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COMMUNITY-BASED MONITORING HANDBOOK
LESSONS FROM THE ARCTIC AND BEYOND

ARCTIC COUNCIL

Acknowledgements

Author
Victoria Gofman

Editing
Mike Gill
Michael Svoboda
Tom Barry
Lesley Grant

Layout
Tom Barry
Michael Edwards

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CAFF Designated Agencies:

- Directorate for Nature Management, Trondheim, Norway
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For more information please contact:
CAFF International Secretariat
Borgir, Nordurslod
600 Akureyri, Iceland
Phone: +354 462-3350
Fax: +354 462-3390
Email: caff@caff.is
Internet: http://www.caff.is

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COMMUNITY-BASED MONITORING HANDBOOK
LESSONS FROM THE ARCTIC AND BEYOND

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1. About the handbook

1.1 Introduction

No single way of knowing is better than the other, but both in union can be better than either. Our Elders teach that masculine and feminine must come into balance before harmony can be achieved, and in harmony comes understanding. The place of bringing the two together is the wisdom of the heart.

Larry Merculieff
Indigenous Peoples and the Bering Sea:
A marginalized ten thousand year legacy of Knowledge and Wisdom

Community-based monitoring is a complex research field that is becoming an essential component in academic research and natural resource management. It is often used to validate results produced by conventional research methods. Community-based monitoring enables researchers to build on "Western" science by using the best available knowledge, be it academic, indigenous, traditional or local. This holistic approach improves understanding of ecological systems and how they interrelate with human societies.

The Community-based Monitoring Handbook has been written to enhance the role of community-based observations in current and emerging research projects in the Arctic. The main principles of community-based monitoring activities, such as inclusiveness, respect for and recognition of knowledge-holder rights and beneficence, are the same across disciplines and geographical areas. Thus, this information could be applied to broader monitoring efforts and non-Arctic regions.

The opinions and recommendations offered in the handbook are based mainly on the shared experience of eight community-based monitoring programs in North America, Scandinavia, Russia and Australia. These projects' leaders kindly agreed to be interviewed and share their thoughts about the challenges and successes in their work. The reviewed projects were selected to represent the cultural and methodological diversity of community-based monitoring programs. Relevant papers and the authors' personal experience weighed in as well. Recommendations were compiled based on the analysis of this information.

This handbook provides a broad assessment of community-based monitoring. While it is not a comprehensive analysis, it explores different community-based monitoring programs in an effort to highlight the best and most successful practices of each. It is also designed for use as a framework for custom-tailoring specific community-based monitoring projects.

The handbook is written for a diverse audience, including scientists, students, Arctic community residents and government officials. The successful implementation of community-based monitoring may help further the pursuit of knowledge in the Arctic and other regions.


Carsten Egevang/ARC-PIC.com

1.2 Navigating the handbook

The handbook consists of six sections. The information is organized so that content can be scanned quickly for material to meet specific needs. Although it may be beneficial to read the sections in sequence, it is not necessary. While the content may be of interest to many audiences, including, to name a few, novices considering community-based monitoring; experienced scientists and local residents wishing to improve their community-based monitoring practices; and resource management agencies, not all sections are of equal value to all readers. The summary below is offered as an aid to navigation.

The handbook is not intended as a step-by-step instruction manual and readers should use it as one of many resources necessary for the successful development and implementation of community-based monitoring activities. A list of useful resources can be found in Section 6.

Section 1: About the handbook

This section contains general information that may be of interest to broad audiences as it outlines the political and scientific context in which the handbook was written. It specifically addresses:

- Major developments that paved the way for community-based monitoring
- Timing for developing the handbook
- How this work was initiated
- How community-based monitoring relates to broader Arctic research
- The importance of recognizing different knowledge types and their role in community-based monitoring

Section 2: Selected community-based monitoring basics

This section is intended for those who are developing or thinking about developing community-based monitoring activities. It outlines terminology, methodologies, and the decision-making process:

- Decision Tree tool for selecting community-based monitoring types and methods
- Selecting community-based monitoring approaches
- Activities commonly described as community-based monitoring
- Relationships between types of community-based monitoring and their methods
- Classifying and rating community-based monitoring types and methods

Section 3: Review of community-based monitoring projects

Eight projects employing various forms of community-based monitoring are reviewed through project leaders answering a suite of questions. Of interest to anyone curious about existing community-based monitoring projects; also useful to community-based monitoring practitioners wishing to learn from the experience of others. Subjects covered include:

- Utility of community-based monitoring in each specific project
- Role of geographical, cultural, and socioeconomic circumstances and their impact on community-based monitoring outcome
- Lessons learned – achievements and opportunites for improvement

Section 4: Recommendations for community-based monitoring development

This section is especially important for newcomers to community-based monitoring. Practical recommendations include:

- Summary of recommendations derived from the interviewed projects
- Planning, implementation and reporting phases of community-based monitoring

Section 5: Conclusions

Policymakers, natural resource managers, funders, educators and other interested parties are invited for a broader discussion on the issues raised in the handbook, with a focus on:

- Important points presented in this handbook
- Broader challenges and opportunities for community-based monitoring

Section 6: Resources

A list of additional community-based monitoring resources including books, articles and web links.

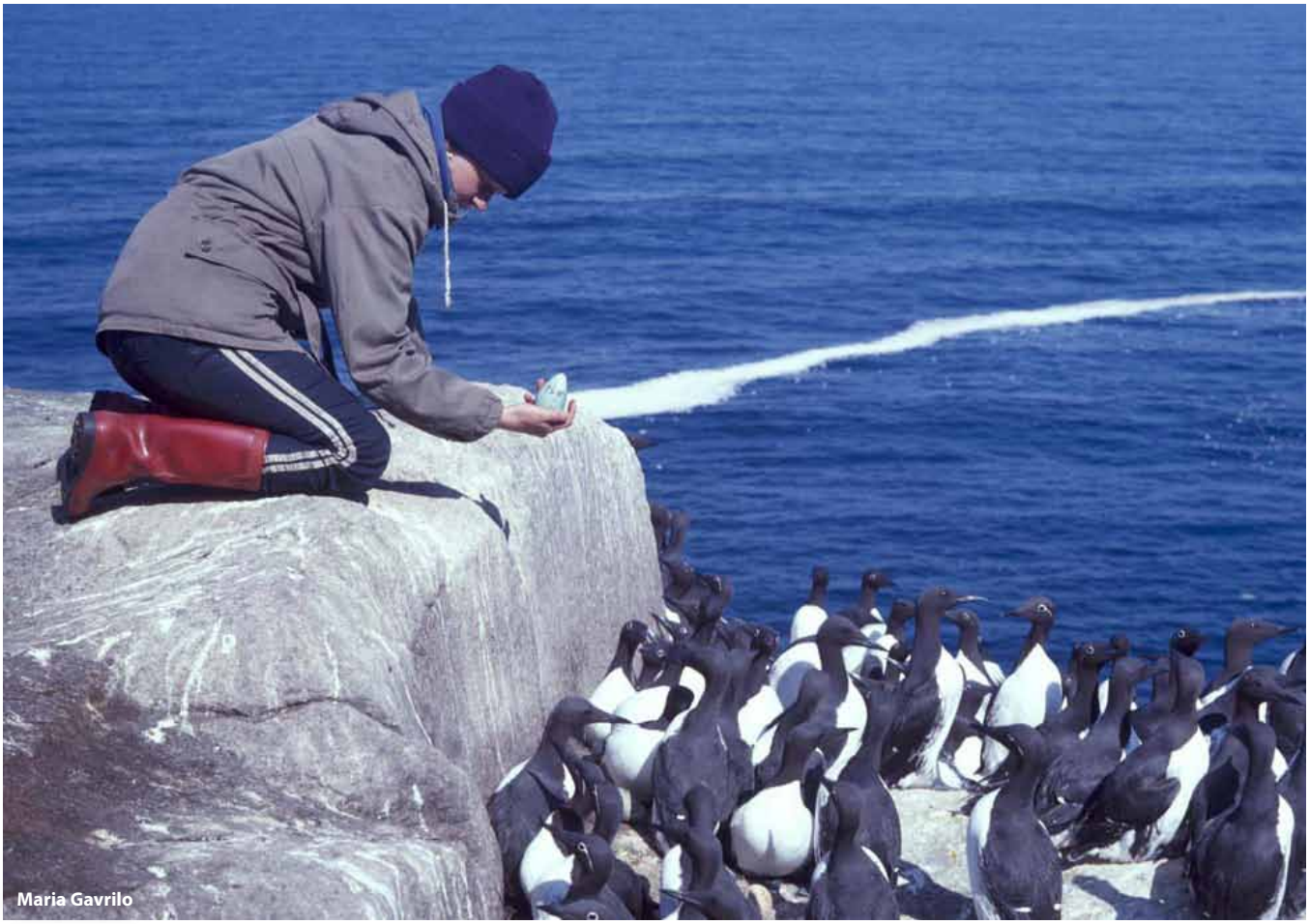
1.3 Background

This handbook was commissioned by the Circumpolar Biodiversity Monitoring Programme (CBMP) of the Conservation of the Arctic Flora and Fauna (CAFF) Working Group of the Arctic Council[1]. The CBMP is an international network of scientists and local resource users working together to improve detection, understanding, reporting and response to significant trends in Arctic biodiversity. Due to the vast and complex Arctic system, it is critical that a coordinated effort be realized to facilitate better conservation and adaptation actions. Providing information that allows local communities in the Arctic to adapt to a rapidly changing environment is a particular focus of the CBMP.

Early in the CBMP's development, community-based monitoring was emphasized as a preeminent component. To foster increased use and recognition of community-based monitoring approaches, the CBMP identified the development of training manuals as a vital step. The manuals would focus on specific community-based monitoring methods, as well as highlight the full spectrum of successful and established community-based monitoring programs, ranging from citizen science projects to the use of local and traditional knowledge to track change in the Arctic's living resources. The goal would be to improve current community-based monitoring programs and to guide the creation of new ones. To facilitate the discussion on the best application of community-based monitoring for Arctic biodiversity monitoring and to encourage the development of community-based monitoring projects, CAFF produced two white papers: *Community-based Monitoring – a discussion paper* (Fleener et al, 2004) and *A Strategy for Facilitating and Promoting Community-based Monitoring Approaches in Arctic Biodiversity Monitoring* (Huntington, 2008). The latter also recommended the production of community-based monitoring training manuals. This handbook was developed in response to these recommendations.

As an additional benefit, this effort may spur the creation of formal or informal networks of community-based monitoring practitioners to share experiences and collaborate on the future development of community-based monitoring .

[1] The Arctic Council is a high-level intergovernmental forum that provides a mechanism to address common concerns and challenges faced by Arctic people and governments. It is comprised of the eight Arctic nations (Member States: Canada, Denmark/Greenland/Faroe Islands, Finland, Iceland, Norway, Russia, Sweden and the United States of America), six Indigenous Peoples' organizations (Permanent Participants: Aleut International Association, Arctic Athabaskan Council, Gwich'in Council International, Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North and Saami Council).



Maria Gavrilo

1.4 Why now?

The 2004 Arctic Climate Impact Assessment (ACIA) report highlighted the changes expected in the Arctic due to climate change over the next century. It also showed that these changes have already begun and will have significant environmental, economic, social and cultural impact in the Arctic.

One of the key findings of the ACIA report was that Arctic species' diversity, ranges and distribution are changing. Observations indicate range changes are already occurring on a large scale. For example, a review of 143 studies involving range distribution of nearly 1500 species demonstrated that 80 percent have shifted towards the poles (Root, et al 2003). A key recommendation for future Arctic research was the improvement of long-term monitoring, extending it to year-round record collection and expanding it spatially.

The ACIA report was one of the first major scientific papers to include the observations of local indigenous peoples as case studies to support scientific findings. A striking convergence of community-based observations with scientific data helped validate local observations. They were elevated from anecdotal evidence to an invaluable building block in the holistic understanding of the Arctic environment. These case studies may provide the basis for discussion and scientific enquiry, although they do not provide aggregate statistics or general trends (Huntington et al, 2004).

However, community-based monitoring employing methods that quantify data can be an invaluable component of any large-scale monitoring effort. It is impossible to collect year-round data in the vast Arctic region without local residents. There are not enough scientists in the world to do this (Kuznetsov, in interview for this handbook, 2009).

The recognition of local observations coupled with the need for ongoing monitoring created a surge in interest in various forms of community-based monitoring. This was amplified by an opportunity arising from the International Polar Year 2007-2008 (IPY)[2]. Its organizers expanded the notion of inclusiveness to a range never experienced in polar research before. Arctic residents, especially indigenous peoples, were recognized as important stakeholders, collaborators and drivers of new research, and, for the first time, were explicitly called upon to participate in IPY.

This inclusion in IPY was a testament to many years of struggle to achieve recognition of indigenous, local and traditional knowledge as invaluable components in the understanding of physical, natural and social environments in the Arctic. Indigenous and local participation in IPY was also a result of political change in recent decades. The process of indigenous land settlement claims that began in the 1970s in Alaska and a similar movement in Canada in the 1990s resulted in the establishment of indigenous government bodies. That led, among other things, to an increase in capacities of local indigenous organizations and to new government regulations requiring consultations and sometimes approval of research planned on indigenous lands.

More than 160 projects were funded and implemented during IPY. Of these projects, 12 were led by indigenous researchers or indigenous organizations and an additional 25 had indigenous partners. Almost all of these projects had a substantial community-based monitoring component. Two of the projects reviewed in Section 3 of this handbook are IPY projects.

[2] The International Polar Year is a large scientific programme focused on the Arctic and the Antarctic from March 2007 to March 2009. IPY, organized through the International Council for Science (ICSU) and the World Meteorological Organization (WMO), is actually the fourth polar year, following those in 1882-3, 1932-3, and 1957-8. IPY 2007-8 involved over 200 projects, with thousands of scientists from over 60 nations examining a wide range of physical, biological and social research topics. It was an unprecedented opportunity to demonstrate, follow, and get involved with, cutting edge science.

2. Selected community-based monitoring basics

2.1 Introduction

Community-based monitoring is a relatively new scientific field. Obviously, in a broader sense, humans always have been "monitoring" their environment. But as an organized activity, monitoring by local residents has only recently begun playing a role in research. In the past few decades, local and indigenous observations of the natural and physical environment have made substantial progress. At first, they were referenced as anecdotal evidence, then they became case studies, and finally, methods are being developed to utilize these observations in independent data sets.

What is community-based monitoring? It most often refers to the gathering of information by local residents over a period of time. However, "community-based monitoring" has become a set phrase often used to describe community- or place-based activities that are not "monitoring" in its true meaning. Examples of such activities include meetings and the recording of local oral traditions. Because this English-language term originated in North America, it is understood that other countries may use different terms for community-based monitoring activities.

Some agencies and researchers prefer the word "observing" to the word "monitoring," explaining that observing relates more to research, while monitoring is more of a regulatory function. There is no good equivalent term for community-based monitoring in the Russian language and different projects use different translations. Careless use of the words "monitoring," "observing" and especially "information collection" in Russia may unintentionally evoke associations with Cold War suspicion and activities.

In the languages of indigenous peoples there may not be equivalent expressions for "community-based monitoring." Defining specific activities planned for community-based monitoring is the best way to avoid misunderstanding.

Since there is diversity of interpretation for community-based monitoring terms, types and methods, it is useful to clarify definitions of the main terms used in this document. These can be found in Sections 2.4 and 2.5. Section 3 may contain different terminology, used by those interviewed for the project reviews, but all other sections of the handbook are consistent with the definitions offered in this section. This handbook adopts the broadest definition of community-based monitoring, as any locally based, repetitive activity performed by community residents at defined time intervals for the purpose of gathering information to monitor the local environment.

Grant Gilchrist

2.1.1 Application of different types of knowledge

Community-based monitoring is often held up as a perfect vehicle for synthesis of different types of knowledge. However, understanding differences and commonalities between the various types is challenging. This issue is further complicated by the lack of standardized terminology. While it is not the purpose of this publication to discuss the philosophical, political, legal and linguistic arguments surrounding community-based monitoring, the information in this section highlights the complexity of the issue and is intended to encourage careful consideration of word choice and a better understanding of what their meanings entail. It cannot be overemphasized that the careful use of terminology plays a critical role in the success of any community-based monitoring project. Misunderstandings due to different interpretations of phrases and terms can create barriers to local support for community-based monitoring projects.

The application of indigenous knowledge in scientific research is a difficult, poorly understood and confusing issue. The confusion begins with the use of terminology. Currently, the following English-language terms are used: Local and Traditional Knowledge (LTK), Traditional Ecological Knowledge (TEK), Indigenous and Traditional Knowledge (ITK) and Traditional Knowledge and Wisdom (TKW). Within different contexts, the word "knowledge" in these terms may mean "ways of knowing" or "the information held by individuals" or may refer to specific skills. Based on the use of terms by international bodies such as the Arctic Council, United Nations Convention on Biodiversity and the United Nations Development Programme, as well relative ease of understanding for diverse audiences, terminology for use in community-based monitoring is suggested below. Note that the terminology used in the project reviews in Section 3 of this handbook is that used by the individuals interviewed for same, so does not necessarily coincide with the definitions applied to the rest of the handbook.

Indigenous knowledge (IK) denotes a system of knowing that enables an indigenous individual "…to make true statements and defend them as true. The statements include empirical generalizations, hypothesis and theories; the sum of knowledge is a collection of all statements whether arising from direct observations or as part of systematic truth."[3] In this regard, indigenous knowledge does not differ, as a system, from other knowledge systems but it differs in essence because the ways of knowing (generating knowledge, processing information and transferring knowledge) are presumed to be different from other knowledge systems.

It should be noted that such indigenous knowledge can exist only in indigenous communities where there was little to no interference from other cultures. In the Arctic, most indigenous communities, though economically marginalized, are located in developed countries with a relatively high level of integration. An indigenous person in such communities holds various types of knowledge, including indigenous. So for these reasons, the terms "indigenous" and "traditional knowledge" or simply "local knowledge" are less confusing and more useful for practical purposes.

Indigenous and traditional knowledge (ITK) refers to the ways of knowing by indigenous peoples and to the knowledge of non-indigenous individuals that is based on local and/or cultural traditions and/or special skills typical of a particular location or culture. The relationship between indigenous and traditional is not defined easily. This expression most commonly denotes that any long-time resident of a particular locale possesses definite qualities that are unknown to individuals outside this locale.

The English language terms discussed above often do not translate well. For example, the word "traditional" sounds similar in many languages but the meaning and application can be different.

Any community-based monitoring project involves the gathering of information. The ownership of this information may present a number of questions, especially if it is labelled as indigenous knowledge. Current legal systems do not offer comprehensive protection of intellectual property rights related to indigenous knowledge, as exactly what needs to be protected has yet to be defined. "The existing legal system cannot properly embrace what it cannot define, and that lies at the heart of the problem."[4]

Therefore, careful consideration should be given to potential issues arising from intellectual property rights on content derived from indigenous knowledge. Some regional and local indigenous organizations have developed policies and protocols for researchers. (For more information, see Appendix 7.)

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[3] Definition of knowledge in *Longman Dictionary of Scientific Usage*, A. Goodman, E.M.F. Payne, Longman Group Limited, Harlow.

[4] M. Dodson, "Indigenous peoples and intellectual property rights" Ecopolitics IX: Conference Papers and resolutions Northern Land Council: Sydney, 1996 in J. Anderson, *Access and Control of Indigenous Knowledge in Libraries and Archives: Ownership and Future Use*. Columbia University, N. Y. 2005.

2.2 Decision tree

To continue the discussion of community-based monitoring basics, two schematic tools were created. The decision tree (Fig. 1) is an example of how to select community-based monitoring methods and types appropriate for specific project needs. It is followed by a summary table (Table 1) in Section 2.3 showing relationships between types and methods of community-based monitoring.

Explanations and definitions of the terms used in the decision tree and summary table can be found in Sections 2.4 and 2.5.

This decision tree should be used as a flexible guidance tool. It is especially useful for beginners, who may feel lost in the maze of issues related to community-based monitoring.

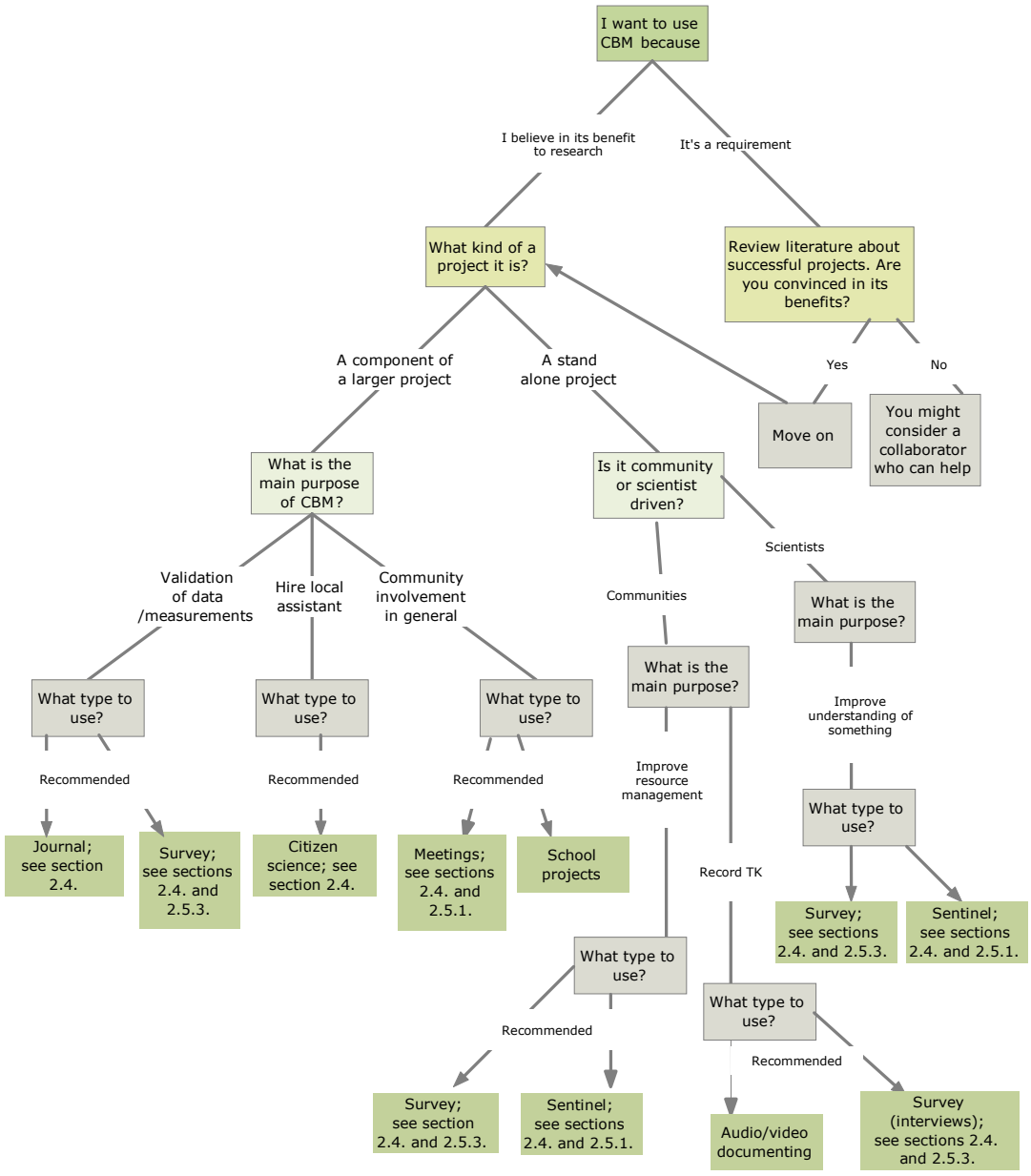


Figure 1. Decision Tree: Example of the decision-making process in developing community-based monitoring activities

2.3 Summary table

*QTY - quantitative
**QLTY - qualitative

CBM TYPES	CBM METHODS						
	Recording of observations by local observer		Meetings	Population survey	Operation or maintenance of scientific instruments	Recording of Phenology	Main product types
	Systematic and organized observations	Free style observations					
Sentinel	✓						QTY* database maps photo
Surveying human sensors				✓			QLTY** QTY database
Citizen science					✓	✓	Varies
Journal		✓					Manuscript
Maintenance monitoring	✓						QTY Database
Group meetings			✓				Reports

Table 1. Community-based monitoring types and methods summary table

Photo © Aleut International Association - Left to right, Victoria Gofman, Vasiliy Tynakyav, Svetlana Kichgelkhut, Tymlat, Russian Federation.

2.4 Community-based monitoring types

Sentinel (Patrol)

Main features:

- Place-based observing and recording of various elements of the environment are typical.
- Local conditions are documented in order to address various local issues.
- Communities often initiate and manage activities, e.g. Tribal or Village Councils in Alaska, but sometimes local or regional governments are involved.
- Observers are usually hired employees.
- Local organizations usually maintain databases that can hold various types of data.

Pros:

- The collected data may result in fairly accurate spatial and temporal records of multiple indicators.

Cons:

- Methodology and data output may not be consistent.
- The collected data may not be available for open distribution.

Surveying human sensors

Main features:

- Information is gathered by surveying local residents' perceptions of the status of and changes in environment.
- Surveys are designed by scientists, often with input from participating community members.
- The data output is processed using sociological, ethnographic or other social sciences' methods depending on the type of survey used.
- Qualitative and quantitative databases are maintained by the researchers.
- The gathered information can be both current and retrospective.

Pros:

- This is arguably the only type of community-based monitoring that enables researchers to recreate data from past periods when no data were collected and there are gaps in knowledge.
- Retrospective survey data can lead to better understanding of temporal changes without generating time series of observation.
- "Humans as sensors" research provides greater spatial information over many areas and on more species and populations than accessible to conventional science alone.

Cons:

- There is a dearth of scientists with the cross-discipline training necessary for this type of research.
- Surveys can be costly.
- If participating communities do not see a clear benefit to them from the research, it may be difficult to recruit respondents for surveys.

Citizen science

Main features:

- Local residents are involved or hired as assistants/technicians in conventional science research projects.
- Activities are usually led by university or government scientists.
- Methods vary depending on the type of research field.
- Methodology and data output follow the standards of conventional science.

Pros:

- Enables continuous collection of data in remote locations.
- Opportunities are created for engaging residents, especially young people, in science.
- Generates interest in science and higher education.

Cons:

- Low literacy in some communities requires a special approach.
- Number of qualified individuals in remote communities may be limited due to other opportunities in the communities or because of the temporary nature of projects.
- Quality control could be difficult to maintain in remote communities.

Journal

Main features:

- A personal account of the observed environment is recorded on a regular basis over a period of time.
- Usually, this is a complementary component to scientific research.
- A detailed record is kept by a local person on his/her initiative, such as fishermen's journals.

Pros:

- May offer rich contextual information that can contribute to the better understanding of a research topic.
- The cost is relatively low.

Cons:

- If no metrics are recorded, it may be difficult or impossible to generate data from this source of information.
- The information recorded can be highly subjective and prone to skewed assessment due to different personality types.

Maintenance monitoring

Main features:

- Regular collection and recording of environmental hazard/waste is performed in defined areas (e.g. beaches).
- Clean-up activities are organized and performed by local residents, sometimes volunteers.
- This type of monitoring is usually not initiated for scientific purposes.

Pros:

- Activities reinforce local stewardship and improve local resource management and environmental conditions. If records of activities and results are maintained properly, such data could be of value for various research needs.
- Outcomes can expose industries that may contribute to environmental problems.

Cons:

- Could create conflict regarding natural-resource management and regulations with relevant authorities/industries.

Group meetings

Main features:

- Regular village (town) meetings are organized for local residents to share and report on observations over a specific period of time.
- Meetings are often facilitated by a researcher who summarizes the discussions in a report that presents evidence-based information approved by the participants.

Pros:

- Group meetings can be a cost-effective way to gather information and engage residents.

Cons:

- There may be a challenge in validating such information, as it may be easily influenced by a particular individual or a group, or be politically driven.

As demonstrated above, types of community-based monitoring vary depending upon the levels of community engagement, involvement of scientists, sophistication of methodology, accuracy of data and other factors. There is limited standardization of information, however a recent paper has addressed the strengths and weaknesses of various approaches (Danielsen, et al, 2009).

BSSN Workshop October 2009 participants (L to R): Olga Gerasimova, Andy Kliskey, Olga Chernenko, Arlene Gundersen, Antonia Penayah, Svetlana Petrosyan, Esther Fayer, Patricia Cochran, Olia Sutton, Iver Campbell, Victoria Gofman.

2.5 Community-based monitoring methods

Community-based monitoring uses methodologies utilized in many scientific fields, including biology, sociology and ethnography. Though proven methods are available, applying them can be a challenge because they require a cross-disciplinary approach. For example, a biologist needs to understand social science methods and learn how to interpret that data; a social scientist needs to understand the fundamentals of biological or physical sciences in order to comprehend the purpose of the research and process the data.

While quantitative data can be managed easily using existing software, it's much more difficult to manage qualitative data resulting from community-based monitoring. The few software programs that are available (see Appendix 1) have limited functions and are sometimes unreliable. Community-based monitoring would make great strides if new qualitative data management tools were developed.

Below is a brief description of some of the methods used in community-based monitoring projects. Many projects employ a combination of methods and types. The methods used in citizen science and maintenance programs are not reviewed here. Those projects use conventional science methods, as well as appropriate maintenance protocols and techniques.

2.5.1 Recording of observations by local observers

The recording of observations by locals is used often to collect quantitative data in sentinel and maintenance monitoring and in journals, as well as through spatial data (mapping) and imagery (photos).

Systematic and organized observations:

These include recording current observations through narratives, photo imagery and mapping. Observations are recorded in established locations, in regular time intervals, using standard instructions. Multiple observers in multiple locations can be employed. Global Positioning System (GPS) mapping and handheld computer devices are used in more advanced communities. The collected observations are organized in a database.

Free style observations:

An experienced individual, recognized as a local expert, is instructed to record on a regular basis observations regarding something specific, such as ice, or any observation of significance from that individual's perspective. The quality of records greatly depends on the skills of the individual, such as their ability to express accurately observations in writing. If possible, the information captured in these records is analyzed and converted into data by a researcher.

2.5.2 Meetings

In general, any type of meeting could be used as a method in community-based monitoring, including presentation seminars, focus groups, roundtables and traditional gatherings. For meetings to satisfy the monitoring criterion, they must be organized by theme and scheduled regularly for a period of time, such as monthly or yearly. They need to be facilitated and there should be a record of the proceedings. Meeting results are normally presented in the form of reports, and it is unlikely that quantitative data can be generated from these reports. Monitoring meetings should not be confused with other types of meetings common to community-based monitoring projects, such as training workshops or project information meetings.

2.5.3 Population survey

Researchers who do not have a social science background frequently underestimate the complexity and sophistication of this methodology, often employed in surveying human "sensors." Community-based monitoring is most often associated with environmental observations and these projects frequently fall within the natural and physical sciences. Many researchers have difficulties designing a survey, which is why this method is described in a greater detail than the others.

Asking the right people the right questions, getting answers that are comprehensible, complete and comparable and being able to effectively work with the data once it has been gathered is not easy. These tasks involve a number of complex issues related to:

1. Developing the questions and designing the survey
2. Handling informed consent and observing standards of research ethics
3. Establishing protocols for administering surveys
4. Sampling technique
5. Training personnel
6. Understanding local human knowledge systems and local culture
7. Choosing a particular survey type (questionnaire, semi-directed interview, etc.)

8. Overseeing fieldwork and monitoring data quality to ensure reliability and validity
9. Managing and handling data once collected
10. Analyzing the data and presenting results

Deciding what to do at each of these steps demands careful consideration, as every decision made will affect things at another point. For example, sampling technique will determine how the data can be analyzed and presented. Furthermore, problems at any of these steps can also create difficulties at a later stage. For instance, a poor understanding of local knowledge systems and the way people think about their environment could result in ineffectively worded questions, challenges for those administering the surveys and problems analyzing the results.

These are a few of the issues that require specialized knowledge for survey development. While this publication does not address the issues in detail, a number of useful books and self-education tools are available through the Internet. See Appendix 1 for a list of resources.

While population survey is one of most difficult and expensive methods of community-based monitoring, when successful, it can produce the most useful sets of statistical and qualitative data, applicable to many fields.

Tina Kurvits

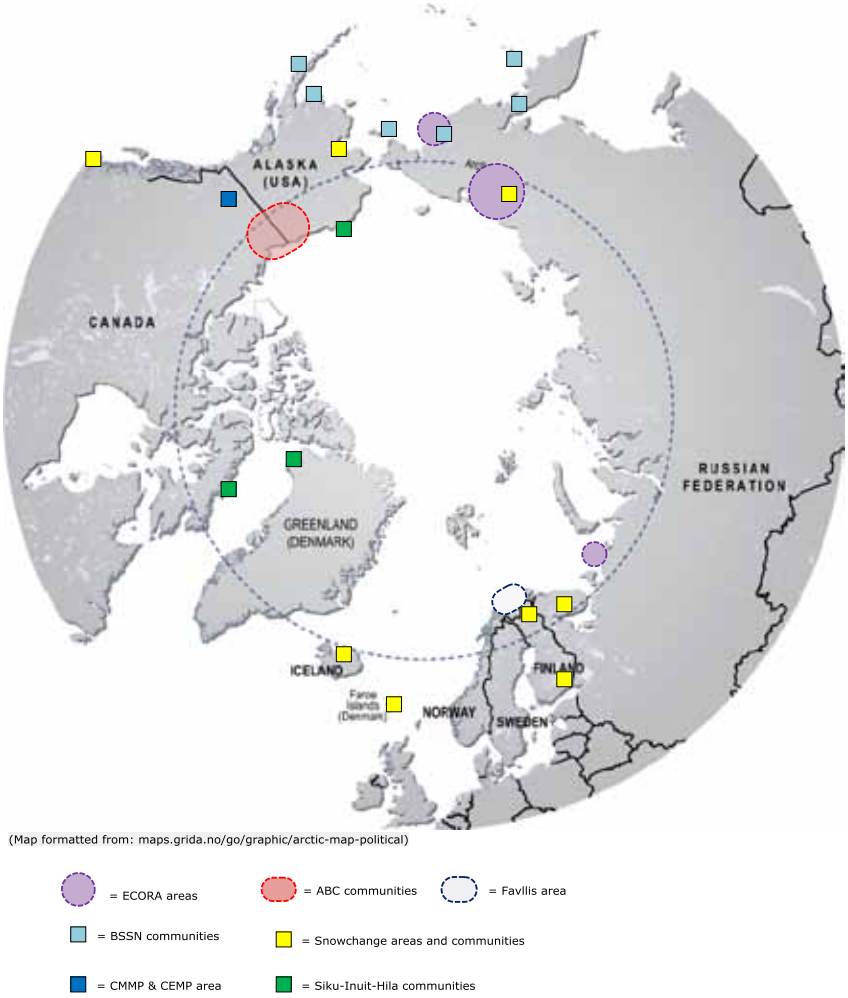
3. Review of community-based monitoring projects

3.1 Introduction

Section 2 provided a glimpse into the complex issues that a community-based monitoring practitioner needs to understand and the range of expertise that is required for a successful community-based monitoring project. In this section, seven community-based monitoring programs in the Arctic (Map 1), and one in Australia, are reviewed. Their real-life successes and failures are discussed, as related by the project leaders.

The projects are presented in alphabetical order and are reviewed through a series of questions and answers outlining their operations, strengths and challenges. The projects represent a broad geographical area and demonstrate a variety of community-based monitoring models that can serve as examples to those interested in the development of community-based monitoring programs.

Although every effort was made to present this information in a systematic way, the interviews range in depth and level of detail due to the diversity of projects and type of information shared by the project leaders.



Map 1. Community-based monitoring projects

The interviews are summarized with the following questions:

1. What are the main goals of the project?
2. Who are the participants?
3. Who initiated the project?
4. What are the locations and how were they selected?
5. How difficult was it to find funding and how long did it take?
6. What are the relationships between the project researchers and the communities?
7. What type of monitoring and what methods do you use?
8. How do you organize your data management?
9. Volunteers versus paid staff and participants: how did you address this issue in your project?
10. What problems have you encountered and how did you work them out?
11. What do you think is the main achievement of the project?
12. What advice would you give to others who would like to develop a similar project?
13. What future do you see for this project?

3.2 Project summary table

Here is how the reviewed projects compare:

	ABC	BSSN	CMMP/ CEMP	ECORA	FAVLLIS	Marine Rangers	Siku-Inuit-Hila	Snowchange
Community/indigenous organization-initiated	✓	✓	✓			✓	✓	✓
Academia initiated				✓	✓			
Government research/ regulatory initiated	✓							
Local			✓		✓	✓		
Regional	✓	✓						
National								
International	✓	✓					✓	✓
Network (# of locations)	✓(8)	✓(6)	✓	✓(10)	✓(3)	✓	✓(3)	✓
Funded by government regulatory agency	✓		✓	✓	✓	✓		✓
Competitive research grant		✓		✓			✓	
Private fund						✓		
Volunteer based					✓	✓		✓
Mostly indigenous			✓		✓	✓	✓	
Mostly indigenous, multiple	✓	✓						✓
Sentinel				✓				
Population survey	✓	✓	✓		✓			✓
Citizen science			✓				✓	
Journal			✓	✓				
Maintenance						✓		
Group meeting	✓						✓	✓
Other					✓			✓
Years in existence	13	2	8/24	10	2	9	3	8
Funding level per year* in USD	$	$$$	$	$$$	$$$	$	$$	$

*Estimated
$ - up to 100,000
$$ - 100,001 - 200,000
$$$ - over 200,000

3.3 Projects

3.3.1 Arctic Borderlands Ecological Knowledge Co-op (ABC) - Canada, United States

The Arctic Borderlands Ecological Knowledge Co-op (ABC) monitors ecosystem changes in the range of the Porcupine Caribou Herd and adjacent coastal and marine areas. It focuses on three areas of overriding concern to the Aboriginal peoples who live in the region – climate change, development and contaminants. The ABC works as a collaborative partnership between the villages of Kaktovik, Old Crow, Aklavik, Fort McPherson, Tsiigehtchic, Inuvik, Tuktoyaktuk, Arctic Village and Environment Canada.

Dr. Gary Kofinas is a professor at the University of Alaska, Fairbanks. He was interviewed for this handbook. Michael Svoboda is affiliated with the ABC and is based in Whitehorse, Yukon.

Status and contact details: www.taiga.net/coop

Mr. Michael Svoboda
Whitehorse, Yukon, Canada
michael.svoboda@ec.gc.ca
ABC Board member: Dr.Gary Kofinas
University of Alaska, Fairbanks, United States
gary.kofinas@uaf.edu

Project Time: 1996-present

Funding: Competitive grants, Territorial Governments, United States Fish and Wildlife Service, Parks Canada, Environment Canada and other sources

Q1. What are the main goals and activities of the project?

The ABC gathers local and traditional knowledge about the ecosystem within the range of the Porcupine Caribou Herd and adjacent marine/coastal areas with the focus on contaminants, climate change and development.

Q2. Who are the participants?

The ABC works as a collaborative partnership between the villages of Kaktovik, Old Crow, Aklavik, Fort McPherson, Tsiigehtchic, Inuvik, Tuktoyaktuk and Arctic Village. Funders are often involved in the partnership as board members, observers and participants. A researcher from the University of Alaska, Fairbanks is also involved.

Q3. Who initiated the project?

The ABC emerged in the mid-1990s when Environment Canada reached out to local communities in the Yukon to join in a broader effort to address issues of ecological change. It built on relationships with co-management boards that had developed out of the settlement of Native land claims and other organizations that represent indigenous communities.

Q4. What are the locations and how were they selected?

The participating communities – Kaktovik, Old Crow, Aklavik, Fort McPherson, Tsiigehtchic, Inuvik, Tuktoyaktuk and Arctic Village – are self-selected.

Q5. How difficult was it to find funding and how long did it take?

The project is administered by Environment Canada, although this can be changed if the various partner organizations wish it to. Funding comes from a variety of different sources. The amounts received from any particular source are often relatively small, for example $5,000. This means the project often has to look for new sources of funding, but it also means that the ABC is not dependent on any single large granting agency.

Q6. What are the relationships between the project researchers and the communities?

There aren't that many "researchers" on the project. Those who are have worked in these communities for many years and have strong ties with them.

Q7. What type of monitoring and what methods do you use?

There is a questionnaire that includes both closed and open-ended questions. Local residents who have been identified as experts by their communities are asked a range of questions that address issues related to the weather, berries, fish, caribou and other animals in the ecosystem. In addition, information is collected about respondents' experiences on the land over their lifetime. There are also mapping exercises. Approximately 20 people are interviewed each year in each community, in sessions that last about one to three hours.

Q8. How do you organize your data management?

Since 2000, the ABC has produced regular annual reports based on interviewers' assessments of and impressions from the surveys they have conducted. These are shared with the communities and posted on the ABC's website. The survey data gathered is entered into a Microsoft Access database. Spatial data arising from the interviews is digitized.

Q9. Volunteers versus paid staff and participants: how did you address this issue in your project?

The interviews are conducted by local residents who have been hired by the project and are paid for their work. Participants are compensated for their time with a fuel voucher.

Q10. What problems have you encountered and how did you work them out?

One of the challenges that the project has faced is that a few years ago one of the individuals who had been putting enormous time and effort into moving the ABC forward changed jobs and became much less involved. The loss of this "energy center" had a negative impact on the project because she was a talented communicator. Another problem has to do with the difficulties of interviewing. There are a lot of "filters" one has to work through to get good and accurate data. First, the question has to be well written, then it has to be understood by the interviewer, then it has to be understood by the respondent, and then the interviewer has to write everything down clearly and completely. Also interview questions have changed over the years leading to some lack of consistency in how the interview is conducted. If anything goes wrong at any point in this process, there will likely be problems.

Q11. What do you think is the main achievement of the project?

Since 2000, the ABC has produced annual reports based on interviewers' assessments of and impressions from the surveys they have conducted. Currently, the project is compiling a ten-year retrospective analysis of the wealth of information that has been collected, which can provide insights into

a variety of longer- and shorter-term changes, as well as unusual events, in the surrounding ecosystem. This data can be integrated and contrasted with other available scientific information. Other important achievements are:

- Capacity building in communities to engage in ecological monitoring;
- Ability for regional participation in land management issues;
- Working model for governments and local First Nations to engage in positive forum, and build relationships;
- Laying the ground work for positive and constructive dialogue on land management;
- Establishing long-term monitoring data set in region;
- Starting to get analysis and models of how community-based monitoring can contribute for decision-makers.

Q12. What advice would you give to others who would like to develop a similar project?

Staying relevant to local communities, thinking long-term, economizing, and moving slowly are important. Being flexible and willing to change things is important, but if methods need to be changed, the old methods should overlap with the new ones for several years to allow for calibration of the new information. The survey for the ABC, for example, has changed across the years a bit in response to our experiences.

Q13. What future do you see for this project?

The ABC is conducting an analysis of the data it has gathered over the past ten years. This is part of trying to demonstrate how the knowledge collected has broader relevance.

Highlights

Achievements:

- Successful collaboration between communities and governments
- Developed an interviewing program striving for consistency
- Flexible and willing to adapt to emerging issues
- Longevity

Opportunities for improvement:

- Ability to retain key people for a small program on a limited budget
- Data analyses are lagging

3.3.2. Bering Sea Sub Network: International Community-based Environmental Observation Alliance for Arctic Observing Network (BSSN) - Russian Federation, United States

BSSN, an IPY-endorsed project (IPY Project #247), is a structured network of coastal communities in the Russian Federation and the United States that provides the means for the systematic collection of community-based environmental observations, the efficient management of that data, and lays a foundation for future community-based research. The overall goal of BSSN is to increase understanding and knowledge of pan-Arctic processes, thereby enhancing the ability of scientists, Arctic residents and governments to predict, plan, and respond to environmental changes and their subsequent socioeconomic effects.

More than 350 harvesters in six coastal indigenous villages have been interviewed in 2008-09 to gather observations on a number of subsistence and local commercial marine species, as well as on physical environment. BSSN is led by Ms. Victoria Gofman, Aleut International Association (AIA) based in Anchorage, Alaska, United States. BSSN secretariat is co-located with AIA and serves as center-point for communication and data management. BSSN co-lead, Dr. Lilian Na'ia Alessa of the University of Alaska, Anchorage, was interviewed for this publication. The first analytical project report is expected by the end of 2009.

Status and contact details: www.bssn.net

Principle investigators:

Ms. Victoria Gofman
Aleut International Association
Anchorage, Alaska, United States

Dr. Lilian Na'ia Alessa
Associate Professor and Group Leader
The Resilience and Adaptive Management Group, University of Alaska
Anchorage, Alaska, United States

Project time: June 1, 2007–August, 2013

Funding: Competitive grant; National Science Foundation ARC – 0634079, 6830216 with contributions from the United States State Department and the Conservation of Flora and Fauna Working Group of the Arctic Council.

Q1. What are the main goals and activities of the project?

The goal is to develop a framework to enable networks of human observers, in this case, residents in remote Arctic communities to systematically document physical and social changes occurring in their region. As a geographically distributed network of human "sensors," it can provide data that are invaluable for the elaboration of adaptation strategies by governments, indigenous communities and individuals. This may enhance community resilience under conditions of rapid environmental and social change. The main objective is to develop a network of the Bering Sea coastal villages for the systematic collection of local observations of the natural and physical environment, and the efficient organization and management of the collected data that would enhance abilities of local residents, scientists and government to understand, predict, plan and respond to environmental changes.

Q2. Who are the participants?

The BSSN research team consists of the Aleut International Association, the University of Anchorage, the Alaska Native Science Commission (Anchorage, Alaska, United States), UNEP/GRID-Arendal (Norway), the Chukotka Business center and the Russian-American center in Kamchatka (Russia), village research assistants and hunters and fishermen in the participating villages.

Map 2. Location of BSSN Communities

Q3. Who initiated the project?

The Aleut International Association was the main initiator and a driving force.

Q4. What are the locations and how were they selected?

Six villages, three in the United States (Alaska): Gambell, Togiak and Sand Point, and three in Russia: Kanchalan, Tymlat and Nikolskoye, were selected by respective regional organizations after receiving an invitation to participate during the proposal preparation stage. Letters of request with the project description were sent to the presidents of five regional consortia in Alaska (the Aleutian Pribilof Island Association, the Bristol Bay Native Association, Kawerak, Maniilag Association and the Association of Village Council Presidents) and to the regional indigenous organizations in Kamchatka and Chukotka. The final selection was confirmed at the workshop where regional representatives selected the locations based upon agreed criteria that included geographic location, community capacity to run the project, community interest, needs and previous project experience, as well as potential project contributions to the community.

Q5. How difficult was it to find funding and how long did it take?

The concept was developed in 2003, approved as a CAFF project in 2004, and endorsed as an IPY project in 2006. The first attempt to fund it through a USAID Biodiversity program in 2005 was unsuccessful. In 2006, a proposal was submitted to NSF Arctic Observing Network, a program created during and for IPY. A pilot was funded by NSF. The second proposal for the continuation of the project for five years was approved in 2009.

At over USD 3.7 million for seven years, BSSN is probably the largest community-based monitoring project in the Arctic in terms of financial investment and its outreach to the communities. The process of securing funding was methodical and required collaboration with scientists, local communities and other relevant organizations. Maintaining a high profile and visibility in international forums through presentations and participation in the Arctic Council and at various science conferences helped establish BSSN as a reputable network for community-based monitoring.

Q6. What are the relationships between the project researchers and the communities?

The project was designed with the villages as the heart of the project. While the travel cost in the region is extremely high, there were joint meetings and the project lead travelled to all villages but one (could not get to Bering Island due to bad weather). Cooperative relationships with village councils were established early on. The project lead made presentations to the council boards during the trips. Village coordinators/research assistants were hired with the help of local councils or village administrations. The BSSN project assistant based in Anchorage is responsible for maintaining ongoing communication with all villages. All project staff located in Anchorage is bilingual (English and Russian). Monthly teleconferences are held for BSSN staff and village research assistants.

Q7. What type of monitoring and what methods do you use?

BSSN gathers observations on subsistence and local commercial marine species, as well as observations on the physical state of the environment in places of harvest. The method of research is a non-probability purposive survey. It is believed that a non-random selection method is best suited for this type of research because of the small size of the communities and close ties that exist between community members. Local community members are trained as interviewers and instructed to interview the most experienced harvesters. When permission is granted interviews are recorded on a digital audio recorder. The survey instrument (questionnaires) was developed with input from community representatives. The questionnaire contains a variety of questions: closed-ended, open-ended and multiple choice. More than 600 surveys were received from BSSN villages in the pilot project in 2008-09 and are being processed.

Q8. How do you organize your data management?

Completed questionnaires are sent to the BSSN Secretariat in Anchorage where they are organized in two data sets: the qualitative data and audio, in the program NVivo; the quantitative data, in statistical software database SPSS. The surveys from Russia are translated and entered into the databases in both English and Russian. A special protocol was developed for categorizing and coding qualitative information.

Q9. Volunteers versus paid staff and participants: how did you address this issue in your project?

BSSN does not rely on volunteers. As it works mostly in impoverished, disadvantaged communities, it's important to provide paying jobs and to demonstrate appreciation to all participants with small cash payments. All village research assistants are paid for their work. The size and type of the appreciation payment is determined by the communities themselves within the approved budget.

Q10. What problems have you encountered and how did you work them out?

Most of the problems were rooted in the inability to react quickly because of communication problems, such as slow or broken Internet connections in the villages, and transportation logistics. However, eventually the problems were solved by using alternate means and thanks to the great perseverance and dedication of BSSN staff. The obstacles could be summarized as: 1) lack of infrastructure in the villages, such as difficulties with office space set up and ability to use and maintain equipment; 2) irregularities in interviews due to insufficient training of the interviewers; and 3) poor communication and challenging transportation logistics.

This is how the problems were addressed:

- Every village is different. The project had sufficient flexibility to change arrangements to accommodate

the circumstances. For example, sub-award agreements with some villages had to be changed and new people needed to be hired in others.

- A BSSN project assistant travelled to the Alaskan villages in the middle of the project to provide much needed field training. There were intense communications with our Russian partners to address the quality of interviews. These efforts helped improve the quality of survey.
- While it was not possible to fix the Internet and telephone connections, having a dedicated staff in central locations in both countries helped maximize whatever means were available. For example, teleconferences for Russian project staff with Anchorage were run via a cell phone service based in Kamchatka, a rather unorthodox approach.

Q11. What do you think is the main achievement of the project?

The main achievement is that local observations are recognized by the mainstream science as valid and important data. This is manifested by the support of one of the main science funding agencies in the United States. Beyond that, the infrastructure and methods developed over the duration of the project will strengthen connections between Russian and Alaskan indigenous communities. They could be utilized by other research projects initiated by communities, academia or government. By training and hiring local residents, the majority of whom are indigenous, an interest in science is generated, and it helps build pride as bearers of local, traditional and indigenous knowledge. It is expected that the data will be of use to the broader scientific and local communities. It is also anticipated that the findings may yield new knowledge that could help address many important issues, such as adaptation to climate change and sustainable resource management.

Q12. What advice would you give to others who would like to develop a similar project?

A project of this scale requires substantial resources to develop. Building a relationship with an organization that has qualified personnel to spend sufficient time on the design and development is important. A diverse team of collaborators with different types of expertise, from university scientists to community leaders and government officials, is essential.

Q13. What future do you see for this project?

The BSSN team is enthusiastic about the opportunity to continue the research for five more years and to add more locations. They will be looking for products and policies that would make good use of the data gathered in the project. The team is also looking forward to helping shape a new generation of scientists.

Highlights

Achievements:

- Developed standardized observation network yielding quantifiable data
- Secured multiyear funding
- Established infrastructure for continuous work in the network communities

Opportunities for improvement:

- Training of local research assistants
- Face-to-face communication between community participants and researchers and among community participants

3.3.3 Community Moose Monitoring Project and Community Ecological Monitoring Project (Canada)

For eight years the Community Moose Monitoring Project (CMMP) has been operating in the Mayo area of the Yukon, which is located in the traditional territory of the First Nation of Nacho Nyak Dun. The population of the village, which in 2006 numbered 248, shares a Native language, Northern Tutchone, with several other surrounding First Nation communities. As part of their efforts to manage the resources that local residents rely on for food, the Mayo community wanted to develop a means to track and monitor the moose population in the area. The Community Ecological Monitoring Project (CEMP), which is also run out of the local Fish and Wildlife office in Mayo, has been active in the area for 25 years. The purpose of the program is to gather systematic observations about the boreal forest food web. There are two parts to the CEMP – a technical monitoring component and a local and traditional knowledge component – both of which involve the active participation of local community members. Mr. Mark O'Donoghue, of the local Fish and Wildlife office, plays a lead role in both projects.

Status and contact details:

Lead: Mr.Mark O'Donoghue,
Fish and Wildlife Branch
Mayo, Yukon, Canada
Mark.ODonoghue@gov.yk.ca

Project time: CMMP 2001-present; CEMP 1985-present

Funding: Fish and Wildlife office, Northern Ecosystem initiative and a variety of other sources

Q1. What are the main goals and activities of the project?

The Community Moose Monitoring Project (CMMP) tracks the health and size of the moose herd in the surrounding region. The Community Ecological Monitoring Project (CEMP) gathers observations about the boreal forest food web.

Q2. Who are the participants?

Participants in the Community Moose Monitoring Project (CMMP) are from the Mayo community. There is an effort to expand the project to surrounding Northern Tutchone communities, but that hasn't yet been achieved. The Community Ecological Monitoring Project (CEMP) is a partnership between residents of the Mayo community, the local Fish and Wildlife office and participants from local universities, First Nations, Parks Canada and Yukon College.

Q3. Who initiated the project?

For the CMMP, the idea and the desire for the project came from the community, but the local Fish and Wildlife office provides the technical resources needed to keep it going. It helps train local participants and analyzes the results. Because

the office is located in the village of Mayo, there is regular communication between the Fish and Wildlife employees working on the CMMP and the local co-management board, which jointly oversees the project. The CEMP has been running for about 25 years, although more recently it has been expanded to include a local and traditional knowledge component. The First Nation communities that participate in the CEMP had expressed a desire that this knowledge be incorporated into monitoring efforts.

Q4. What are the locations and how were they selected?

The local Fish and Wildlife office was set up in the Mayo area for the express purpose of working directly with local Northern Tutchone communities. This grew out of an agreement with First Nations. It was widely known that they had a huge body of knowledge about the environment and wanted it be incorporated into management decisions. The intention in establishing the Fish and Wildlife office was to help with monitoring, but also simply to listen to what the communities were saying. It also offers input on programs and management decisions.

Q5. How difficult was it to find funding and how long did it take?

The money for the CMMP comes directly from the Yukon government and is part of the Fish and Wildlife office's regular budget. By virtue of the office being there, is a source of funding for the project. The CEMP draws on a range of different partners that contribute. However, the local and traditional knowledge component, which started four years ago, is funded from a special grant through the Northern Ecosystem Initiative, which was looking for projects that combined scientific and indigenous knowledge. There are some people who are sceptical about the usefulness of the information gathered, and so that needs to be justified in order to get more funding in the coming years. However, the project only costs about $3,000 to run, which makes it easier to deal with the sceptics.

Q6. What are the relationships between the project researchers and the communities?

Because the Fish and Wildlife office is a local outfit, the people who lead the monitoring projects are themselves members of the community.

Q7. What type of monitoring and what methods do you use?

For the CMMP, each fall 20 local people who spend a lot of time on the land, record in a small booklet with maps their observations about all the moose they see. Participants in the project are hunters and other residents who are very skilled in the bush. Although the participants have changed somewhat from year to year, many of the same people have been involved in the project from the beginning

The technical monitoring component of the CEMP occurs at five long-term sites set up in the surrounding forest. Each year, community residents along with a technician from the local Fish and Wildlife office go to these locations at specific times of the year to take measurements and make scientific counts of a variety of things, including the volume of berries, the amount of snow cover, the numbers of hares and mice, etc. Also, community members do counts of carnivore tracks, owls, songbirds and other animals within a designated 25-kilometer trans-sector.

During the summer months, technicians from the local Fish and Wildlife office play a leading role in monitoring. During the winter time these responsibilities are shared equally between the office and community members. The local and traditional knowledge component of the CEMP consists of interviews with local residents who have been most active out on the land during the previous year. About 20 surveys are done each year with people who have extensive experience in everything from hunting, trapping and fishing, to berry picking. Initially, a grandfather-grandson team did the interviews, but for the past two years it has been done by two high school students. The surveys used were modelled after those developed by the Arctic Borderlands Ecological Knowledge Cooperative, which also helped train interviewers.

Q8. How do you organize your data management?

Every year, the CMMP observations are compiled by the local Fish and Wildlife office and the results are summarized and presented at a meeting of the local Mayo Area Renewable Resources Council. Also, during the first five years that the project was in place, a one-page summary of the results was put in every resident's mailbox. Currently, the local Fish and Wildlife office is preparing an eight-year overview of the project in response to a request by the Yukon government, which provides the financing for the CMMP. A two- to four-page glossy summary of this overview will be distributed to all community members when it's done.

The data collected from the CEMP technical monitoring is analyzed and published in an annual report. These reports, which are available to anyone, go to the project funders and partners, and are also presented at the local co-management board. When the local and traditional knowledge component of the CEMP was being implemented by the grandfather-grandson team, a five- to ten-page report was produced by them every year and presented to the local co-management board. Because this work is currently being done by students, who don't have the time to produce such a report, the information gathered in the interviews is entered into a Microsoft Access database by the local Fish and Wildlife office. The aim is to compile this information in a sort of "community diary" available at local community offices.

Q9. Volunteers versus paid staff and participants: how did you address this issue in your project?

Each year, participants receive a special CMMP coffee mug. People seem to really like this and some have developed a collection of the mugs from different years. They're often displayed in their homes. In addition, every year five names out of the 20 are picked out of a hat and those participants receive a $100 voucher that can be used toward the purchase of food or fuel. People participating in the CEMP – monitors, interviewers and interviewees – also get compensated for their time.

Q10. What problems have you encountered and how did you work them out?

There is an attempt to expand the CMMP to nearby Northern Tutchone villages. However, it has been difficult to find someone in these communities who has the time to dedicate to getting the project off the ground. This fall, a newly hired technician from the local Fish and Wildlife office will travel to these communities in order to work onsite toward getting the CMMP started in these areas.

As for the CEMP, when surveys of local residents first were started, there were some difficulties with the interviews. Sometimes people didn't answer certain questions and

it wasn't clear what the problem was. Was it because the interviewer skipped the question? Or was it because the interviewee didn't understand the question? However, after the first year, things improved a lot. The source of the problem became clearer. It helps that the local Fish and Wildlife office is here, because someone is on-hand to review the interviews shortly after they're done and give the students feedback.

Q11. What do you think is the main achievement of the project?

The response from the community to the CMMP and CEMP has been positive. There are some people who are indifferent, but certainly there's been no negative response. The reason is that the communities want to gather this information for their management decisions. Also, in certain ways the projects are a source of pride for participants. The hunters who take part in the CMMP enjoy the fact that they have been singled out by the community as people with valuable knowledge and experience. The communities really like the traditional and local knowledge part added to the CEMP. The people being interviewed like the fact that local schoolchildren are doing the interviews. They feel it is a way for them to share their knowledge with a younger generation.

Q12. What advice would you give to others who would like to develop a similar project?

Trying to expand the CMMP made clear the importance of being in the community and being there all the time, so the work is well known. So far, the expansion hasn't been successful because of that. In one place, the administrative person assigned to work on the CMMP just didn't have time to do it. In another area, there's been a problem of high turnover of staff. And also, if a person is not from the community, they often do not have the connections necessary to get the work done. So it's really important to have the right person onsite.

Q13. What future do you see for this project?

This fall, a newly hired technician from the local Fish and Wildlife office will travel to the communities in order to work onsite toward getting the CMMP started in these areas. The CEMP is currently preparing a multiyear project summary. A particular focus is the local knowledge component, whose funding is dependent on a special federal grant that is currently running out. We hope this report will lay the basis for securing further funding for the local knowledge component. The technical monitoring will continue on as it has for the past 25 years.

Highlights

Achievements:

- Longevity
- Full engagement and support of the communities
- Encourages transfer of traditional knowledge from older generation

Opportunities for improvement:

- Finding personnel to work in new communities
- Training of interviewers

3.3.4 Integrated Ecosystem Management Approach to Conserve Biodiversity and Minimize Habitat Fragmentation- ECORA (The Russian Federation)

An Integrated Ecosystem Management Approach to Conserve Biodiversity and Minimize Habitat Fragmentation in Three Selected Model Areas in the Russian Arctic. (The acronym ECORA was derived from the Russian-language title of the project and then was transliterated in English and, eventually, became the most commonly used name for the project.)

The Conservation of Arctic Flora and Fauna (CAFF) Working Group of the Arctic Council, UNEP/GRID-Arendal and the Russian Federation initiated ECORA, a Global Environment Facility (GEF) project in the Russian Arctic, to address threats to habitats, fragmentation of ecosystems, and disruption of ecological balance, especially in lowland tundra, forest tundra and coast and nearshore marine areas. The main goal of ECORA is the harmonization of relationships between environmental protection, industries and indigenous populations leading to the sustainable use of biodiversity in the Russian Arctic, as demonstrated in the model areas through the implementation of integrated ecosystem management (IEM) strategies. The model areas of Kolguyev Island, Kolyma River Basin and Beringovsky District were selected because of their rich biodiversity, the presence of resource development industries and indigenous population. The project activities range from strengthening legislative, administrative and institutional frameworks to enhancing the knowledge base through involvement of local residents and integration of indigenous and traditional environmental observation.

Status and contact details: www.grida.no/ecora/

Project Manager: Dr. Evgeny Kuznetsov
National Institute for Nature Protection
Ministry for Natural Resources of the Russian Federation
Moscow, Russian Federation

Project time: 1999–2009

Funding: GEF, in-kind contributions from Arctic Council's member states

Q1. What are the main goals and activities of the project?

The main objective of community-based monitoring in ECORA was to develop long-term monitoring of selected biodiversity components that would serve as indicators of species' status and trends, habitat fragmentation and climate change. However, in Russia the results of such monitoring would be difficult to apply in the same manner as official scientific data are used. In addition, there are no rigorous standards to comply with. So, there were opportunities for creativity and flexibility. The focus of community-based monitoring was turned into nurturing partnership relationships between local participants and project scientists, with special attention paid to cultivating interest and respect for traditional knowledge and the people who hold it.

Q2. Who are the participants?

ECORA has a complex collaboration of international participants. The project is co-led by Russia and United Nations Environment Programme's Global Resource Information Databank – Arendal (UNEP/GRID-Arendal) with the participation of advisors from other Arctic countries and Russian Association of Indigenous Peoples of the Far North,

Siberia and Far East (RAIPON). Local residents are participating in the community-based monitoring component of the project.

Q3. Who initiated the project?

ECORA was conceived in 1999 by CAFF and UNEP/GRID-Arendal and went through a multiyear planning and approval processes.

Map 3. ECORA model areas

Q4. What are the locations and how were they selected?

The model areas were selected by a group of project experts based on the following criteria: 1) presence of indigenous peoples; 2) rich biodiversity of global significance; 3) current or planned industrial activities; and 4) location within CAFF geographical territory. Other factors that played a role were the presence of other large international programs in the area, willingness and good-spirited cooperation from local and regional authorities. The model areas were selected in 2003. Since all three areas had small populations and only a few villages, all ten communities were included in the project. They were Bugrino (Kolguyev Island); Chersky, Kolymsk, Andryushkino, Pokhodsk, Nutendli (Kolyma); and Beringivski, Meinypylgino, Khatyrka and Alkatvaam (Beringovsky District).

Q5. How difficult was it to find funding and how long did it take?

ECORA's budget consisted of a three million dollar grant from GEF, which was matched by in-kind contributions from the Russian federal government and additional grants from the Arctic states for specific project activities. GEF requires at least a 50 percent match. So the total project budget can be estimated at six million U.S. dollars. The portion allocated to the community-based monitoring effort is relatively small.

Q6. What are the relationships between the project researchers and the communities?

Despite many logistical difficulties, ECORA's research team has developed good partner relationships with participating communities. Local residents were invited to meetings with researchers and had opportunities to ask questions. All too familiar complaints that some scientists came, village folks participated by providing information, then the scientists left and no one heard from them again, were brought up many times. Sometimes residents of remote villages, lacking the attention of the regional government, perceive scientists, and especially foreign researchers, as a funnel to vent their frustration and to pass information about local issues to the outside world. It's important that researchers have the patience and humility to listen to what people have to say.

Relationships with regional governments vary from very active engagement and support in Yakutia (Kolyma) to polite indifference in the other two regions. Reporting to Russian officials is necessary regardless of their interest in the project. Unfortunately, there are no incentives for government officials to support projects with community-based monitoring, as data derived from this research cannot be used officially in natural resource management. However, it can be used as reference material, and ECORA, acting through other components of the program, has had success in doing this. The most tangible benefit to communities from the project's interactions with the regional governments was drawing authorities' attention to the dire situations in those remote and almost forgotten communities.

Q7. What type of monitoring and what methods do you use?

Two types of community-based monitoring are used in ECORA: 1) a sentinel monitoring performed by a selected observer who regularly fills out questionnaires and sends them to the researchers for data management and analysis; and 2) a freestyle diary of observations by one individual.

A set of a dozen thematic questionnaires was designed by the researchers based on the results of population surveys to determine subsistence activities in each model area. Two local observers were hired and trained for about two days by a researcher visiting each village. Each observer has a set of questionnaires based on the types of harvesting activities of that individual. They are also equipped with digital cameras so they can take pictures of bird colonies and other objects of observation. Completed questionnaires are sent to regional coordinators by whatever means available, and then mailed to the Moscow ECORA office.

An experienced subsistence harvester writes about 100 pages of observations during one year, creating an environmental observation diary. No instructions are provided, except one – the writer should document everything that he/she deems important. This document is his/her vision of the environment. All participating villages are using the same set of survey materials and standardized methodology.

The frequency depends on the theme. For example, the phenology questionnaire is completed once a year but observations of bird colonies are recorded two to three times a year. For traditional knowledge interviews, ECORA asked for assistance from Snowchange, another project active in community-based monitoring and with particular experience in the gathering of oral traditions. This partnership developed a good synergy and complemented each other's work.

Q8. How do you organize your data management?

All collected data (questionnaires, diaries) are processed and stored in the manager's office in Moscow. No special qualitative and quantitative software is used for analysis because researchers consider the volume too low. Currently, only a preliminary analysis has been performed, such as verification for obvious mistakes. A final report will be prepared after all activities are completed. There are no restrictions to the access to the data and it is under discretion of the manager. The research team

welcomes collaborative requests.

Q9. Volunteers vs. paid staff and participants: how did you address this issue in your project?

Local observers receive a modest compensation for their time. The size of the payment is a small portion of an average salary in the area. In general, there is an opinion that excessive compensation could entice people who are interested in a financial gain more than in the project and that could negatively affect the quality of the recorded data. Payments to respondents of surveys are not common in Russia and often do not have much influence on the decision to participate. If people are willing to participate, they will do it without payment.

Q10. What problems have you encountered and how did you work them out?

Unfortunately, one very important factor — accessibility of a remote location — was overlooked. That created difficulties with establishing communication and keeping the work plan on schedule. That was one of the reasons why the communities did not participate in the planning and selection process and were informed about participation in the project only after the formal selection.

The two most important methodological challenges for community-based monitoring are the application of standardized approaches and training people how to record their observations (e.g. filling out questionnaires) based on these approaches. While the original plan called for synchronized observations in all areas, difficulties with finding local coordinators and experts impeded the schedule. The target year for the beginning of monitoring was 2004 but the delays pushed it to 2006, when the Beringovsky District began working. The other regions joined in 2007 (Kolyma) and in 2008 (Kolguyev).

The remoteness of the model areas makes it difficult, even for the regional coordinator, to visit villages more that just a few times a year. This presents problems with verification of information and with timely assistance for local observers when they experience difficulties. For example, one of the problems encountered was incomplete questionnaires. More opportunities for onsite training could have reduced such problems.

Public relations should not be overlooked. Local newspapers and radio stations are good ways to provide information back to the community and should be used year-round to report to the whole community about project activities. Every time a meeting takes place, be it a city-hall meeting or talks with authorities, a short news item should be submitted to the local media. ECORA began doing this too late into the project and should have started doing this when the project was still in the planning stages.

Q11. What do you think is the main achievement of the project?

Local participants feel an increase in the awareness of the value of their knowledge and traditional ways of life. After several centuries of government-induced assimilation, society is beginning to recognize that the traditional ways of life led by indigenous peoples for millennia are efficient and healthy ways of living in the Arctic. Participation in the project leads to increased interest in learning from elders about traditional ways and promotes the transfer of this knowledge to the younger generation.

While the goal of meaningful participation in resource management may seem to be unattainable at this time, this project builds the qualities that communities need to advance this cause, such as growing self-awareness and a renewed reliance on traditional ways of life. Cooperation with scientists is a two-way learning process: while traditional knowledge is shared with scientists, many learn new skills working as research assistants. Involving schools in the project is an investment in a new generation of local observers.

Q12. What advice would you give to others who would like to develop a similar project?

There are no recipes for success. Community-based monitoring is an invaluable component of any large-scale monitoring because of one simple fact – without local residents it is impossible to collect year-round data in the vast Arctic region. There are not enough scientists in the world to do this. Community-based monitoring is based on human relationships. What is invested in that relationship will define what the final result will be. It's a fine balance between give and take.

Q13. What future do you see for this project?

It is important to recognize community-based monitoring as a valid monitoring method and give it an "official" status in Russia. The National Institute for Nature Protection has not had any funding for field work since the 1990s. The prospects for project continuation are not very bright at this time. A new proposal, related to climate change, is being prepared in cooperation with UNEP/GRID-Arendal and if successful, would allow the continuation of the work that began in ECORA.

Highlights

Achievements:

- Developed standardized protocols and instruments
- Promoted an increase of self-awareness and value of indigenous and traditional knowledge
- Advanced indigenous and traditional knowledge as one of the important components of resource management in Russia

Opportunities for improvement:

- Training of local personnel
- Methods to validate community-based monitoring for natural resource management in Russia

3.3.5 Fávllis Network (Norway)

Fávllis is a network of academic and community collaborators that was created to advance knowledge relevant for effective resource management, including understanding interactions between ecosystems, culture and local societies in the northern fjords. The research project initiated by the Fávllis network is centered around the traditional knowledge of Sami fishermen: documenting traditional ecological knowledge, developing a model for a knowledge database for marine resource management, and using documentary to increase the visibility of traditional knowledge and its relevance for effective resource management. Four municipalities in Finnmark are participating in the project.

Status and contact details: www.sami.uit.no/favllis/more.html

Leads: Dr. Einar Eythórsson
Norwegian Institute for Cultural Heritage Research
Dr. Svanhild Andersen
University of Tromso, Center for Sami Studies

Co-Lead: Dr. Else Grete Broderstad
Center for Sami Studies, University of Tromso
Tromso, Norway

Project Time:

Stage 1: January 2008-2010, Stage 2: November 2008-2011

Project funding: competitive grants from the Norwegian Research Council

Q1. What are the main goals and activities of the project?

The overall goal is to document ecological change in the fjords of Finnmark using local knowledge.

Q2. Who are the participants?

The multidisciplinary international team consists of social scientists, biologists, a linguist and a film crew. The Center for Sami Studies of the University of Tromso implements the project.

Q3. Who initiated the project?

Dr. Else Grete Broderstad and Dr. Svanhild Andersen, of the Sami Center at the University of Tromso, initiated this concept in 2003.

Q4. What are the locations and how were they selected?

Four communities (municipalities) in Finnmark and Troms are the participants. These Sami communities, fjord settlements, were facing environmental challenges and that is why they were selected. The existence of local institutions with the ability to participate in research was an important factor as well.

Q5. How difficult was it to find funding and how long did it take?

The project is funded by the Norwegian Research Council at the amount of NOK 8.5 mil (USD 1,303,199) for two project stages for four years.

Q6. What are the relationships between the project researchers and the communities?

Many Sami communities that asked for this research cooperated in the planning of the project. They wanted the project because they observed that the fish stocks were decreasing and the ecosystem was changing. The project consortium is administered by the Sami Center at the university in partnership with Sami institutions. Community members are not employed by the project. The communication is both ad hoc and planned based on the schedules of key participants in the Sami institutions and local fishermen.

Q7. What type of monitoring and what methods do you use?

The project is trying to establish baseline data over a period of time that people can remember, approximately from 1945. It does not use the word "monitoring." The activities include:

- Interviewing fishermen using open-ended, guided questionnaires and an interview guide. Interviews are conducted by the researchers, sometimes with the assistance of local residents. About 20 people are interviewed in December, May, June and in autumn. Village populations range from 50 to 200.
- Making use of the interviews that were conducted in the 1970s and 1980s by local research institutions. GIS mapping.
- Making a documentary film about traditional knowledge because traditional knowledge cannot be documented by words alone. The film will also capture differences between fishermen's knowledge and researchers' when they have discussions on such topics as causes for seal-population change.

Q8. How do you organize your data management?

The team is planning to analyze GIS biological data derived from the summaries of the surveys stored at the National Statistics Bureau. The goal is to put together different types of knowledge and have it available for open access.

Q9. Volunteers vs. paid staff and participants: how did you address this issue in your project?

The project does not pay participants. People are motivated; they want to tell researchers what is going on and they see the benefit in this research. The project, however, contributes to local institutions by providing financial support.

Q10. What problems have you encountered and how did you work them out?

Sufficient funds were not budgeted for project administration and that created problems. The time needed for the website was underestimated. This will be taken into account for the next proposal.

Q11. What do you think is the main achievement of the project?

This project has advanced cooperation between local residents and scientists. Through its work Sami traditional knowledge is made relevant and its use should improve local fisheries management. This project is about how to use all types of knowledge and make the best management decision. This project is also important for documenting traditional knowledge.

Q12. What advice would you give to others who would like to develop a similar project?

To look for partners to cooperate as early in the project as possible, preferably prior to any research activities, is important. Reviewing previous research and looking at what kind of knowledge is available can be helpful.

Q13. What future do you see for this project?

There is a desire to continue and establish a network for Sami

fishermen. There is a need to train young researchers, build the capacities of local institutions, and make the University of Tromso aware of the traditional knowledge of Sami fishermen. The project team is fortunate to work with senior biologists who are open-minded, interested and see the future of this type of research.

Highlights

Achievements:

- Built a strong collaboration between researchers of various disciplines, local communities, government and academia
- Utilized archived data and integrated with new data
- Multidimensional approach to resources management

Opportunities for improvement:

- Network management capacity
- Communication and outreach

3.3.6 Marine Rangers Project (Australia)

The Marine Rangers project began in 2000 in Australia's Northern Territory at the request of local indigenous communities to address the issue of a large volume of debris washing up on their beaches and the entanglement of marine animals. With help from the World Wildlife Fund, and later from the regional government, a program was established by local residents to monitor and clean up marine debris. A comprehensive database is maintained and regular reports are presented to the communities. Participation in this project raised local residents' awareness of their own role in creating waste that washed up on their beaches and increased the capacities of local people, who learned new skills through project implementation. Mr. Shane Penny works on the Marine Rangers Project for the Department of Natural Resources, Environment and the Arts.

Status and contact details:

http://www.nt.gov.au/nreta/wildlife/marine/research.html#debris

Lead: Mr. Shane Penny
Northern Territory Department of Natural Resources, Environment and the Arts
Brinkin, Northern Territory, Australia
shane.penny@nt.gov.au

Project time: 2000-2009

Project funding: the Northern Territory's Department of Natural Resources, Environment and the Arts (DNRETA)

Q1. What are the main goals and activities of the project?

The goal is to monitor and clean up marine debris washing up on the shores of Aboriginal communities located along the coast of Australia's Northern Territory.

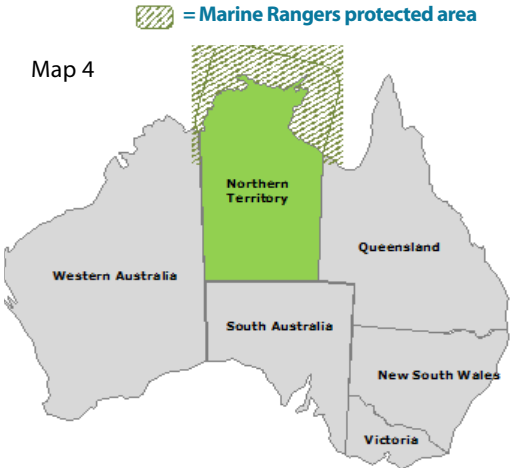
Q2. Who are the participants?

The participants are local community members, volunteers from Conservation Volunteers Australia and employees from the Department of Natural Resources, Environment, and the Arts. Previously, people from the World Wildlife Fund were also involved in on-the-ground operations.

Q3. Who initiated the project?

Australia's Northern Territory is a sparsely populated region of the country bordered by the Timor Sea, the Arafura Sea, and the Gulf of Carpenteria to the north. Indigenous peoples make up more than 30 percent of the residents of the region, with some living in remote communities located along the coast accessible only by air, boat or four-wheel vehicle during the dry season. About ten years ago, certain local community councils began to express concerns about a large volume of debris washing up onto their beaches, as well as the fate of sea turtles and other marine life that were getting entangled in nets. In addition to being a source of food for indigenous inhabitants, these animals were also considered sacred by the Native communities. The project was initiated by Aboriginal communities in the area, which are represented through local Land Councils.

Representatives from the communities reached out to the World Wildlife Fund for help and input on develop a monitoring program and ways to clean up the shoreline.



Map 4

Q4. What are the locations and how were they selected?

The communities are self-selected. They realized they had a problem and then contacted outside organizations seeking help to design something. There are about seven communities regularly involved right now. There are several more who have participated more sporadically over the last several years. For a while, the organizers were happy to take anyone on board. They would try to find them a bit of money to get them going and send someone out there to help them set things up.

Q5. How difficult was it to find funding and how long did it take?

For some communities, the Aboriginal Land Councils fund community projects. They get their money from the federal government and a bit from the state government. They initially teamed up with the World Wildlife Fund, which also contributed resources, to establish the program. But because of a change in the World Wildlife Fund's policies, they're no longer involved on the ground in the project.

In 2006, the Northern Territory's Department of Natural Resources, Environment and the Arts (DNREA) took over from the WWF. The project received a three-year funding grant. This is now coming to an end, and the team was unsuccessful in getting more money, so now the project is looking for other ways to keep the monitoring going.

Q6. What are the relationships between the project researchers and the communities?

There have never been any tensions with communities. The only problems that have been faced have revolved around cultural issues. If there's a ceremony going on in the community or if someone has passed away, then people are not around. Often there's no advance notice, such that you can show up at a community to do some work and people just aren't around or you can't get access to areas that you want to survey. But generally people are really keen to help out and be involved.

The project is trying to engage the community in some of its scientific work and trying to build capacity in communities for doing simple numerical tasks. Many of these ranger groups don't get a lot of exposure to doing these kinds of things, but the skills tend to be transferable across other projects. So when another project is started, the rangers can use those skills and develop further. The project attempts to get people involved and not be seen as government officers collecting data and disappearing.

Q7. What type of monitoring and what methods do you use?

The monitoring is done by local community members. In some cases they are volunteers. In other cases, they're on a government works program. Also, the project recieves some help from Conservation Volunteers Australia. They work at three sites. In some cases school kids come out. It's whoever is available. A date is arranged and depending on how well-funded the community is and its infrastructure, vehicles are supplied. Sometimes other resources are needed, occasionally with the help of local mining operations. Then, they spend a couple of days combing the beach and then a couple of days sorting, counting, weighing. The monitoring generally happens during October and November, although it occurs at other times as well in certain locations.

Q8. How do you organize your data management?

The DNREA has developed a comprehensive Microsoft Access database to store the data from the Marine Rangers Project. People involved in recycling efforts often request information from the database about the weight of the plastics collected by the rangers, with the aim of making use of the debris.

In addition, a copy of the data is left in the communities, as they own it. Electronic summaries from the office database are sent out as well. An annual summary is also compiled. Previously, these were quite technical documents, but the past couple of years they have evolved into a visual-based document. There's a problem with literacy and numeracy in these areas, so it's important to make things accessible. Very good positive feedback was received from the first reports using this method.

Q9. Volunteers vs. paid staff and participants: how did you address this issue in your project?

The Marine Rangers Project is largely a volunteer-based system. Participants are not compensated, except for those who already get some compensation through the government works programs. They're often assigned to do community work, and since there isn't always something to do, they're happy to participate when the debris monitoring starts. Food and water are provided when the monitoring is being conducted. And in some places operational expenses are paid. But a desire for financial compensation is not really an issue.

Sometimes the researchers do get inaccurate information. One of the things that they had to deal with was problems identifying the marine debris. Many of the community participants had trouble reading the data sheet. When the problem was detected, pictures were added, so that people who had trouble reading could identify the debris without a problem. This worked well.

Additionally, sometimes if there is a lot of debris, interest wanes pretty quickly, particularly if it's very hot outside. To deal with this the workday is adjusted: work for two to three hours in the morning, then relax, and return to sorting in the afternoon. Sometimes it's the cultural issues that are the hardest things to overcome. In some communities people are working to a different timescale. Some of the rangers have the attitude that they want to do the monitoring, but it happens when it happens. So it takes a lot of effort on the project part to coordinate them to get going.

Q11. What do you think is the main achievement of the project?

Gathering information about marine debris has helped communities identify where it is coming from, and also look for solutions to the problem. Also, as a result of the Marine Rangers Project, some of the communities have started paying more attention to their beaches and taken more pride in them. One community in which the project did a survey didn't realize that half of the debris washing up onto the shore was their own rubbish. Once they did, straight away "Do Not Litter" signs went up all over beach. They really got a sense of pride from their work, and a feeling that they've got control of the consequences.

Q12. What advice would you give to others who would like to develop a similar project?

Understanding the realities of the community is important. In this project's experience, keeping to a minimum the written text in training manuals was important. Lots of drawing and images for interpreting the task that needs to be undertaken was critical. Another thing had to do with how people were actually using the information being gathered. A lot of the data queries we got were from people wanting to recycle plastics. For them, weight, not numbers, is the important thing. We were cataloguing a lot of information that wasn't really necessary.

Another thing to bear in mind is what happens when there are multiple community-based monitoring programs in one area. Another project that runs parallel with ours, the Ghost Nets program, which is more focused just on collecting nets off beaches, also has a lot more money. Some of the communities try to weigh the amount of money our project has versus the amount of work, compared to that offered by other programs that require less effort but bigger returns. There's a certain competition. No one has said no to our work yet, but it's something that people talk about over dinner when they are out in the field.

Q13. What future do you see for this project?

Unfortunately, it has just run out of funding. The proposal for continuation was unsuccessful. Now the project team is deciding what to do. Some communities, probably about half, really want to keep going. So, it's about figuring out where money would be coming from. One of the things that was done with the project is the creation of "net kits," which are kept at local ranger stations. Local residents can effectively go out on their own and do surveys anytime they want. However, when it comes down to time and the amount of fuel needed for boats and vehicles, there are challenges. Some places are really well funded, whereas in other places their cars are falling apart. It's much more difficult for these communities to keep things going without some outside support.

Highlights

Achievements:

- Organized a systematic monitoring and data-gathering in very remote communities
- Helped communities to find solutions to their problems, while collecting data useful for others
- Community participants are volunteers

Opportunities for improvement:

- Increase level of literacy in the communities
- Consistent and sufficient funding

3.3.7 Siku-Inuit-Hila Project (Canada, Greenland, United States)

The Siku-Inuit-Hila (Sea ice-People-Weather) project looks at the different ways in which the Inuit communities of Barrow, Alaska, Kangiqtugaapik, Nunavut and Qaanaaq, Greenland live with and from sea ice. The purpose of the project is not simply to understand human/sea ice relationships, but also to facilitate the exchange of knowledge between the indigenous peoples who live in these places, and between local sea ice experts and scientists. Despite being separated by vast distances, cultures and languages, these groups all share knowledge and experience of sea ice. The Siku-Inuit-Hila project combines different community-based research methods in order to monitor sea ice, gather local and traditional knowledge about sea ice, and enable exchange between the participating communities and scientists. Dr. Shari Gearheard is principle investigator on the Siku-Inuit-Hila Project. She is an expert on human-environment interactions, traditional knowledge research, the Arctic environment and change, and community-based research methods. She is also a resident of Kangiqtugaapik, Nunavut.

Status and contact details:

Principle investigator: Dr. Shari Gearheard
National Snow and Ice Data Center
University of Colorado at Boulder
Kangiqtugaapik (Clyde River), Nunavut, Canada
shari.gearheard@nsidc.org

Project time: 2006-2010

Funding: Competitive grant, National Science Foundation project # 0624344

Q1. What are the main goals and activities of the project?

This study looks at the relationship between humans and sea ice in three different communities: Barrow, Alaska, Kangiqtugaapik, Nunavut and Qaanaaq, Greenland. It has three main goals: to facilitate the exchange of knowledge among local sea ice experts in these three communities and between these experts and scientists; to support these diverse experts in examining and documenting together sea ice characteristics, change and use, including similarities and differences between the three locations; to develop and implement community-based sea ice monitoring in these communities.

Q2. Who are the participants?

The participants are local sea ice experts (hunters and elders) in each of the three communities. Each community has six to seven experts who meet regularly (usually monthly) to work on project activities and three to four of these experts also participated in the exchange trips to the other communities. The five scientists on the team are from Canada, Greenland, and the United States and include a glaciologist, climatologist and geographer. The scientists have extensive backgrounds in community-based research and knowledge of sea ice conditions and monitoring.

Q3. Who initiated the project?

The project was initiated jointly by community members and researchers who already had long-standing relationships in each community at the project outset. Community members have been involved in all parts with regard to design, research, logistics, analysis and oversight. This project built on a pilot project conducted between two of the communities (using the exchange approach) a few years before. So when the proposal was written for funding, people were already onboard and helping to design and write it. There was excitement and hope. People were wondering, "Is our idea really going to get funded?" The momentum was already there.

Q4. What are the locations and how were they selected?

The original pilot project was between Kangiqtugaapik (Clyde River) and Barrow. These communities were chosen because researchers involved in the project had strong relationships in these areas. When new funding was received, Greenland was added. The Inuit Circumpolar Council (ICC) was approached to suggest which community might be interested in taking part. The ICC joined as a partner in the research and recommended Qaanaaq. They helped in project discussions and community consultations with Qaanaaq. Qaanaaq's local government

was enthusiastic about joining the project and they had their own meetings to decide on which local experts would be appropriate to create Qaanaaq's core team.

Q5. How difficult was it to find funding and how long did it take?

The project is funded by the National Science Foundation (NSF). ICC has provided some additional support to help bring local experts to our meetings and exchanges, and they have provided tremendous in-kind support. Funding was also received from Health Canada for a book of results that the team is working on.

The project was built on a successful pilot project. Something small-scale was tried first, it worked, and then the new project was built from there. That might have been what made this application successful. Also, the National Science Foundation is increasingly interested in local knowledge. The travel component of the project, to facilitate knowledge exchange between all these people and places, is huge. The participants are very grateful that NSF saw the value in that. They (via Polar Field Services) provided tremendous logistics support.

Q6. What are the relationships between the project researchers and the communities?

Community members are the project researchers. They play the same leading roles as the scientists and they lead researchers who are not residents of the villages, however, one has lived in Kangiqtugaapik for some time now and the other has long and extensive ties to the community of Barrow.

Q7. What type of monitoring and what methods do you use?

There are three components to the project. The first is an exchange of people, in which participants visit the different communities and learn about local sea ice knowledge and the activities that people do on the ice and related skills. There was one exchange to each participating community. There are about 12 to14 people going to the different places, where they spend around two to three weeks. In each place, they try to spend as much time on the ice as possible. Local hosts planned ice trips.

In Barrow, permission was received from the Whaling Captains Association to be on the ice during the spring bowhead whale hunt. People from Kangiqtugaapik were really excited because there's no bowhead whale hunting there. And the same was true for those from Greenland. Being able to participate in that hunt allowed participants hands-on, on-ice experience learning about Barrow sea ice knowledge and use. Similar on-ice time in Kangiqtugaapik (travelling regional fjords by snow machine and camping) and Qaanaaq (travelling by dog team to the next community of Siorapaluk and back) were key to project learning and the exchange of knowledge.

The second component of the research is establishing in each community a Sea Ice Working Group that meets regularly to discuss observations of ice conditions and experiences on the ice. In particular, they focus on issues like what the ice is doing at that time versus what it normally should be doing, documenting knowledge and language about sea ice, and the results of the technical monitoring from the local sea ice stations, which is the third component of the project.

In each of the locations, local monitors set up three to four sea ice monitoring stations to record a variety of data about ice conditions. With training by the project glaciologist and supported by a manual designed by two of the project researchers, local residents gather quantitative information about the sea ice, including parameters such as sea ice temperature and thickness. The method developed for this work is simple but yields robust data. The method has been so successful that there are requests from other communities for Siku-Inuit-Hila monitors be sent to their communities to help them set up something similar. For example, ice monitoring projects in Nunavik, Canada, have already switched to this method. It may be the basis for a wider network around the Arctic.

Q8. How do you organize your data management?

The data stays in the communities and is shared with the project glaciologist to assist with analysis and reporting. In Kangiqtugaapik it is housed at the Ittaq Heritage and Research Center and in Barrow at the Barrow Arctic Science Consortium. In Qaanaaq it will be deposited with the local government. Communities decide where they want the data stored and shared. There has yet to be a discussion of whether or not there is a desire for more public access of the raw data (there are publications of the results and the team is also writing a book). Also, all communities are looking for ways to extend the monitoring beyond the project. So far Kangiqtugaapik has been successful in acquiring additional funding. With more long-term monitoring, a detailed plan for data management will be made.

Q9. Volunteers versus paid staff and participants: how did you address this issue in your project?

Participants are paid for their participation. They are researchers, so just as scientists get paid, so do local researchers and monitors.

Q10. What problems have you encountered and how did you work them out?

At the very beginning of sea ice monitoring there were some problems with people writing down incorrect measurements. But these were simple issues and as soon as they were pointed out, it was easy enough to fix. The monitors take a lot of pride in what they do and they want to do it right. It took a little bit of time at first for monitors to learn the techniques of course, but now they're used to it and they are running the stations (from set up, to monitoring, to station take-down) independently.

Communication can be a challenge across such great Arctic distances. It's been successful, but it requires a lot of energy. It's a continuous process, calling people and emailing people (even snail-mailing people). Language, too, is a challenge in that the project wants to respect everyone's language and publish in all the dialects. But it comes down to money. So, for example, the book has to be in English with as much local language as possible, although it would be ideal if it had been in each of the local languages. It's hard for the lead researcher to say to any of the communities, "Sorry, but we don't have the money to translate." Trying to balance language as much as possible and always looking for translation support is the best strategy under the circumstances.

Q11. What do you think is the main achievement of the project?

The knowledge gathered and shared is most central, but there are also the bonds between people. When participants travel together it is a really intense time of exchange. It is not just about sea ice, but about people, and life, in general. The participants are reminded that these "knowledge holders," whether scientist or hunter, are people with very interesting life stories, families, senses of humor, etc. When travelling

great distances across ice or taking flights together, as well as living together, deep bonds are created. This was also the thing that created the momentum that kept the project going. People don't want to let their friends down by not doing their part.

All the Inuit really liked meeting people from other communities. It is really interesting to see what similarities and differences there are. And sea ice is the common denominator among all participants. There are scientists who have dedicated their lives to trying to understand it and they are passionate about it. Even if this is different from Inuit, everyone has something to say about it.

During one of the last meetings when people realized that they were at the end of the last exchange trip, people were crying. They had become very close to each other and didn't know when they would see one another again. It's no longer just a project when you have people around the table crying – there is something deeper there. The manual for setting up sea ice monitoring stations developed by the project has proven very effective. There is a hope that it can serve as guide for other communities interested in doing similar work. It can be found online at: http://nsidc.org/pubs/special/nsidc_special_report_14.pdf.

Q12. What advice would you give to others who would like to develop a similar project?

If anyone wants to do a community-based project, they already need to have or must work on establishing a relationship with a person or a group in the community who will actually do the project. Unless they live there, they need to partner with a local person or local organization to carry the project through. This is critical for keeping the project going and making it meaningful locally.

Q13. What future do you see for this project?

The results of the Siku-Inuit-Hila project are being compiled in a book, which is being written and illustrated primarily by the local sea ice experts. One of the aims of this book is to show what life with ice is really like from the practical standpoint of people who live and depend on it. The authors hope that this approach might reach a broader audience including the public, students, science and industry. But the first audience for the Siku-Inuit-Hila project is the communities themselves. The people in these communities want to know and share amongst their own people what is valuable and important to them.

The funding for the project is coming to an end, and it remains to be seen how, whether, and in what form it's going to keep going. In Kangiqtugaapik there is funding to keep the sea ice monitoring station going and in Qaanaaq the local monitor there is interested in maintaining observations as well. Collaboration with other ice monitoring projects in Barrow may allow local observations to continue as well.

Highlights

Achievements:

- Developed a manual for local communities for setting up sea ice monitoring using a simple but robust method that can be used in other projects
- Integrated activities, which enhanced connections between Inuit living in different countries
- Built successful relationships between scientists and indigenous communities

Opportunities for improvement:

- Access to long-term funding to keep up observations and research network
- Additional funding to translate project results and products into multiple indigenous languages

3.3.8 Snowchange (Canada, Finland, Russia, United States)

The Snowchange Cooperative is a not-for-profit organization based in Finland. It was established in 2001 to document indigenous views on climate and ecology. Mr. Tero Mustonen has been leading the organization since its inception. Snowchange's mission is to empower indigenous peoples by enabling them to conduct their own research. The program runs projects in the Arctic countries working with local indigenous communities. Snowchange responds to requests from communities and/or scientists to initiate research. In addition to the Arctic countries, the program has partners in New Zealand, India and Australia. All research activities, which often include scientists, are based on careful gathering of traditional knowledge about the environment by interviewing harvesters and sometimes recording interviews on video or audio. The results of the research are archived at the Snowchange office and are available for communities and researchers. Annual conferences, held in different countries, bring together international participants to share their experiences. Approximately 2000 people are estimated to have been involved with the project.

Status and contact details: www.snowchange.org

Head of International Affairs: Mr.Tero Mustonen
Chairperson: Ms. Saija Lehtonen (annual rotation)
Snowchange Cooperative, Finland

Project Time: 2001-ongoing

Funding: various government and private sources

Q1. What are the main goals and activities of the project?

The Snowchange Cooperative is a program that consists of various projects aimed at documenting indigenous views on climate change and ecology. Snowchange activities are comprised of education and cultural events (crafts fairs, workshop facilitation, etc.) and scientific research focused on traditional knowledge. For example, in a project on the Environmental Observations of Seal Hunters in the Community of Merikarvia, Southern Finland (on the Baltic Coast), the goal was to find out what local knowledge could tell about environmental changes happening in the area. In ECORA Snowchange surveyed local residents to find out how indigenous peoples of the region, Chukchi, Yukagir and Even, apply traditional knowledge to natural resource use.

Q2. Who are the participants?

Snowchange partners with researchers, as well as other organizations and institutions, such as the Northern Forum, the Academy of Science of Yakutia (Russian Federation), and the Saami Council, to implement its projects depending on

its needs. Over the years, approximately 2000 local residents have participated in Snowchange projects.

Q3. Who initiated the project?

Initial meetings were held with Saami in 1996. At one of the meetings in 2001, an Inuit lady was talking about what united all indigenous peoples in the Arctic. Everyone agreed that it was snow. Then the conversation turned into a discussion on climate change and the fact that people should have a positive outlook on change, something that people can influence, rather than seeing it as negative and destructive. By combining two words together they got the idea of the Snowchange project. It took several years to organize it and in 2001 the first project activities took place. Snowchange's approach is community-centered. It all depends on what people want it to do. Snowchange does not initiate activities.

Q4. What are the locations and how were they selected?

Snowchange has had projects in many Scandinavian, North American and Russian communities. Some of them are Sevettijärvi, Merikarvia in Finland, Krasnochelje and the Kolyma region in Russia. Snowchange does not select communities but engages in a dialogue with communities, and if the community expresses an interest Snowchange takes on a project.

Q5. How difficult was it to find funding and how long did it take?

Snowchange generates a small income from educational and cultural activities but the core funding and project funding come from various agencies and organizations. The list includes: Ministry of Natural Protection of Finland, Finnish Academy of Science, MFA of Finland, Saami Council, Barents Sea Secretariat and others.

Q6. What are the relationships between the project researchers and the communities?

A typical Snowchange project is organized like this:

- After Snowchange has been approached with a request from a community, it organizes a visit to this community to listen to that community's concerns.
- Snowchange, sometimes in partnership with scientists or other organizations, designs the research.
- The team goes back to the community to explain what they propose to do and the community holds a meeting to approve the work.
- The team spends substantial time in the community easing into the life of the residents, participating in some of their activities if invited.

Q7. What type of monitoring and what methods do you use?

Researchers conduct open-ended interviews with local residents. Sometimes local peoples are trained to interview but the interviewing is performed only during the team's visit. If permission is granted, information is recorded on audio and video, and locations are mapped.

In the project on the Environmental Observations of Seal Hunters in Southern Finland, Snowchange researchers have been coming to the community every year since 2002 to document and map the use of the sea ice in the Baltic Sea and the interactions between sea ice and seals. Oral history, as told by the hunters, was compared with scientific data.

In partnership with the Saami Council, Snowchange has been working in two communities, Sevettijärvi in Finland and Lovozero in Kola peninsula in Russia, to document observations on climate change and biodiversity on and off for about ten years. The observations collected in 2000 and 2002 were included as case studies in Chapter 3 of the *Arctic Climate Impact Assessment*.

Q8. How do you organize your data management?

Snowchange's office maintains digital archives of interviews, audio/video recordings, and other project materials. All interviews are transcribed. Metadata is created for all material. Access is defined by the communities where the data was collected. Snowchange archives only the data that the community has permitted it to store. Residents also specify what final products they would like to receive. Snowchange follows up on all requests.

Q9. Volunteers versus paid staff and participants: how did you address this issue in your project?

This is a difficult topic. Because compensation is often required in North America, the cost of community-based monitoring there is substantially higher than in Russia and in Northern Europe. For example, the cost of activities for one year per community in Russia ranges between ten and twenty thousand Euros. Snowchange may have six to eight communities at a time. Most of the budget is allocated to travel to enable visits to these communities. Compensation to participants is provided by Snowchange only in communities (located mostly in North America) where this practice has become a norm.

Q10. What problems have you encountered and how did you work them out?

Working with researchers can be frustrating, as they have a difficult time understanding the holistic nature of indigenous and traditional knowledge. One cannot focus on just one topic, such as index species, and not pay attention to anything else. This presents a challenge when designing surveys. Scientists should also be sensitive to the ownership of knowledge. People in the communities own their knowledge – scientists don't. The use should be negotiated prior to any release to the public and people in the communities should have an opportunity to review. It is difficult to include women's observations. Women should be in the center of the research as they are key to many subsistence activities, but in some cultures traditionally only men are interviewed.

Q11. What do you think is the main achievement of the project?

Snowchange has gained valuable experience over the decade of its work. An expansive library of materials has been accumulated and shared with communities and scientists. Several books based on the research results and articles in science journals were published. The main benefit, for example, to the Finnish community of Merikarvia is in the recording and preservation of traditional knowledge. This is one of the few communities in Finland where these stories are still told. By nurturing long-term relationships, Snowchange is helping communities to develop their own capacity for community-based monitoring .

Q12. What advice would you give to others who would like to develop a similar project?

The most important message from Snowchange is that communities should have opportunities to continue their subsistence practices and be able to speak their language,

a paramount condition for the continuation of traditional knowledge. Recordings are not the traditional knowledge; the knowledge can only exist if people use it. Community-based monitoring is one of the means to entice people to use it.

Q13. What future do you see for this project?

Snowchange is successful and effective. Many multimillion dollar programs disappear but Snowchange is still here. It is grassroots and there are no plans on expanding. One of the strengths of Snowchange is its cost-efficiency in organizing its projects. It does so by building long-term relationships with communities and organizations across the Arctic. Generating grassroots support is the most important condition for sustainable community-based monitoring. No long-term funding is available for community-based monitoring in the Arctic. Local people should contribute their time to collect information on their own. It does not take a lot of money if there are good relationships with communities. Snowchange is trying to define these relationships without money.

Highlights

Achievements:

- Longevity based on flexible and creative approach
- Built partnerships outside the Arctic
- Earned trust of communities
- Encouraged indigenous communities to value and practice their traditional ways of life
- Provided valuable input to the *Arctic Climate Impact Assessment*
- Won 2002 World Wildlife Fund Panda Prize for best national environment project

Opportunities for improvement:

- Mutual understanding with scientists

4. Recommendations for community-based monitoring development

4.1 Advice from those who tried and succeeded

The interviews in the previous section provided a useful and inspiring account of practical issues involved in the implementation of community-based monitoring programs. Since there are no formal text books on community-based monitoring, learning from such projects could be the most productive way of entering this field.

While the interviewed projects vary greatly, some common trends relating to community-based monitoring emerge from "lessons learned." Below is a summary of what the interviewed project leaders highlighted as the most important components and activities contributing to successful work.

Plan ahead:

- Building a relationship with an organization that has qualified personnel to spend sufficient time on the design and development of community-based monitoring is important. A diverse team of collaborators with different types of expertise, from academia to community leaders and government officials, is essential.
- A researcher should already have or must work on establishing a relationship with a person or a group in the community who will actually do the project. Unless they live there, researchers need to partner with a local person or organization who would work with them to provide training and other support.
- Investigate knowledge or information that is already available; look at prior research first and build on it.
- Plan long-term, economize and move slowly. Start with a small project or a pilot that can be built on later.
- Allocate sufficient time and resources for local project-staff training.

Prepare for the unexpected:

- Remaining flexible and willing to change things is important. Maintain a presence in the community at all times — it's important to have the right person onsite to address emerging issues in a timely manner.

Be relevant to communities:

- Indigenous and traditional knowledge can only exist if people use it. Community-based monitoring is one of the means to entice people to use traditional knowledge. By paying more attention to their environment and taking pride in their work, communities develop a feeling of ownership of and control over the consequences of the use of their environment.

Respect communities:

- Learn about the life cycle of the communities involved in your project and respect their schedule.
- Do not implement the project without significant community interest and support.
- Respect gender roles accepted in the community but do not overlook women as they are the key to knowledge on many subsistence activities.

Be relevant to science and resource management agencies:

- Community-based monitoring is an invaluable component of any large-scale monitoring, since without local residents it is impossible to collect year-round data in the vast Arctic region.
- Quantifiable methods that allow for the comparison of data between disciplines increase the range of application of community-based monitoring data and therefore increase the interest of funding agencies.

Consider sustainability:

- Community-based monitoring is based on human relationships. What is invested in that relationship will define what the final result will be. It's a fine balance between give and take.
- Generating grassroots support is the most important condition for sustainable community-based monitoring. Long-term funding is not available for community-based monitoring in the Arctic at this time. Local people should contribute their time to collect information on their own. Good relationships with communities are the key to success.

4.2 Community-based monitoring project development

More specific recommendations drawn from the section above could be helpful to those developing community-based monitoring programs. The following suggestions are building blocks and should not be viewed as an all-inclusive work plan. The tasks are presented in the project-timeline phases where they typically occur. Theses phases do not necessarily match the timeline of grant cycles, but rather include in the planning phase all activities leading to actual monitoring; monitoring activities (data collection and processing) fall under the implementation phase; and the reporting phase covers activities encompassing the analysis of collected data.

4.2.1 Planning

The community-based monitoring component is frequently an afterthought in research projects. It is often described in vague language in proposals, and only after the project has been approved does actual planning for a community-based monitoring component begin. This is too late. Community-based monitoring should be planned during project design and proposal development and treated on par with all other project components.

Collaboration: build a team

As every project leader emphasized in Section 3, community-based monitoring is rooted in collaborative research. Building relationships with potential communities, researchers and other partners is essential for its success. It is important to understand that social scientists are indispensable in developing appropriate research methods even if the project is directed at monitoring for biological resources, including bio-sampling and other "hard science" research.

Anticipate competition: find out what else is happening in the community

Some communities, especially the ones with relatively easy access, are popular among researchers. If the project plan calls for work in such a community, it is useful to determine if other projects are planning their activities in the same timeframe. When a community is inundated with research projects, residents may not want to participate in yet another project, regardless of the perceived benefits. There may also be competition for the few individuals available to work on projects.

Make timely decisions: select community-based monitoring types and methods to meet project goals

There are no templates for how to design community-based monitoring, but the key components are known and it is the responsibility of the project developer to figure out which ones are necessary to accomplish the goals of the project. The community-based monitoring decision tree in Section 2.2 illustrates a possible decision-making process for choosing the appropriate type or types of community-based monitoring for a particular project. Refer to the summary table in Section 2.3 to match community-based monitoring types with recommended methods.

Be prepared in advance: get a project data organization system in place

Once the decision on the type of community-based monitoring for the project has been made and the methods suitable for this type are determined, it should become clear what kind of data may be generated. Designing a data organization and storage system prior to the collection of data is a big advantage. Unfortunately, data management, analysis and reporting are often overlooked and under-budgeted but nonetheless are components that should be addressed at the beginning of the project. While programs such as Excel and Microsoft Access are quite common, many other software packages require an expert who can guide the process of data gathering and storage. For projects that are part of larger research programs, data-management requirements are often more specific. For community-based monitoring projects, this frequently presents a problem, as their data often do not fit into the moulds created for other disciplines. Community-based monitoring data can come in many different formats and media, and designing a system that accommodates all of them is a challenge that should not be underestimated. There are many resources available for data management. The more complex the program, the harder it is for a nonspecialist to work with it. (See Appendix 1.)

A project developer should strive to ensure that:

- The information gathered can be converted into data.
- The monitoring methods are repeatable and information collection is easily standardized (collected in the same way no matter who the observer or recorder is).
- Project personnel are available to process and organize the data using appropriate software.
- The data is deposited where it can be easily retrieved by potential users.
- The terms of the data use are clearly spelled out and reflect local requirements in addition to all applicable national laws.
- Metadata is created and is broadly available.

Communicate effectively: make it a priority

Communication between all collaborators and partners is essential. A communication plan should be developed early in the project and, if possible, dedicated personnel should be selected or hired. For programs that originated outside of communities with only marginal initial consultations with residents, starting on the right foot with the communities is imperative. Below are some suggestions about how to approach such communication.

Researchers should obviously learn as much as possible about potential participating communities, including their culture and administrative structure, before contacting that community.

What materials to prepare:

- Describe the project in simple language using visual aids, such as graphics and photos.
- Emphasize the links between the project goals and issues of concern in the community and be prepared to modify the project to reflect the community's recommendations.
- Show how the researchers will be reporting the results of the work back to the community and how the results may be used by the community.
- Prepare a realistic budget for the work in the community based on actual costs of "doing business" there (find out in advance rate of rents, salaries, communication costs, etc.).

Whom to contact:

Research the government structure and direct your first inquiries to the appropriate individual or body and be persistent in getting a response from them. (See Appendix 7 for more information on local and indigenous governments in the Arctic countries.) Use local media where appropriate to make introductions and short presentations.

How to contact:

- Realize that in rural and indigenous communities people may have a different communication protocol. Don't get discouraged if your attempts to communicate are not reciprocated.
- Find an authority figure who will introduce you to the community and show some support for your project.

It may not be possible to accomplish all suggested planning phase tasks due to a lack of resources, or time, or both. However, the more tasks checked off the list, the fewer problems will surface later in the project.

4.2.2 Implementation

Project activities that take place after the project has been established and funded are technically in the implementation phase. In this section the focus is on gathering information, generating data and processing it – activities that constitute community-based monitoring.

As mentioned previously, community-based monitoring programs are very diverse and it would be difficult to come up with a useful list of generic recommendations. Below are some of the issues raised by the project leaders interviewed for Section 3 of this handbook. Almost every project has experienced varying degrees of difficulty in these areas: providing adequate training and building capacity, ensuring efficient ongoing communication, retaining staff, project oversight and quality control.

Provide adequate training

Any community-based monitoring activities that call for community members' participation should plan on sufficient time and adequate funding for training. While it is sometimes easier to bring all participants to a centrally located city, one-on-one training in the community may be more efficient. In indigenous cultures, learning is achieved through observing and practicing, not taking notes in a classroom. Project leaders or senior staff should be able to visit communities over the course of the project for continuous training and troubleshooting. Training should not be seen as a one-time workshop. Manuals are helpful but they cannot substitute for personal training.

Find reliable local project staff

Finding the right person to do the job in the community is crucial. When the community leadership is interested and supportive of the activities, they will recommend local community members who will be appropriate for the project. Adequate compensation could also help retain the most capable people. Scheduling project work with consideration for harvesting activities could help avoid problems arising from absenteeism.

Ensure work oversight and quality control

Regardless of the amount of training, there will be difficulties in execution, following rules and procedures. Maintaining flexibility in how activities are organized and expedient feedback are needed to successfully deal with these issues. The incoming data need to be continually monitored to ensure that the selected methods and their execution are providing the intended information. Whenever possible, adjustments should be made. However, in the case of population survey, changes may need to be deferred until the next cycle. If the survey instrument is altered in the middle of a survey there will be problems with data analysis.

Engage in ongoing communication

In most community-based monitoring projects, researchers do not reside in the communities where activities are taking place. All possible technology options should be explored to keep in touch weekly. External project communication is as necessary as internal communication. Whenever possible, media, conference, local meetings and events should be used to inform the public about the project.

4.2.3 Reporting

Depending on the length of the project, there may be a number of reporting opportunities. Regular reporting is important in all project phases. The suggestions in this section address final project reporting (after the project or a substantial portion of it has been completed) but can be applied to other project reports. For ongoing monitoring projects, it is important to present overall findings and results of the monitoring regularly.

The most common problem is the gap between the time of completion of the project (or a portion of it) and the time when the report is available. Another common problem is presenting (or mailing) a report written in scientific language that lay people, and especially community members, cannot understand. Figure 2 illustrates an example of a step-by-step approach for keeping a community in the loop after the monitoring activities have been completed.

Step 1

After all activities have been completed, a simple letter of appreciation sent to all participants in the community will acknowledge the value of their contribution and will inform them about the timeline for project results and final reports. If appropriate, town-hall meetings and presentations to local authorities should be organized.

Step 2

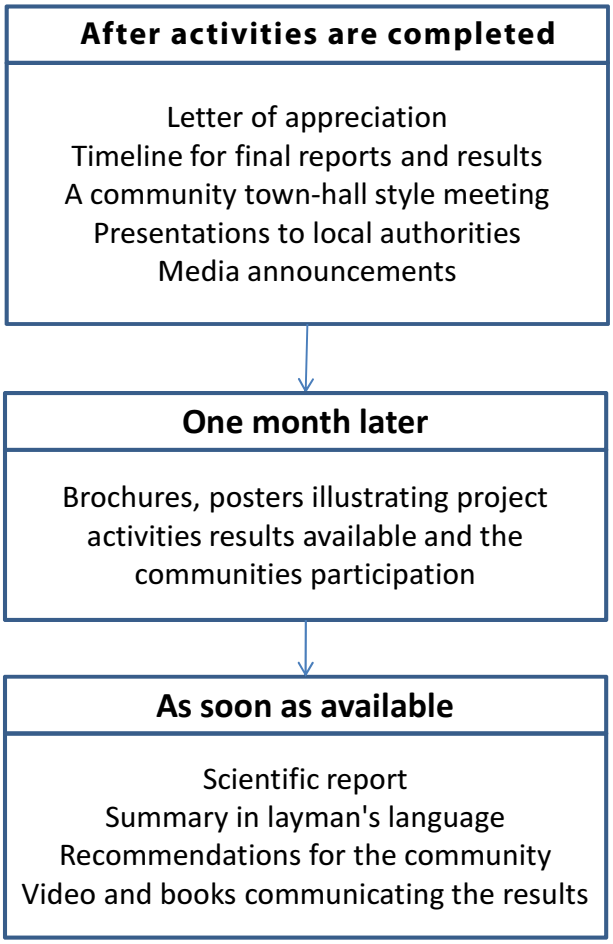
Approximately within one month, project summary materials and any results available at this time should be delivered to the community. These materials should be concise and visually appealing (brochures, posters). Slide shows and short videos are excellent media as well.

Step 3

Presentation of final project product(s) should be done in the communities, preferably by the project lead within a reasonable time after the activities are completed. If necessary, material should be translated into local languages. Whenever possible, recommendations on how the results of the research may be of use to the communities should be developed. Presentations should not be limited to talks and reports. If the budget permits, films and books should be considered.

The successful conclusion of a project opens doors to other opportunities within that community. This is important because monitoring presumes ongoing activities for long periods of time and building interest and support in communities will ensure future cooperation.

Fig 2. Reporting phase communication plan example



5. Conclusions

Conclusions

Community-based monitoring, in all its forms, has so many variables that it is impossible to devise a single one-size-fits-all approach. Every component that goes into the design of a community-based monitoring program needs to be specific to a particular country, region, culture, community needs, science needs and government regulations just to name a few. In the end, it is critical to understand how these components work together to ensure project success.

Many researchers leading community-based monitoring projects are individuals who are passionate about this work, who are independent thinkers and are not afraid to break the barriers. They don't always work "by the book"; rather they design "the book" of community-based monitoring practices. Some of those practices and advice are featured in this handbook and should serve as encouragement to others to continue these discoveries and to write new chapters in "the book" of community-based monitoring.

Most of the recommendations singled out as important by the project leaders interviewed in Section 3 deal with the processes of community-based monitoring, such as project design, organization and human relationships. Not surprisingly, most of the difficulties identified also arise from the deficiencies in these processes. It is worthwhile to note that almost all challenges cited are similar to those faced by many other research projects operating in remote locations, such as difficulty in finding qualified human resources, dealing with complex logistics, building rapport with local government and residents and searching for sustainable funding. This demonstrates that the failures and successes of community-based monitoring projects, in many cases, depend on the same factors as any scientific or natural resource management activities.

One conclusion is clear: community-based monitoring is here to stay. As the reviewed projects have shown, there are many successes, but there are also many challenges that need to be addressed. There is a consensus among researchers on some issues, while on other issues researchers take opposite sides. What are some of these issues?

There is great diversity in project sizes and funding levels. The reviewed projects range from three thousand U.S. dollars to several hundred thousand dollars per year.

Do smaller, less expensive projects have better sustainability?

Several long-term monitoring project leaders emphasized that modest funding and manageable size are keys to their long-term sustainability. Indeed, the longest-running reviewed projects are relatively inexpensive. (See Table 1.) However, all these projects are organized and run with substantial involvement from government agencies that provide offices, staff and technical support. Had this support been calculated, the total cost of the projects would have been much higher. The longevity of these projects is most likely explained by the government involvement. Another important factor is a project's ability to provide regular and community-relevant results. So, partnering with government regulatory agencies is a positive step towards sustainability.

Do project products and results differ in projects of different size and funding levels?

The most significant advantage of larger projects is in the final products, which offer better organized and higher quality data, and other products, such as books and films. Since these project teams usually have better scientific expertise they are more likely to make discoveries and advance science. At the same time, these project may have a more difficult time taking root in the communities.

The smaller projects are more adaptable. It is easier for a smaller project to pick up activities when funding is not consistent and there are gaps. However, if funding is not sufficient, there may be difficulty in attracting and retaining staff and participants, accumulated data may not be properly processed and therefore may remain useless for a long time.

Many projects start small, as pilots, and expand slowly. This was pointed out as a good strategy by several interviewed researchers. Since community-based monitoring is a new research field, many projects are sailing in uncharted waters. Testing pilot ideas, refining design and then expanding is a good progression to success.

The leaders of small projects interviewed thought that being small was good. At the same time, everyone expressed the need for more sufficient funding. No leader of larger projects suggested that downsizing would improve the project. The lesson here may be that every researcher is setting goals that are commensurate with available funding.

Ultimately, every program deals with two major challenges: how to fund work and how to sustain funding. Most of the long-term monitoring projects are funded by various government regulatory agencies that operate on annual funding cycles. They have modest budgets but enjoy the benefits of government infrastructure, such as local offices and staff. Projects funded by competitive grants often have larger budgets and more ambitious goals. These projects are better equipped to develop and test new methods and approaches. It would make sense for a community-based monitoring project to begin as a competitive grant research project. Successful projects demonstrating results deemed valuable for society could be transferred to appropriate government regulatory/maintenance agencies and "adopted" by communities through the direct involvement of village or other local governance entities. Until this chain of command develops, the sustainability of community-based monitoring programs will remain a problem.

Many community-based monitoring projects use various types of interviews as methods of data collection.

How do local resident-interviewers compare to visiting researchers?

In the social sciences, the discussion about the effectiveness and appropriateness of local residents interviewing other people in their communities is not new and there is no consensus. There are successful projects that do not use local residents and there are successful projects that do. Some scientists believe that a person who has no academic training cannot perform as well as a researcher or a graduate student. Another opinion in favour of visiting researchers is that a stranger may get more information as people would make an effort to explain things that are obvious to locals. Other researchers see a tremendous potential in local residents and advocate hiring and training them. There are many social benefits in that. A younger person interviewing an elder will not only collect information for the project but will likely learn something new about their own culture and traditions. Obviously, local residents who are not researchers will require training, and there will likely be more work needed to address technical irregularities during data processing. Every researcher needs to weigh all the pros and cons and decide what works best for their project and its budget.

Another contentious issue is whether or not to pay local assistants and participants.

Are paid employees better than volunteers?

There is no consensus here, either. Paid employees may not be better, but providing compensation may be the only way to retain local residents working in the project. There is a definite division in opinions between North America and Europe. Volunteerism is not typical in North American Arctic communities. In many surveys, respondents expect to receive small payments or gifts. The only reasonable solution is to follow the practices established in the community.

All projects recognize the importance of finding and retaining qualified individuals to oversee project activities in the communities. Unfortunately, it remains incredibly difficult to do this. Some projects stalled altogether in the absence of such people. Poor infrastructure in many communities makes it challenging to run projects. Dependence on only a handful of capable individuals becomes the Achilles' heel of many community-based monitoring projects. Optimistically, the growth of community-based monitoring projects will lead to an increased interest from the best qualified people in the communities. It is also important that community-based monitoring projects, large and small, are funded at a level that makes them competitive. Building capacity for running community-based monitoring projects through local organizations is critical.

While these issues were not brought forward in most of the interviews in Section 3, it should be noted that there is a need for comparative analysis studies on the accuracy and effectiveness of community-based monitoring activities to advance the theoretical basis for its implementation in scientific research and natural resource management; furthermore, there is a definite shortage of scientists comfortable working within both "soft" and "hard" science disciplines.

There is a need for a new generation of scientists with multidisciplinary academic backgrounds; there is also a need for a new generation of local residents who are as comfortable working in community-based research projects as they are in harvesting activities. The research and natural resource management agencies need to work together with local governments to better integrate community-based monitoring practices in the everyday life of the communities. Local knowledge, which is a foundation for community-based monitoring, is holistic, and so should be the academic education and government approach to community-based monitoring.

In the meantime, self-education and experience-sharing are the keys. Fortunately, there are many successful projects and resources, some of which have been highlighted in this handbook, to encourage further thought and discussion around community-based monitoring.

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6. Resources

Appendix 1: Survey of information and resources

Research Methods Knowledge Base: A comprehensive web-based textbook that addresses all of the topics in a typical introductory undergraduate or graduate course in social research methods. Although much of what it covers goes beyond the boundaries of survey research, it does have some useful basic information about sampling, measurement, survey design and data analysis. It also addresses the major theoretical and philosophical underpinnings of research including: the idea of validity in research; reliability of measures; and ethics. It is written to be accessible to experts and non-experts alike. http://www.socialresearchmethods.net

Designing Surveys: A Guide to Decisions and Procedures, Czaja, R and J. Blair. 1995. Pine Forge Press.

How to Conduct Surveys: A Step-by-Step Guide, Fink, Arlene. 1998. Sage Publications.

The Good Research Guide: For Small-Scale Social Research Projects. Denscombe, M. 1998. Open University Press.

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Improving Survey Questions, Fowler, F. 1995. Sage Publications.

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The Power of Survey Design: A User's Guide for Managing Surveys, Interpreting Results, and Influencing Respondents, Iarossi, G. 2006. World Bank Publications.

Cognitive Inerviewing: A "How to" Guide, Willis G.B., R.A. Casper and J.T. Lessler. 1999. Research Triangle Institute.

Yukon North Slope Research Guide. http://www.wmacns.ca/conservation/ltrmp/researchguide/

Appendix 2: Community-based monitoring in conservation and natural resource management

A compilation of case studies and peer-reviewed articles on application of community-based monitoring in conservation and resource management in the developing countries: http://www.monitoringmatters.org

AMBIO: A Journal of the Human Environment, Volume 36, Issue 7 (November 2007) pp. 566-570: "Increasing Conservation Managment Action by Involving Local People in Natuaral Resource Management" by Finn Danielsen et al. http://ambio.allenpress.com/perlserv/?request=get-document&doi=10.1579%2F0044-7447%282007%2936%5B566%3AICMABI%5D2.0.CO%3B2

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Appendix 4: Inclusion of Aboriginal voice

Laduke, Winona. *Recovering the Sacred - The Power of Naming and Claiming*. Cambridge, MA, USA: South End Press, 2005. ISBN 978-0-89608-712-5.

Smith, Linda Tuhiwai. *Decolonizing Methodologies – Research and Indigenous Peoples*. Lontoo: Zed Books, 2005.

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Berkes, Fikret. *Sacred Ecology – Traditional Ecological Knowledge and Resource Management*. Philadelphia: Taylor & Francis, 1999. ISBN 1-56032-695-6.

Kawagley, Oscar Angayuqaq. *A Yupiaq Worldview – A Pathway to Ecology and Spirit*. Prospect Heights: Waveland Press, 1995. ISBN 0-88133-859-1.

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Appendix 6: Methodologies

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Huntington, Henry P. "Traditional Knowledge of the Ecology of Beluga Whales in the Eastern Chukchi and Northern Bering Seas, Alaska." *Arctic*, 1999. Vol 52, no 1. pp. 49-61.

Huntington, Henry P. "Observations on the Utility of the Semi-Directive Interview For Documenting Traditional Ecological Knowledge." *Arctic*, 1998. Vol 51, no 3. pp. 237-242.

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Appendix 7: Governance in Arctic communities

Canadian Indigenous Governance Structure

Canadian Indigenous governance is divided among three officially recognized groups:

1. First Nations: First Nations represent approximately 500 tribal organizations divided among all of Canada's 10 provinces and 3 territories with the exception of the territory of Nunavut which is entirely Inuit. First Nations overall is represented by the Assembly of First Nations (http://www.afn.ca). The group is further divided among 24 Provincial Territorial Organizations (http://www.afn.ca/article.asp?id=2952)
2. Inuit: The national Inuit organization in Canada is Inuit Tapiriit Kanatami (http://www.itk.ca/) which represents Inuit in four regions: 1. Nunatsiavut (Labrador), Nunavik (Northern Quebec), Nunavut and the Inuvialuit Settlement Region in the Northwest Territories.
3. Métis: The national Métis organization in Canada is the Métis National Council (http://www.metisnation.ca/) which represents Métis in five provinces via the following provincial organizations: 1. Métis Nation of Ontario; 2. Manitoba Métis Federation; 3. Métis Nation – Saskatchewan; 4. Métis Nation of Alberta; and 5. Métis BC Nation.

Indigenous Peoples and the Canadian Government

The Canadian government maintains numerous resources related to Indigenous Peoples primarily under the auspices of Indian and Northern Affairs Canada (INAC http://www.ainc-inac.gc.ca/). These include the Aboriginal Canada Portal (http://www.aboriginalcanada.gc.ca/acp/site.nsf/en/index.html), which contains a database of National Aboriginal Organizations, as well as sections on environmental research and traditional and ecological knowledge. In addition, the portal provides a listing of more than 700 unique First Nations, Inuit and Métis community pages with information such as community home page, statistical profiles, tribal council and other organization affiliations, mapping and connectivity profiles.

Other Canadian government agencies maintain a great deal of information related to Indigenous Peoples as well and can be contacted for more specific information, these include: Parks Canada (http://www.pc.gc.ca/), Fisheries and Oceans Canada (http://www.dfo-mpo.gc.ca/), Environment Canada (http://www.ec.gc.ca/), Natural Resources Canada (http://www.nrcan-rncan.gc.ca/) and Health Canada (http://www.hc-sc.gc.ca/). These agencies also maintain field offices which may have specialized information about specific regions of the country.

Local government/indigenous government structures in Scandinavia

Sami: Sami governments in Scandinavia are represented by Sami Parliaments that are political bodies. Currently the Norwegian Saami Parliament (established in 1989) consists of 39 representatives elected from seven electoral districts in Norway. The Swedish Saami Parliament (established in 1993) consists of 31 members and Sweden is considered an electoral district. A new Saami Parliament in Finland was granted its powers in 1996, and 21 members were elected. The three Saami Parliaments do not have identical functions and tasks, but they all share rights to raise questions and issue political statements on all issues within their jurisdiction. The three parliaments form the Saami Parliamentary Council.

The Saami Council (NGO) is an umbrella organization of the Sami people in Finland, Sweden, Norway and Russia and it was established in 1956. www.saamicouncil.net

"The primary aim of the Saami Council is the promotion of Saami rights and interests in the four countries where the Saami are living, to consolidate the feeling of affinity among the Saami people, to attain recognition for the Saami as a nation and to maintain the economic, social and cultural rights of the Saami in the legislation of the four states. (Norway, Sweden, Russia and Finland). This objective can be achieved through agreements between these states and the bodies representing the Saami people, the Saami parliaments. … Saami Council renders opinions and makes proposals on questions concerning Saami people's rights, language and culture and especially on issues concerning Saami in different countries."

http://www.saamicouncil.net/?deptid=2178

In general, there are no strict research protocols established, such as in Alaska or Canada's Northwest Territories, to conduct research in the Sami Territory or with the Sami people. A researcher should contact the relevant local Sami organization and keep them informed of new research. This is what has been done with projects like Snowchange.

The Sami Council has eight member-organizations from the four countries;

1. Guoládaga Sámi Searvi (GSS) - Saami Association of Kola Peninsula
2. Murmánskka guovllu Sámesearvi (OOSMO) - Saami Association of Murmansk Region
3. Norgga Boazosápmelaččaid Riikkasearvi (NBR-NRL) - Saami Reindeer Herders' Association of Norway. http://www.nrl-nbr.no/cms/
4. Norgga Sámiid Riikkasearvi (NSR) - Norwegian Saami Association
5. Riikkasearvi Sámi Ätnam (RSÄ) - The National Association of Samiland
6. Sámiid Álbmotlihttu (SÁL/SFF) - (People's federation of the Saami)
7. Sámiid Riikkasearvi (SR) - Saami Association of Sweden
8. Suoma Sámiid Guovddášsearvi (SSG) - Saami Association of Finland

There are a number of other Sami organizations, and a list can be found here: http://www.saamicouncil.net/?deptid=2182

The University of Lapland has a database that has a collection of research conducted with the Sami people or in their region. Database can be found at: http://arcticcentre.ulapland.fi/radju/Tietokanta.aspx

Conducting research in Sweden

Guidelines on where to get information and financing (EU based): http://ec.europa.eu/youreurope/business/competing-through-innovation/conducting-research/sweden/index_en.htm

Sweden's own "The Researcher's Mobility Program": http://www.researchinsweden.se/

Conducting research in Finland

Guidelines on where to get information and financing (EU based): http://ec.europa.eu/youreurope/business/competing-through-innovation/conducting-research/finland/index_en.htm

National Advisory Board of Finland: http://www.tenk.fi

There are research guidelines developed by the National Advisory Board of Finland that should be followed when conducting research. Different disciplines have their own norms and recommendations that should be followed.

Conducting research in Norway

The Research Council of Norway provides advice and financing for researchers: http://www.forskningsradet.no/servlet/Satellite?c=Page&cid=1177315753906&p=1177315753906&pagename=ForskningsradetEngelsk%2FHovedsidemal

Alaskan Indigenous Peoples and the U.S. Government

Alaska indigenous communities are divided among the twelve Alaska Native Regional Corporations created under the Alaska Native Claims Settlement Act (ANCSA) in 1971. A thirteenth corporation was also created to represent Alaska Natives no longer living in Alaska. Within these corporations approximately 230 Alaskan tribal entities are recognized by the United States Bureau of Indian Affairs (http://www.doi.gov/bia/index.html), which maintains a knowledge base of useful information concerning all federally recognized tribes in the United States. It should be noted that these tribal entities should not be confused with communities as members of different tribes may live in the same community, and some residents of communities may not be members of any tribe. In addition to the BIA, other federal agencies maintain a great deal of useful information and are involved with programs concerning Indigenous People. These include the National Parks Service (http://www.nps.gov), the Environmental Protection Agency (http://www.epa.gov), the U.S. Fish and Wildlife Service (http://www.fws.gov), and the Bureau of Land Management (http://www.blm.gov), all of which are under the auspices of the U.S. Department of the Interior (http://www.doi.gov).

Alaskan Indigenous Peoples and the State of Alaska

The State of Alaska maintains an extensive database of community information online (http://www.dced.state.ak.us/dca/commdb/CF_COMDB.htm), which includes community information summaries, detailed community information, local contact information, capital projects by community and community photos. In addition, virtually all state agencies work closely with Indigenous People and communities, in particular, the Alaska Department of Fish and Game Division of Subsistence (http://www.subsistence.adfg.state.ak.us/), which maintains the community subsistence information system among other data.

Alaska Regional Corporations

The following Alaskan non-profit regional institutions encompass the vast majority of the state and are as follows:

- Aleutian/Pribilof Islands Association (APIA) http://www.apiai.org
- Arctic Slope Native Association, Ltd. Tel. no. + 1.907.852.9368
- Association of Village Council Presidents (AVCP). Calista region (Yukon-Kuskokwim Delta). http://www.avcp.org
- Bristol Bay Native Association (BBNA) http://www.bbna.com
- Chugachmiut. Chugach region (Gulf of Alaska, Prince William Sound, Lower Cook Inlet). http://www.chugachmiut.org
- Cook Inlet Tribal Council, Inc. (CITC) http://www.citci.com
- Copper River Native Association. Ahtna region. http://www.crnative.org
- Kawerak, Inc. Bering Strait region. http://www.kawerak.org
- Kodiak Area Native Association. Koniag region. http://www.kanaweb.org
- Maniilaq Association. NANA region. http://www.maniilaq.org/home.html
- Tanana Chiefs Conference (TCC). Doyon region. http://www.tananachiefs.org
- Tlingit and Haida Indian Tribes. Sealaska region. http://www.ccthita.org

[List from http://justice.uaa.alaska.edu/rlinks/natives/ak_natives_organizations.html]

Some Alaska Native communities own their land outright and are not part of any regional corporation. An example is St. Lawrence Island, which is jointly owned by Gambell and Savoonga.

It should be noted that federal, state and privately funded research takes place frequently in many areas of Alaska. For this reason regional entities have often developed research guidelines for use in their communities. Researchers should inquire about any local regulations or guidelines and comply with them. The Alaska Native Science Commission has developed recommendations for research in Arctic communities (http://www.nativescience.org).

Russian Indigenous Governance Structure

General information about Russian Association of Indigenous Peoples of the North, Siberia and Far East (RAIPON) can be found at http://www.raipon.info/en/.

RAIPON was created in 1990 at the First Congress of Indigenous Peoples of the North. The Association was originally called the "Association of Peoples of the North of the USSR" and united 26 indigenous groups of the North. On November 24, 1993 the Association was registered as public political movement "Association of indigenous peoples of the North, Siberia and Far East of Russian Federation" and on July, 1999 it was reregistered at the RF Ministry of Justice as All-Russia public organization and received the registration number 2174.

RAIPON is a non-profit organization. Its goals are the protection of human rights, advocacy for the legal interests of indigenous peoples of the North, Siberia and the Far East, and addressing environmental, social and economic problems.

RAIPON unites 41 indigenous groups whose total population is around 250,000 people. These people are represented by 34 regional and ethnic organizations that have the authority to represent these groups both in Russia and in the international community.

Russian indigenous associations:

1. Ассоциация коренных малочисленных народов Севера Приморского края - Association of the Indigenous Peoples of the Primorsky Krai. Ассоциация объединяет удэгейцев, нанайцев, тазов, орочей. Members: Udege, Nanai, Tazy, Orochi Tel/fax: (4232) 45-16-07. e-mail: mlicenter@yandex.ru, psulyandziga@mail.ru, www.udege.org.
2. Ассоциация коренных малочисленных народов

Чукотки - Association of the Indigenous Peoples of Chukotka. Ассоциация объединяет чукчей, чуванцев, эскимосов, эвенов, коряков, кереков, юкагиров. Members: Chukchi, Chuvan, Eskimo, Even, Koryak, Kerek, Yukagir, Tel: (42 722) 2-60-75, Fax (42 722) 2-17-09.

3. Камчатская краевая Ассоциация коренных малочисленных народов Севера - Kamchatka Regional Association of the Indigenous Peoples of the North. President: Tatiana R. Frolova, Ассоциация объединяет коряков, ительменов, эвенов, алеутов, чукчей, камчадалов, Tel/fax: (4152) 49-01-32.
4. Местная общественная организации Ассоциация КМНС «Корякия» - Association of the Indigenous Peoples of the North "Koryakia." Ассоциация объединяет алеутов, чукчей, ительменов, коряков, алюторцев, камчадалов, эвенов. Members: Aleut, Chukchi, Itelmen, Koryak, Alyutor, Kamchadal, Even Address: 3 Lenin Street 29, Palana, Tigilsky Raion, Koryaksky Autonomous Okrug, Russian federation 688000, Корякский автономный округ, Тигильский район, п.Палана, ул. Ленина 3 - 29.
5. Алеутская Ассоциация «Ансарко» Камчатской области - Association of Indigenous Peoples of the Aleut District of the Kamchatsky Krai. Members: Aleut Tel: (41547) 3-32, Tel/fax: (41547) 2-30, e-mail: veratim@mail.kamchatka.ru, aiarussia@yandex.ru.
6. Межрегиональная общественная организация «Совет ительменов Камчатки «Тхсаном» - Inter-regional Itelmen Council of Kamchatka "Tkhsanom" Организация объединяет ительменов Корякского АО. Members: Itelmen in Koryak Autonomous Okrug Tel: (41539) 28149, Tel/fax: (41539) 26629, e-mail: zapo@mail.kamchatka.ru.
7. Региональный Совет уполномоченных представителей коренных малочисленных народов Сахалинской области - Regional Council of Representatives of Indigenous Peoples of the Sakhalin Oblast. Совет объединяет нивхов, нанайцев, эвенков, ороков. Members: Nivkh, Nanai, Evenk, Orok, Tel/fax: 8 (4242) 42-50-35, 8 914 759 73 42, e-mail: rsup_kmns08@mail.ru.
8. Региональная общественная организация «Ассоциация коренных малочисленных народов Севера Хабаровского края» - Regional Association of Indigenous Peoples of the North of the Khabarovsk Krai. Ассоциация объединяет эвенков, эвенов, негидальцев, нанайцев, ульчей, орочей, удегейцев, нивхов. Members: Evenk, Even, Nigidal, Nanai, Ylchi, Orochi, Udege, Nivkh, Tel/fax: (4212) 30-90-47, Tel: (4212) 31-38-44, e-mail: ulchi@inbox.ru.
9. Ассоциация коренных малочисленных народов Севера Амурской области - Association of Indigenous Peoples of the North of the Amur Oblast Ассоциация объединяет эвенков. Members: Even Tel/fax: (4162)35-47-36, e-mail: jialin59@mail.ru.
10. Общественное движение «Ассоциация ненецкого народа "Ясавэй"» Ненецкого автономного округа - Association of the Nenets People "Yasavey." Tel: (81853) 4-91-64, Fax: (81853) 4-91-63, e-mail: vladpskv@mail.ru, yasavey@atnet.ru, www.raipon.net/yasavey.
11. Общественная организация Ханты-Мансийского АО «Спасение Югры» - NGO "Spasenie Yugry" ("Revival of Yugra") of the Khanty-Mansiysky Okrug Ассоциация объединяет ханты, манси, ненцев. Members: Khanty, Mansi, Nenets, Tel/fax: (34671) 3-30-72, e-mail: noviuhovav@admhmao.ru, www.admhmao.ru.
12. Ассоциация коренных малочисленных народов Севера Ямало-Ненецкого АО «Ямал – потомкам!» - Association of Indigenous Peoples of the North of the Yamalo-Nenets AO "Yamal for Future Generations!" Ассоциация объединяет ханты, манси, ненцев. Members; Khanty, Mansi, Nenets, Tel: (34922) 4-41-30, Tel/fax: (34922) 3-46-64, e-mail: kui@salekhard.ru.
13. Ассоциация коренных малочисленных народов Севера Таймырского (Долгано-Ненецкого) АО - Association of the Indigenous Peoples of the North of the Taimyr (Dolgano-Nenets) AO. Ассоциация объединяет ненцев, энцев, нганасан, эвенков, долган. Members: Nenets, Ents, Nganasan, Evenk, Dolgan, Tel: (391-11) 5-88-33, Tel/fax: (391-11) 2-29-39, e-mail: malid@dumatao.ru.
14. Ассоциация коренных малочисленных народов Севера Эвенкийского АО «Арун» («Возрождение») - Association of Indigenous Peoples of the North of the Evenkiysk AO "Arun" ("Rebirth"). Ассоциация объединяет эвенков, Members: Even Tel: (3912) 63-63-62 внутр, e-mail: koptelkova@mail.ru.
15. Ассоциация коренных малочисленных народов Севера Республики Саха (Якутия) - Association of Indigenous Peoples of the Sakha Republic. Ассоциация объединяет эвенков, эвенов, юкагиров, чукчей, долган. Members; Evenki, Even, Yukagir, Chukchi, Dolgan, Tel: (4112) 43-53-80, Fax: (4112) 43-53-33 тел/факс: (38822) 2-31-54, e-mail: Robbek_KV@iltumen.sakha.ru, sumachakova@apra.gorny.ru.
16. Общество эскимосов ЮПИК - Eskimo Society "Yupik" Tel/fax: (42735) 2-21-72, Tel: (427-35) 2-29-46, e-mail: ainana@prues.chukotka.ru.
17. Мурманская областная общественная организация «Ассоциация Кольских саамов» - Murmansk Regional Organizations of Kolsky Saami.

Regional Governments in the Russian Arctic

- Karelia, Republic: www.gov.karelia.ru E-mail: government@karelia.ru
- Murmansk Oblast: www.gov-murman.ru, http://english.gov-murman.ru
- Yamalo-Nenets Autonomous Okrug: www.adm.yanao.ru
- Krasnoyarsk Krai: www.krskstate.ru
- Sakha (Yakutia), Republic: www.sakha.gov.ru
- Chukotka Autonomous Okrug: www.chukotka.org
- Kamchatksky Krai: www.kamchatka.gov.ru. E-mail: cancel@kamchatka.ru

Appendix 8: Knowledge system concepts, terminology and their application

ANKN - The Alaska Native Knowledge Network is designed to serve as a resource for compiling and exchanging information related to Alaska Native knowledge systems and ways of knowing. It has been established to assist Native people, government agencies, educators and the general public in gaining access to the knowledge base that Alaska Natives have acquired through cumulative experience over millennia.

http://www.ankn.uaf.edu/index.html

Terminology/basic concepts

- Local environmental knowledge. (Source: The Resilience and Adaptive Management Group, University of Alaska Anchorage.)
- Traditional ecological knowledge (TEK) has often been used in the anthropological field about indigenous peoples' knowledge that refers to a holistic world view together with the practice and knowledge generated through generations. The term "local knowledge" is used typically as a generic term for knowledge that is generated through local observations about the local environment held by a specific group of people (Berkes & Folke, 2002). The more specific term local environmental knowledge (LEK) or local ecological knowledge is distinguished from the more widely interpreted term local knowledge. In this research, we refer to LEK. LEK incorporates the depth of the community knowledge, and as Berkes & Folke write, "publications, data records, and computer databases are often not adequate to serve the institutional memory" (2002, p. 143). C.R. Menzies writes that "All traditional knowledge is local, but not all local knowledge is traditional" (2006, p. 108). What is common for both LEK and TEK is that they are both detailed situated knowledge that can be both collective and individual. Local (ecological) knowledge usually has less temporal depth than indigenous knowledge according to Berkes & Folke (2002) and environmental knowledge is created by people from observations and understandings. Studies have shown that LEK exists not only in indigenous communities, but also in non-indigenous, resource-dependent communities, such as farming and fishing communities, as well among observant individuals, whether from rural or urban backgrounds, and whether original inhabitants or migrants (Schulman, 2007). So LEK can be non-indigenous and non-traditional knowledge about the environment among observant individuals and the community. Local knowledge itself can be determined in many ways and Antweiler (1998) has compiled these into a comprehensive list which is summarized below:

Term, synonyms	Meaning, salient aspect, implicit significance, antonym
Indigenous knowledge (internationally the most widespread term)	Culturally integrated knowledge; knowledge of small, marginal/non-western groups
Local knowledge	Knowledge rooted in local or regional culture and ecology
Traditional knowledge	Handed down, old, oral
People's knowledge	Broadly disseminated knowledge, knowledge as potential for political resistance, as opposed to elite knowledge
Community knowledge	Related to small social units
Everyday knowledge, practical knowledge	Informal, practical, applied, as opposed to academic, specialist, expert knowledge or as opposed to ritual knowledge
Experiential knowledge	As opposed to theoretical knowledge, speculation
Experimental knowledge	Trial-and-error, as opposed to controlled experiment

Diversity of local knowledge, its branches and their various connotations. (After Antweiler, 1998, p. 5.)

List of acronyms

ABC	Arctic Borderlands Ecological Knowledge Co-op
ACIA	Arctic Climate Impact Assessment
AFN	Assembly of First Nations (Canada)
ANCSA	Alaska Native Claims Settlement Act
AON	Arctic Observing Network
BIA	Bureau of Indian Affairs (USA)
BLM	Bureau of Land Management
BSSN	Bering Sea Sub-Network
CAFF	Conservation of the Arctic Flora and Fauna
CBM	Community-based Monitoring
CBMP	Circumpolar Biodiversity Monitoring Progamme
CEMP	Community Ecological Monitoring Project
CMMP	Community Moose Monitoring Project
DNREA	Northern Territory's Department of Natural Resources, Environment and the Arts (Australia)
DOI	Department of the Interior (USA)
ECORA	Integrated Ecosystem Approach to Conserve Biodiversity and Minimize Habitat Fragmentation in the Russian Arctic (acronym derived from the Russian name of the project)
EPA	Environmental Protection Agency (USA)
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
GEF	Global Environment Facility
GPS	Global Positioning System
ICSU	International Council for Science
IEM	Integrated Ecosystem Management
IK	Indigenous Knowledge
INAC	Indian and Northern Affairs Canada
IPY	International Polar Year
ITK	Indigenous and Traditional Knowledge
ITK	Inuit Tapiriit Kanatami (Canada)
LTK	Local and Traditional Knowledge
MFA	Ministry of Foreign Affairs (Finland)
NGO	Non Governmental Organization
NPS	National Parks Service (USA)
NSF	National Science Foundation
RAIPON	Russian Association of Indigenous Peoples of the North, Far East and Siberia
RF	Russian Federation
TEK	Traditional Ecological Knowledge
TKW	Traditional Knowledge and Wisdom
UNEP	United Nations Environmental Programme
USAID	United States Agency for International Development
WMO	World Meteorological Organization
WWF	World Wildlife Fund

For further information and additional copies contact:

CAFF INTERNATIONAL SECRETARIAT
Borgir
Nordurslod
600 Akureyri
ICELAND

Telephone: +354 462 3350
Fax: +354 462 3390
E-mail: caff@caff.is
Internet: http://www.caff.is

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Prentstofan Stell