Idea356

INTERNATIONAL POLAR YEAR

THEMES FOR CANADIAN PARTICIPATION

INTRODUCTION

The proposed Canadian Themes are based on a number of criteria and it must be emphasized at the start of this presentation that consultation and communication are ongoing. These themes have emerged from suggestions received in the planning process to date and will mature over the next few months in keeping with the ICSU timelines proposed by the Steering Committee.

The criteria are

- Develop research programs within the community of researchers in the North.
- Inclusion from the earliest planning stages of the "human dimension" in the scholarship, relating particularly to those people who live in the north.
- Research in topics where Canada has a broad base of expertise, generally in more than one scientific tradition
- Inclusion of training opportunities and commitment to communication with all communities
- Provide opportunities for regional scholarship within the broader polar international themes
- Build on Canada's commitment to Arctic Council and the Antarctic Treaty process
- Honour all obligations under land claims agreements and Inuit governance settlements
- Encourage community, education institution, industry and government links

THEMES

Six overarching themes have emerged from discussion to date but it must be reiterated that the discussion and consultation process is not complete and there has been no formalisation of a National Committee. The Canadian Polar Commission has been leading the process of consultation and is addressing questions of funding for the

National Committee. The six themes are centred on one idea incorporating a number of aspects of scholarship on specific regional, national, or global programs and projects. The themes all have a central objective of the integration of social and natural science.

1. The merging of indigenous knowledge traditions and western science traditions in polar scholarship

2. Potential impacts on culture and economy of changes in exchanges of water through the Canadian Arctic Archipelago. Establishing the importance of Arctic Ocean - Atlantic Ocean exchange.

3. Contaminant dynamics in polar systems. Stresses on human activity and environment.

4. Atmosphere, earth and ocean interactions stressing climate change and its impacts at different spatial scales

5. Polar genomics, baselines for resource management and assessment of environmental change.

6. Earth observation technology for monitoring applications to all projects

INDIGENOUS AND WESTERN KNOWLEDGE TRADITIONS.

The theme emphasises the design and conduct of research from an integrated approach using indigenous and western knowledge traditions.

During the last 25 years the face of northern Canada has changed fundamentally as new governance structures have been empowered, as rapid changes in environmental conditions have occurred, and as the Arctic has become a sink for contaminants produced elsewhere on the globe. These changes have resulted in a massive shift in research priorities in the North, moving away from the western tradition academic discipline approaches to an emphasis on social and cultural issues and their relationship to the environments of northern residents.

It rapidly became apparent that northern indigenous people possessed a vast store of knowledge based on oral traditions stretching back for generations. This knowledge base has been variously referred to as ‘traditional ecological knowledge’, ‘traditional knowledge’, and ‘Inuit Qaujimajatuqangit’. The western scientific tradition has been seriously challenged to understand the value of traditional knowledge and to work for, and with, a full integration of the two traditions. This challenge has been due in part to the rigidity of the ‘scientific method’, which has been unable to adapt to different knowledge criteria.

IPY 2007 – 2008 provides an opportunity to develop a new paradigm for polar research in Canada and elsewhere. The paradigm is one of inclusivity of all knowledge bearers

and knowledge bases, and the development of true interdisciplinarity between the social, human and natural sciences in the conceptual design of programs and projects.
The proposal for IPY 2007 – 2008 is to advance the development of the new paradigm with research projects based on the integration of knowledge traditions. Changes in the approach to research will affect all of the circumpolar Arctic where indigenous communities have had their homelands for thousands of years and where other northern residents have lived, often for centuries.

There are a number of areas of scholarship where the two traditions have come together. In glaciology Julie Cruikshank has demonstrated that information on glacier fluctuations can be obtained from the oral record of First Nations elders and can be used in collaboration with western science to produce assessments of the impacts of glacier fluctuations. The methodology of the inclusivity of knowledge traditions is in its infancy but success stories such as the Labrador Ashkui project can be cited as examples.

CONTAMINANTS IN POLAR ENVIRONMENT AND HUMAN SYSTEMS

Contaminants are being transported into the Arctic from industrialized areas of the world to a far greater extent than in the Antarctic due to differences in atmospheric and oceanic circulation systems. The Arctic has also been the dumping ground for industrial wastes. The contaminants are present in all natural and biological systems, bio-accumulate in food chains, and may be stored and subsequently released from natural systems.

Canada has developed a substantial international expertise in contaminant issues in the North and in the environment in general. The reports from the two phases of the Northern Contaminants Program (NCP) are benchmark studies on most issues. The NCP has been a model for the development of expertise in the North. This expertise includes areas such as sources and sinks of contaminants, ecological and health issues due to bioaccumulation, contaminants in natural systems such as permafrost, and clean up of contaminated sites, and is supported by University and government based researchers in southern Canada. The NCP provided the focus for health related and pathways work for over a decade.

The International Polar Year provides the focus to continue contaminant related research with an extension for comparative research to analysis of the less contaminated environments of Antarctica. Antarctica is thought to be less of a sink for pollutants than the Arctic, and is undergoing lower rates of change in permafrost and glacial environment. Knowledge of climate change in the southern polar-regions however is poor compared with northern polar regions. The focus of research would straddle the range of expertise in Canada from the study of contaminants in frozen ground, to the sources and sinks of contaminants, to the effects on human populations through country food consumption.

The model for research, which would draw extensively on the northern research agendas developed in the territories, may include human focused issues such as health, site remediation, waste management, bioaccumulation, and reduction in outputs.

The system dimensions of contaminants require analysis of historical proxy data sources (e.g. ice cores and lake sediment cores); movement and storage of contaminants in oceans; permafrost; terrestrial snow and ice; and the development of bi-polar analogues.

ARCTIC ARCHIPELAGO THROUGHFLOW

One of the themes for IPY, being discussed in Europe, is the notion of 'Gateways'. Gateways exist between the polar oceans and the mid and low latitude oceans, between the polar atmosphere and global atmospheric circulation, and play a critical role in the migration of species.

One of the least understood gateways, and one with potentially the greatest impact on northern communities in Canada, is the gateway between the Arctic Ocean and the Atlantic Ocean through the straits of the archipelago, Baffin Bay, and Davis Strait. Canadian research would concentrate on these pathways, both from a national perspective and as a contribution to the Pan Arctic research program of IPY.

In the natural and physical sciences it would combine expertise from the Institute of Ocean Sciences, the Bedford Institute, and universities. The science would build on the results of the NOW, CASES, ARCTICNET, and JWACS projects using logistics bases of the Canadian science icebreaker, CCGS Amundsen, and terrestrial field stations. The nature of the exchanges and the assessment of potential changes in components such as ice conditions have major implications for marine and terrestrial renewable resources and their accessibility to northern communities which depend on the resources. Climate variability and long term change will be reflected in the marine and terrestrial feedback mechanisms and will have substantial effects on the isolated ecosystems of the Arctic Islands.

Opening of the Northwest Passage to shipping with amelioration of the ice conditions has already been predicted. The shipping changes will include both through-passage between Europe and the Pacific and supply routes into Arctic communities and resources. The potential impact on the economy and environment of the Archipelago is substantial and will be a focus of research.

ENVIRONMENTAL GENOMICS AND RENEWABLE RESOURCES

Technology advances in the field of genomics now enables detailed study of all life forms, from microorganisms to species at the top trophic levels. There are a number of issues in the circumpolar worlds critical both to understanding polar ecology and to effective management of renewable natural resources.

One of the major gaps in our knowledge of polar-regions is a comprehensive taxonomy of species, both terrestrial and marine. Over the last decade projects such as BIOICE, recently focused on the shores of Iceland, have identified thousands of new pelagic species raising vast new fields of research in marine biology. Technological advances within the fields of genomics and proteomics is enabling the recording the genetic make up of microorganisms and hence will be in a position to establish a taxonomy of all species. This fundamental knowledge of ecology will enable major advances in polar science.

A second major issue is the effects of the rapid changes in both the Arctic and Antarctic, long reported by residents and now by scientists, on human activity and environmental health. The changes, which models now predict will accelerate through the 21st century, are produced by anthropogenic activity superimposed on natural change (IPCC and ACIA). The changes are not only apparent in the physical environment, typified by melting of permafrost, but also in the natural environment with changes in the natural environment with attendant migration of species. Vegetation communities, birds, mammals and fish population distributions are changing in ways that impact the lives of polar residents. The observable changes in the latter three reflect changes in other organisms in the food chain as well as physical changes such as the retreat of the ice margin. The changes will result in challenges for communities relying on species for food, for resource managers and health practioners, and directly therefore for culture and economy. Without the baseline data provided by genomics and proteomics it will be impossible to assess the nature of the changes.

It is therefore critical to establish the taxonomy and genetic signatures of polar regions as change accelerates in order to address questions of adaptation, migration, or moves towards extinction.

Much of the material required for genetic analysis can be collected during any other component of IPY projects ensuring the widest possible database. Projects can be supplied with basic sampling protocols and could accommodate material from deep Arctic and Antarctic Ocean environments, from terrestrial ice and sub-glacial lakes and from terrestrial environments.

EARTH ATMOSPHERE OCEAN EXCHANGES

Earth, Atmosphere, Ocean exchanges have been the theme of many recent regional projects in Canada. Surface Heat Budget of the Arctic Ocean (SHEBA), North Open Water Polynia Study (NOW), Canadian Arctic Shelf Exchange Study (CASES), Joint Western Arctic Circulation Study (JWACS), the National Centre of Excellence ARCTICNET, and others have addressed aspects of EAO exchanges, and projects such as the Arctic Coastal Dynamics (ACD) have addressed some of the physical impacts of changes in the coastal regions. Canada has developed extensive expertise in government, academia and the private sector through these projects with international collaborators.

Research in these domains connects directly with the contaminants and throughflow themes.

The IPY will not only provide the opportunity to coordinate observations across polar regions but will promote detailed studies in more sensitive regions relating to human adaptation to changes in ice cover, snowfall, storm occurrence and hydrological changes.

Many of the fundamental science questions on the mechanisms of Earth-Atmosphere-Ocean exchanges will be addressed by international participants in the IPY. Of particular interest for Canada are questions of ecosystem change as exemplified in the International Tundra Experiment (ITEX) study and the Tundra Taiga project of The International Arctic Science Committee (IASC), and permafrost melt and its impacts as currently reflected in the Arctic Coastal Dynamics (ACD) project of IASC.

With the recent ratification of UNCLOS by Canada extensive research will be required nationally, and with international cooperation, on issues of sovereignty and security.

EARTH OBSERVATION

All programmes and projects within IPY will require extensive remotely sensed data from satellite earth observation platforms. The current Canadian platform RADARSAT 1, which provides extensive ice information, is expected to be replaced by RADARSAT 2 in 2005. The new satellite will have a range of new capabilities for measuring atmospheric, surface and sub-surface information and can be used in conjunction with European and American polar orbiting satellites. The schematic demonstrates some of the fundamental roles, which RADARSAT 2 and the other platforms can perform in the conduct of the IPY.

The further development of the technology, together with the ground-truthing will also stimulate a re-investment in polar monitoring sites particularly in the Arctic where some regions have not been contributing fully to networks.