvests of top 10 species in each community accounts for a mean of 90 percent of total harvest. This finding has major implications for the feasibility of conducting economical, targeted harvest surveys in communities participating in the AON network.
• The forthcoming Arctic Social Indicators report will identify subsistence harvest and consumption as one of a few primary arctic social indicators.
• We collaborated with other researchers directing regional projects involving communities in a proposal to test targeted harvest surveys. These researchers included: Shari Gearheard (IPY: Exchange for Local Observations and Knowledge of the Arctic (ELOKA OPP0632345), Susan Crate (Assessing Knowledge, Resilience & Adaptation and Policy Needs in Northern Russian Villages Experiencing Unprecedented Climate Change OPP0710935), Gary Kofinas (Heterogeneity and Resilience of Human-Rangifer Systems: A Circumpolar Social-Ecological Synthesis, OPP0531200), Larissa Abyrutina (Russian Association of Indigenous Peoples of the North, RAIPON), Kristina Lasko (Saami Council), Gerard Duhaime (Laval University), Birger Poppel (University of Greenland).
• **Recommendation**: International pilot testing of targeted harvest surveys in collaboration with participating communities. Foster development of the approach as part of a community-based observation network.

**Commercial Fishing**
• Since climate-fishing interactions are likely to differ by resource, we are focusing on key resources in each region. Alaska: crab, halibut, herring, salmon, other groundfish, other shellfish. Norway: Atlantic Cod, Atlantic Mackerel, Blue Whiting, Capelin, Pollock, Haddock, Shrimp. Iceland: match with Norwegian species. Russia (Chukotka): Chum Salmon.
• Of particular relevance to social outcomes of fishing activity is where fish are landed and where fishers live. Measures include: (1) number of fishers; (2) number of licenses; (3) metric tons; (4) value. We are compiling landings data by region for Alaska, Iceland, and Norway.
• Of particular relevance to climate-fishing interactions is where fish are caught. We have been collaborating with the Norwegian College of Fisheries in Tromso, and through them, with the Ministry of Fisheries. They have been able to process landings and log book microdata into GIS format to track changes in harvest location. Additional work of this type is now being done in the Fish Exchange Project centered in Bergen. This work was reported at the recent S4D Workshop in Oslo.
• Understanding climate-fisheries interactions requires marine geospatial observations of catch locations and terrestrial geospatial observations on employment and income. This understanding also requires that the two types of observations be linked. A change in catch locations, for example, can be accompanied by a shift between resident coastal fishers and non-resident offshore fishers. Linkage of harvest and shoreside economic data constitutes the principal gap in fisheries observations.
• **Recommendation**: Starting with groundfish fisheries in Alaska and Norway, expand the approach of the Norwegian Fish Exchange Project in collaboration with the Alaska Fisheries Science Center and the Norwegian Fisheries Directorate to create a time series database at a 25km resolution that includes landings by harvest location and port, biomass survey data, and spatial fisheries regulations. Making this linkage will require reanalysis of microdata and re-aggregation separately for offshore processors and shore-based catcher boats.

**Resource Development & Marine Transportation**
• Climate-resource development interactions may produce changes in resource production, but existing production statistics vary by country and cannot be aggregated across resource types. Changes in value can be aggregated but value is affected by price as well as activity level. The ideal measure of resource development activity for the purpose of understanding social outcomes at the regional level is employment. Such data are not available by industry by region and are collected inconsistently across countries. Alaska and Norway petroleum data are readily available by field and thus can be aggregated by region. Russia petroleum data are not reported separately for the Arctic. Marine transportation data (i.e. numbers of vessels by industry traveling routes involving arctic waters) exist but are currently classified.
• We are creating indexes of resource activity by region based on the best proxy variables for each country.
• We collaborated with Hajo Eicken’s team proposal **AON Collaborative Research on the State of the Arctic Sea Ice Cover: Sustaining the integrated Seasonal Ice Zone Observing Network** (SIZONET) in a proposal to will collect historical data on ore shipments and barge activity through the Bering Straits, and match this data with sea ice data. Together, these data would support analysis of the effects of changes in sea ice conditions on the economics of resource development and the cost of living in Northern communities.
• **Recommendation:** Seek funding and implement proposed integration of marine transportation and sea ice data.

**Tourism**

• Tourism activity does not uniquely account for employment in any reported industry sector. The Accommodation industry, for example, experiences demand by resident travelers (e.g. business and government personnel providing services) as well as non-resident travelers. To address this problem, the World Travel and Tourism Council has developed methods for re-organizing national accounts to identify the contribution of tourism to a state or national economy. This approach, called Satellite Accounting, has been implemented in Norway. The satellite accounting approach cannot be practically applied at the level of arctic regions, but could be extended to arctic states (i.e. at a more aggregated level than the 75 regions identified in this project).
• Given the uneven application of Satellite Accounting in arctic nations, we are focusing on two types of measures: (1) employment in sectors with significant tourism-driven demand; and, (2) number of visitors.
• At our project workshop of researchers and stakeholders, we together identified a major shortcoming of tourism data. In many instances, tourism-related jobs in the Arctic are held by transients. In addition, many tourism-related businesses are owned and managed by firms located outside the arctic. For both reasons, tourism statistics often are not accurate measures of local economic impacts.
• **Recommendation:** Include in the initial testing of the community-based observation network a measure of tourism local benefits that can be compared with standard tourism measures of activity.

**Social Outcomes**

• We have developed and released through CADIS a database containing 597 social outcome measures in the domains of employment, housing, mobility, education, language, and income for 27 regions of Alaska for the period 1970 to 2000. These measures are based on decennial census data.
• Larry Hamilton, in a collaborative AON project, is developing an annual, pan-Arctic population database that uses the same spatial and time structure.
• We have developed a place-level data base containing 703 social outcome measures in the same domains as the regional database for 408 places in Alaska, again for the time period 1970 -2000.
• A member of the project team, Gerard Duhaime, and his colleagues created **ArcticStat** as a single portal for accessing social and economic data from arctic national statistical agencies. Duhaime’s team was successful in negotiating collaborations with the national statistical agencies of Canada, Greenland, Norway, Sweden, Finland, Iceland, the Faroe Islands, the United States, and Russia. Arcticstat includes links to data at the regional level on vital statistics, education, employment, income, migration, health, housing, and national accounts.
• ArcticStat is a major step toward the development of a pan-Arctic social outcomes database. Its use also presents major challenges. We have downloaded over 3,400 tables using ArcticStat. We have successfully used special software to recognize complex table structures and to recreate original tables. We have learned in the process of testing our protocols that national statistical agencies vary widely in their choice of what data to publish. They often differ in how they group data. Their tables are intended to be printed, not used as a database and combined with data from other countries. Yet the development of recommendations for improving the comparability of arctic social and economic data depends on having first developed a variable-by-variable comparison. Creating readable electronic files of tabular data is a first step in this process. The second step is to convert the tables to databases sharing the same file structure and variable naming conventions. Only then will it be possible to make variable-by-variable comparisons.
• **Recommendation:** Compile ArcticStat-derived tables into a pan-Arctic regional database that will support a variable-by-variable comparison. Create comparable variables to the extent possible. Recommend country-specific tabulation changes that will significantly improve the comparability of data.

**Lessons Learned**

• The SEARCH Implementation Plan logically identified the compilation of existing data as a high priority task. We designed our project accordingly. Most sources of social science data are national agencies that operate under strict confidentiality regulations. This is true for both business and individual records. They in turn choose to aggregate and publish summaries of data within the context of their national mandates and interests. National differences in mandates and interests result in differences in what summaries are published. Published summaries are not intended as databases but rather as reports to be printed. These challenges cumulatively make the tasks of compiling existing data and collecting primary data of much closer complexity and effort than we ever imagined.

**Interactions with Other Projects**

• We discussed many of these interactions in more detail above. This is a listing.
  • ArcticRIMS (Richard Lammers et al): collaborated on common geospatial system
  • Arctic Social Indicators (Joan Larsen et al): collaborated on common definition of social outcome domains and key measures including total harvest of subsistence resources; collaborated with ASI leadership on Phase 2 AON proposal
  • Norwegian Fish Exchange Project (Geir Odd Johansen et al): collaborated on joint approach to compiling and linking Barents Sea and Bering Sea fisheries catch and landings data.
  • SIZONET (Hajo Eicken et al): collaborated on integrated proposal for linking marine transportation and sea ice data
  • Shari Gearheard (IPY: Exchange for Local Observations and Knowledge of the Arctic (ELOKA) OPP0632345): Collaborated on proposal for testing targeted harvest surveys as part of the development of a community-based observation network.
  • Susan Crate (Assessing Knowledge, Resilience & Adaptation and Policy Needs in Northern Russian Villages Experiencing Unprecedented Climate Change OPP0710935): Collaborated on proposal for testing targeted harvest surveys as part of the development of a community-based observation network.
  • Larissa Abrutina (Russian Association of Indigenous Peoples of the North, RAIPON): Collaborated on proposal for testing targeted harvest surveys as part of the development of a community-based observation network.
  • Kristina Lasko (Saami Council): Collaborated on proposal for testing targeted harvest surveys as part of the development of a community-based observation network.
  • Gerard Duhaime (Laval University): Collaborated on proposal for testing targeted harvest surveys as part of the development of a community-based observation network.
  • Birger Poppel (University of Greenland): Collaborated on proposal for testing targeted harvest surveys as part of the development of a community-based observation network.
Brief Examples of Data Use

Map 1. Location of Norwegian Cod Catches, 1985; 2005

Location of Cod catches shows shift to the north and east between 1985 and 2005.
Source: Norwegian Fisheries Directorate

Figure 6. Distribution of Change in Kilograms Per Capita Edible Resource Harvest Between Successive Harvest Surveys for 47 Communities, 1980s to 1990s

Figure 7: Value of Alaska Metal Mining as a Share of US Production

[Graph showing value of Alaska metal mining as a share of US production over time]
Project Relationship with international Arctic observing efforts
Concurrent with the development of our original proposal in 2006, the Arctic Council initiated the Arctic Social Indicators project (ASI) as a follow-up to the Arctic Human Development Report (AHDR). The intent of ASI is to devise a limited set of indicators that reflect key aspects of human development in the Arctic, that are tractable in terms of measurement, and that can be monitored over time at a reasonable cost in terms of labor and material resources. Four members of our project team were invited to be ASI participants: Kruse, Hamilton, Duhaime, and Rasmussen. Over the past three years, we have collaborated with over 50 other scientists and indigenous people in ASI. Building on the recommendations of the AHDR, ASI identified six dimensions to describe human development: material well-being, education, demography and health, cultural integrity, contact with nature, and fate control. Within each of these dimensions, scientists and indigenous people involved in ASI identified an indicator, or index composed of several indicators. ASI leadership, including Hamilton, Rasmussen, and Kruse, presented ASI results to the membership of the International Society of Quality of Life Studies in San Diego in 2007 and to the membership of the International Arctic Social Science Association in Nuuk in 2008.

The work of the Arctic Observation Network Social Indicators Project and ASI has, by design, converged. We are both using the same six dimensions to describe social outcomes (or in ASI terminology, human development). It has become clear to both groups that there are critical gaps in the existing Arctic Observation Network. The most critical gap is the lack of current and ongoing observation of subsistence resource harvests, particularly in Alaska and Canada. It is equally clear that the gap in resource harvests can only be filled through primary data collection. Less clear is how best to measure the dimensions of fate control and cultural integrity. Testing of alternative measures, including those requiring primary data collection, is required. Even education and language measures appear to require special tabulations by government statistical agencies.

With these data gaps in mind, ASI leadership joined with the team of the Arctic Observation Network Social Indicators Project in a continuation proposal to test a low cost approach to expansion of the Arctic Observation Network through primary data collection and special tabulations. Our continuation proposal was not recommended for funding. Our collaboration with ASI will continue to the extent that our project is able to compile and analyze ArcticStat data with the goal of increasing the comparability of social outcome data.

Project Website: www.search-hd.net