

**DAWSON CLIMATE CHANGE ADAPTATION**

**IMPLEMENTATION FUND**

**DAWSON CLIMATE CHANGE AND SCIENCE CENTRE**

**FEASIBILITY STUDY**

**FINAL REPORT**

**DECEMBER 2009 - JUNE 2010**

PREPARED BY

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## INTRODUCTION

The objective is to evaluate the viability of developing a Climate Change and Science Research Centre in Dawson. Given the uncertain effects of climate change on Dawson, this could achieve the Dawson Climate Change Adaptation Plan vision by:

- 1) Taking steps to increase local community resilience including:
  - The level of *education* of its inhabitants,
  - Their sense of *connection to the place*,
  - The *demographic mix* of the residents,
  - Their general level of *wealth*,
  - The institutional *memory and traditional knowledge* retention of the community. (\*)
- 2) Increasing monitoring and knowledge of the local environment
- 3) Developing ways to adapt to sudden changes in the Dawson society and climate

The centre could improve the network of science & technology facilities that support research; deliver benefits to Dawson by engaging local participation in scientific work; and continue the work of the Dawson Climate Change Adaptation project. It could develop ways to live with and take advantage of the changes that are anticipated over the next half-century. It could serve as a clearing-house and repository of past and future regional research, and engage the Dawson public and their visitors in that research.

The project characteristics and operational concepts under study include, but are not limited to:

- 1) Facilitating implementation of the Dawson City Climate Change Adaptation Plan.
- 2) Complementing the “hub and spoke” concept articulated by the Northern Research Institute and placing the facility in relationship to the wider Yukon research infrastructure strategy including the new Tombstone Territorial Park Interpretive Centre.
- 3) Support for community monitoring projects and other scientific infrastructure in the region.
- 4) Central repository for storage of, and access to, research from past Dawson projects contrary to the present practice where researchers work, leave and take the accumulated knowledge with them.
- 5) Badly needed working laboratory space, offices and support for the considerable number of scientists currently active and wishing to work and travel in the area.
- 6) University course options and connections to the hospital with regard to climate change health effects
- 7) Public access assembly area showcasing and interpreting scientific research in the area.
- 8) Engagement of local students and other citizens in science being conducted in the area
- 9) Developing, adapting and applying science and technology for the North, increasing economic activity, strengthening environmental stewardship and enhancing quality of life.

- 10) Socio-economic impact on the region through growth of the expanding knowledge economy and reduction of carbon footprint by decreasing reliance on the long-haul tourism market and mining industry which are carbon intense. Rooting the community through diversifying local employment in ecological monitoring projects and as field assistants, building local capacity for stewardship of the environment. Weaving scientists into the community allows for Traditional Knowledge to be integrated.
- 11) Possibly housing the Centre in a rehabilitation of a vacant heritage structure to modern energy standards with a minimal carbon footprint, demonstrating that *'the greenest building is the one that is already built'*, using local resources, materials and employment.

(\* From: *Community Adaptability and Vulnerability In Arctic Regions-* (CAVIAR), led by Frank Duerden of Ryerson University

The project will be undertaken in two distinct stages:

1) *Stage One Scoping Assessment*

Needs assessment to outline all issues in meeting project objectives.

2) *Stage Two Feasibility and Business Case*

Feasibility and business case report to inform and recommend a 'go/no go' decision on the proposal by undertaking research into and making recommendations on the needs outlined in Stage One and the deliverable project objectives above.

**STAGE ONE**

**SCOPING ASSESSMENT**

## **PROFESSIONAL RESEARCHERS AND INSTITUTIONS**

Work to date has not validated an immediate need for a large research centre in Dawson. There are about three teams in the Dempster area in a typical summer, usually of two to four people, occasionally as many as ten, and most only use Dawson as a supply and logistics base. All researchers including government scientists were supportive of the idea of a facility in Dawson, but concern was expressed about the level of use it would attract and if it would be sustainable. Further investigation is required to determine the level of use it would see, and if the center could be sustained.

It is difficult to say if the Dawson center would be a case of “build it and they will come” – a suitable facility may attract more research teams to the area, and Dawson does have some points in its favour, including: a modern, attractive community; easy road, air and river access to unique geology and palaeontology (especially in the field of Beringia); and a wide variety of geological formations, habitat regions, two ecozones and five ecoregions. The area is also rich in human history, and the presence of a research facility may present opportunities to partner with First Nation groups on anthropology or archaeology projects. Other prominent fields of interest include earth sciences, permafrost, agriculture, climate and cultural materials research/stabilization and preservation. It is far enough from other facilities in Whitehorse, Inuvik and Old Crow to make daily commuting impossible. At least one team is considering expanding their research from the Kluane Lake Station to the Tombstone/Dempster area and would definitely want access to this type of facility if they were to move into the area.

### **Key Learning**

- 1) Research on university websites indicates that most northern research falls into two categories, boreal or alpine based research, most of which is done in the north of the provinces or out of the Kluane Lake Research Station; and Arctic/High Arctic based research which, apart from the few teams working along the Dempster Highway each year, seems to be mostly based out of NWT or Nunavut.
- 2) Identified useful centre functionality for researchers would include power connections; storage space; bench space; wet & dry workspace; office equipment and internet/phone connection; technical equipment such as drying ovens, large freezer, high & low precision balances; and microscopes.
- 3) The Dawson center could also serve as facility for distance education students to complete laboratory work they would otherwise not be able to do. Visiting researchers could teach short intensive laboratory based courses out of the facility. This would allow students to stay in the community and the north when they would otherwise have to go south for courses containing laboratory work.

Institutes and associations for northern studies with possible partnership linkages to the centre include:

- Association of Canadian Universities for Northern Studies, which has a triennial student conference to “provide a unique opportunity for young researchers to meet and exchange ideas with others who share similar academic interests”, an example of events that could be hosted through the centre.
- Canadian Polar Commission, which maintains interactive, searchable map of research facilities in Northern Canada, and directory of researchers. Responsible for report ‘Beacons of the North – Research Infrastructure in Canada’s Arctic and Subarctic’.
- Aurora Research Institute, Inuvik and Churchill Northern Studies Centre, Churchill
- University of Alberta, which is billed as one of Canada’s foremost centers of northern and circumpolar research and has a Northern Strategy which identifies a desire to:
  - Design relevant northern oriented degree – granting programs
  - Deliver courses in northern locations through on-line distance education
  - Enhance existing Northern Field Schools.
- University of Alberta Circumpolar Institute
  - Courses and programs in all disciplines including science, health & public health – most listed appear to be regular U of A courses, relevant to Northern Studies in some way – i.e. ecology courses, geology etc.
  - Creating a Path to a Northern University Field School (NUFS), The Blachford Trust Project:

*“This project addresses public policy issues related to access to, quality of, and relevance of education to Northern students. The Vision is to operate a sustainable sub-arctic wilderness education facility, featuring diverse educational programming, in response to articulated need. The Northern University Field-School (NUFS) is intended to bridge: a) Indigenous, Northern and Southern students with Northern and Indigenous expertise; b) Northerners and Canadian universities; c) Policy-makers and Northerners; and, d) Classroom education and land-based education. NUFS is partnering with leading Canadian Universities to ensure support for Northern students to receive quality relevant education in the North and the support to continue their studies toward degree completion.”*

- McGill University has some researchers working on northern research – the Murray Humphries lab does work based in Kluane and Old Crow, but doesn’t currently work out of Dawson. McGill has historically had a center for northern studies and research, but it is unclear if the center is still active.
- UBC has northern research happening through Kluane Lake Research Station.
- University of Calgary has an agreement with the Geological Survey of Canada to create a world-class research center on responsible Arctic Development and Carbon Management.

## **GOVERNMENT AND STAKEHOLDER COMMUNICATIONS**

### Needs and Opportunities

The overwhelming opportunity is to collaborate with Yukon College and possibly one major university. The College is already developing a science degree for which a northern Yukon presence would be welcome and the mutual use of expensive classrooms and well-built laboratories makes sense.

- A physical space is essential and not just a virtual centre, including:
  - Instructional space for university credit course (fieldwork)
  - Archival space for research in the region (interpretive displays) – past, present and future
  - Laboratory and office space for transient researchers
  - Logistical and equipment support, e.g. Inuvik centre, inc for government programs & survey staff.
- Provision of baseline monitoring, expertise and advice to local governments and industries
- Exposure to the public and local knowledge and expertise for researchers
- Small projects and seminars could play a very useful role in moving climate change adaptation ahead
- Local skills sharing centre e.g. a permafrost seminar involving Dawson's construction industry. They would share their knowledge of permafrost conditions and how they may be changing and assist in developing adaptive responses for the construction industry.
- One-day climate change impact courses for tourists
- School program to familiarize students with emerging environments in Dawson - informing and involving the generation that will experience environmental change. Could involve senior high school students in a series of monitoring exercises.
- Satellite research station of the Beringia centre
- Dawson City Museum has existing interpretive skills, staff and theater space. So, to a different degree, does the Danojá Zho Cultural Centre.

### Issues

- Caution with regard to:
  - Costs, especially those of a new dedicated building
  - Management capacity
  - Community expectation levels
- Priority should be the paleontology field that could be the local specialty to attract a critical mass, but:
  - Regulation is not in place for the paleontology activity and must be completed first.
  - Timetable may be ten years for full implementation of a paleontology centre.

- Paleontology would prefer a new-build facility especially for interpretation and display

## Previous Related Initiatives

- 1) Friends of Dempster Country Society proposed building a permanent field station on the highway to support research work done in that area as a part of a wider Northern Research Institute network.

The Dempster corridor with its all weather access to unique Beringia ecosystems has fostered basic work on everything from caribou to invertebrates as well as assessment of the value of natural systems to the Yukon tourism industry. It is the site of one of the longest studies tracking annual fluctuations in ptarmigan numbers and is especially attractive to botanists interested in post glacial and refugial species. Current work involves PhD research into tundra arachnids, research into effects of global climate change on permafrost, and bird of prey breeding studies.

Researchers arriving on the 465km of Yukon Dempster Highway every year face the challenges of working without adequate infrastructure to accommodate the most basic needs of their studies. Research has been conducted from three campground cook shelters and two trailers shared with Yukon Government interpretive and maintenance contractors and staff. Priority functionality would allow for drying of gear and equipment, sample processing and storage, researcher collaboration, satellite internet communications and access to databases and archives.

An application was made to Arctic Research Infrastructure Fund (ARIF) but rejected. It should be ensured that the facilities would compliment rather than duplicate each other.

- 2) Department of Tourism and Culture, Yukon Government proposed a satellite research station for the paleontology field a number of years ago. The intent was for basic storage, office and equipment support. Considerable progress was made in a partnership with Parks Canada to use a building at Bear Creek and additionally re-open the site including the Gold Room for interpretive use. Environmental issues at the site prevented follow-through but this will soon be resolved. Further consideration was given to use of OTAB and the Yukon Sawmill Co. Office building.

Interest in such a facility remains and grows and has been actively promoted by Klondike Placer Miners Association in the last year. The industry works well with researchers in providing access to specimens. Independent feasibility work is expected to commence imminently and ongoing communication with the parties leading this process is essential to realize synergies in a small community.

- 3) Northern Climate Exchange, Yukon College submitted early-stage proposals for this same facility to the Arctic Research Infrastructure Fund and unsolicited to the YG Dept. of Tourism and Culture

Yukon Sawmill Co. Office Building RFP process. The ARIF proposal was rejected and no official reply was received from YG but both indicated that, while there is merit to the concept further feasibility and preparatory work was required.

- 4) Dialogue on Northern Research took place in Whitehorse in 2004. A considerable number of recommendations related to this area were made in extensive reports that are available. It is unclear at this time if, and how, any have been or are being implemented and the ongoing intent with regard to this dialogue.

### **EXISTING HERITAGE BUILDINGS**

Four potentially suitable buildings have been sourced and considered:

**Large:**

Yukon Sawmill Building	Unavailable as future tenant assigned pending funding approval.
Court House	Renovations underway and needs tenant in 1-2 years. Potential.

**Small:**

Bear Creek	Environmental remediation underway, available in 1-2 years. Potential.
Klondike Thawing Company	Available and has high potential as close to new college campus.

## **KEY CONCLUSIONS FOR MOVING FORWARD**

Work to date has focused on the numbers and needs of professional researchers in the region. A critical mass of demand sufficient to justify an independent dedicated research facility is not yet validated. This is accentuated by the preference the paleontology field has to move forward with an initiative separately in partnership with the Klondike Placer Miners Association.

### **Scoping Recommendation**

*Consideration of an independent research centre should be referred to the longer-term paleontology lead process. Communication to remain open such that needs of wider fields are met by that facility and collaborative benefits (academic, management and cost) are maximized.*

The focus on the needs of the professionals distracts from the original objectives of the proposed centre.

### **Scoping Recommendation**

*The project should focus on the needs of the Dawson community and building its resilience, ahead of the requirements of outside researchers.*

A four-part strategy is proposed:

#### **Step One                      Education**

- Train area residents as environmental monitors and field assistants (e.g. fisheries field assistants)
- Facilitate teaching of university level credit courses in Dawson (field programs):
  - Enable Dawson residents to consider careers in science, building long-term research capacity
  - Field program research projects can be continued by local monitors

#### **Step Two                      Baseline Monitoring**

- Provide logistical support to local monitors in building required knowledge of Dawson and its environment through:
  - Locally inspired and lead projects (e.g. PlantWatch, Christmas Bird Count and others)
  - Maintenance of outside professionally lead research projects in the area
- Provide limited logistical support to outside researchers in area who are required to:
  - Share results and add to repository of local knowledge
  - Teach short workshops in their fields to residents

- Engage local monitors wherever possible, thereby building long-term capacity

#### Step Three                      Knowledge Dissemination

- Be a central repository for collation of local environmental data and knowledge, past, present and future, generated both by the local monitors and outside researchers:
  - Physical library of reports and statistics
  - Easy access internet database
- Facilitate public presentations (including governments, industries, tourists) of local research results:
  - Lectures and 'socials'
  - Interpretive displays and 'live feeds'
- Organize Dawson specific seminars and conferences to encourage cross-discipline collaboration

#### Step Four                      Needs Analyses and Adaptation Recommendations

- Conduct an annual knowledge Needs Analysis of the community to prioritize required studies
- Promote the benefits of the Dawson area as a well-supported and highly skilled location for professional research related to these needs
- Assist in organizing necessary studies by sourcing funding assistance (especially in-kind community support) and qualified outside researchers where necessary,
- Provide expertise and adaptation recommendations to local governments based on results

It is recognized that the centre must be 'placed' within the hierarchy of Yukon governance. The extensive crossovers into professional research that would normally be best placed within the research arm of Yukon College but given the early stage of the Yukon Research Centre of Excellence, the timing is likely wrong to expand that initiative further at this time. Clear ongoing communication with these agencies is, however, a necessity.

The success 'trigger' of the Dawson Climate Change and Science Centre strategy will actually be the local skills capacity, which fits the mandate of the education arm of Yukon College.

### **Scoping Recommendation**

*Yukon College, lead by the Dawson Community Campus Committee, is best placed to be the project proponent.*

### **INTERVIEW CONTACTS TO DATE**

- Sylvia Frisch Friends of Dempster Country
- Jill Johnstone Botanist, University of Saskatchewan
- David Hik Ecologist, University of Alberta
- Duane Froese Paleontology, geosciences, beringia
- Grant Zazula Paleontologist, YG Dept. of Tourism and Culture
- Cameron Eckert Biologist, YG and Yukon Bird Club
- Bruce Bennett Wildlife Viewing Biologist, YG
- Ian Church Former science advisor to YG
- Clair Eamer Science writer
- Anita Day Nuttall Assistant Director, U of Alberta Canadian Circumpolar Institute
- Christopher Burn Permafrost researcher, Carlton University
- Sebastian Jones Project Coordinator, Northern Climate Exchange, Yukon College
- Lacia Kinnear Coordinator, Northern Climate Exchange, Yukon College
- Gordon MacRae Regional Superintendent, Klondike Region, Dept. of Environment
- Karen Barnes Vice-President, Education and Training, Yukon College
- Jeff Hunston Manager, Heritage Resources, YG Dept. of Tourism and Culture
- Gary Wilson Director of Business Development and Strategic Initiatives, Tr'ondëk Hwëch'in
- Steve Nordick MLA, Klondike
- Laura Mann Executive Director, Dawson City Museum
- Karsten Henriksen Coordinator Dawson City Community Campus, Yukon College
- Caili Steel Coordinator, Conservation Klondike Society
- Frank Duerden Ryerson University

Secondary research comments have been reviewed from:

- Morris Lamrock Youth Programs Coordinator, YG Dept. of Environment
- Joseph Bowden Natural Resource Sciences, McGill University
- Carissa Brown Dept. of Biology, University of Saskatchewan
- Charles Roots Geological Survey of Canada

Note:

The Arctic Science and Technology Information System (ASTIS) database is somewhat inefficient as a method of identifying Dawson area researchers and projects, as only the titles of studies/publications are listed, text and detailed information is not available from the website – unless the location of the study is specified in the title it is impossible to tell if it was located in central Yukon/Dawson or not.

Additionally, Yukon residents do not require permits from Yukon Government and so their research projects are rarely entered into this system.

## NEXT STEPS

- 1) Baseline Monitoring:
  - a) Further clarify numbers and support needs of professional researchers including academia, government and industry in order to best attract high-end monitoring and training capacity
  - b) Identify existing outside lead research projects that could utilize local monitors
  - c) Compile an inventory of existing locally inspired and lead monitoring projects. These may be formal (e.g. PlantWatch, Christmas Bird Count) or informal (e.g. personal river break-up/freeze-up and weather records, traditional knowledge)
  - d) Source potential locally inspired and lead monitoring projects including, but not limited to:
    - Scope
    - Timetable
    - Infrastructure requirements
    - Personnel and skills requirements
    - Budget
- 2) Education:
  - a) Validate feasibility of environmental monitor and field assistant training
    - Source shortlist of interested community participants
    - Source shortlist of interested instructors
    - Outline of course including, but limited to:
      - Scope of curriculum
      - Timetable
      - Infrastructure requirements
      - Budget and cost to participants
  - b) Validate feasibility of university level credit course options in Dawson (field programs):
    - Source shortlist of interested institutions and instructors
    - Outline of course including, but limited to:
      - Scope of curriculum including example research projects that could be continued locally
      - Timetable
      - Infrastructure requirements
      - Budget and cost to participants
- 3) Knowledge Dissemination:
  - a) Develop public access concept (resident & visitor) for interpretation, including, but not limited to:
    - Lectures and 'socials'
    - Interpretive displays and 'live feeds'
    - One-day or half-day climate change and local environment tours for visitors

- b) Propose case study Dawson specific seminars & conferences to encourage cross-discipline collaboration, including, but not limited to:
- 4) Clearly identify functional needs including, but not limited to:
  - a) Space
  - b) Equipment
  - c) Periods of use (seasons and times)
- 5) Evaluate and validate the broad economic and social benefits to the community
- 6) Consider proponents, partnerships and governance:
  - a) Explore potential community-based partnerships including the role of Yukon College, Yukon Government, federal government departments, and other agencies.
  - b) Develop a conceptual management and operational structure
  - c) Identify partners, commitments and obtain formal demonstration(s) of intent.
- 7) Estimate financial implications, including, but not limited to”
  - a) Capital investment budget using local resources, materials and employment where possible
  - b) Operational budget
  - c) Investment contribution of proponent(s)

**STAGE TWO**

**FEASIBILITY STUDY AND BUSINESS CASE**

## **PART ONE**

### **PROFESSIONAL RESEARCH REVISITED**

Attracting and engaging high-end expertise and training capacity were considered key elements of a successful monitoring regime. The unexpected indications of stage one with regards to the extent of professional research in the region necessitated further clarification of the numbers and support needs of such researchers, including academia, government and industry.

#### **Researcher Numbers and Needs**

ASTIS indicates that approximately one to six research projects are recorded as active in the area on an annual basis. The Yukon Geological Survey has a permafrost monitoring station that is visited annually in Dawson, placer research and landslide monitoring and bedrock related studies in the region. However, they already have an office in Dawson that it is not utilized very much by their visiting staff.

University of Ottawa (Antoni Lewkowicz) has been very active during International Polar Year but it is unlikely that they will be doing much further work in the Dawson area as funding determines the focus areas of projects. There will likely have a student coming in summer 2010 to download data from existing permafrost stations, but ultimately will likely hand them over to the community.

#### **Previous Related Studies**

Consideration of northern research capacity and infrastructure is not new and a number of previous reports have been published on the subject. These consistently express the importance of creating research facility networks as opposed to a limited number of major research centres. The importance of research within the communities, and the active engagement of northerners were also highlighted.

Early work at the turn of the century, in response to concern about the decline of Canadian research in the North, identified a number of important issues, including:

- The need to rejuvenate, sustain, and augment existing northern research expertise and to train a new generation of researchers on and in the North;
- The need to augment the amount of high-quality research being done on and in the North; the need to enhance Canada's ability to contribute to northern research of international and national importance;
- The lack of easy access to the North and very high costs of doing research in the North;

- The lack of research infrastructure in the North; and
- The lack of appropriate and satisfactory community participation in the research being done.

A series of recommendations were made in order to address some of the above issues but without conducting extensive research it is unknown exactly which recommendations have been enacted.

The Walter and Duncan Gordon Foundation initiated a project to facilitate a pan-northern/national conversation with regard to the future of advanced postsecondary education in the Canadian North, exploring in particular the idea of a university in Canada's Far North. Some of the features that were noted as important in a northern institution were:

- Building on what already exists
- Establish educational and research partnerships
- Be a pan-territorial institution
- Leverage existing programs and build on current investments in the territories
- Act as a 'network' made up of multiple sites.

The potential of a pan-northern university and the persistence of the idea of a network of research institutions indicate that the proposed facility in Dawson would have a considerable future role in such an endeavour. It could contribute its facilities and research to the network and at the same time may be able to benefit by hosting university level courses through the northern university structure.

The Speech from the Throne of October 16, 2007 committed the Government of Canada to delivering a Northern Strategy, including the construction of a world class Arctic research station. Subsequently Indian and Northern Affairs Canada commissioned a peer review of stakeholder input into a proposed agenda for the promised Arctic research station.

A number of science priorities were identified, including observation and monitoring, which was said to constitute: "an indispensable core activity for building our knowledge base, understanding the environment, exercising stewardship and managing resource development". Again, the notion of a research 'network' was identified as more valuable than the idea of a single institution.

The report recommended that the Arctic Research Station be centred on the concept of a northern network of researchers in various locations across the North, rather than bureaucracies placed in one or two locations. So, while the federal government has picked up on the idea of a Canadian High Arctic Research Station (CHARS) it has also recognized a need to take care of what already exists and that one station could not serve the breadth and diversity of the north. This resulted in the \$85 Million Arctic

Research Infrastructure Fund (ARIF) to upgrade some of the stations. This was part of the Economic Stimulus package.

The Beacons of the North report (Canadian Polar Commission) specifically recommends a dispersed pan-northern network of delivery facilities under the following categories:

- Research stations
- Community Centres
- Cabins
- Temporary Facilities

Existing facilities would link into this network. For example, Yukon College would likely fit as a research station, as well might the envisioned paleontology centre. The proposed research facilities on the Dempster Highway would likely fit best under the 'cabin' category (i.e. small facilities that can accommodate changing research needs on short term projects).

With analysis to date indicating insufficient demand to make a major research station viable in Dawson, the proposed centre would likely best fall under the category of community centre, defined by:

*“The greatest demand in the North for research, and therefore for research facilities, is in the communities. Culturally appropriate space for community research where other research could also be accommodated would facilitate research, research communication, and hiring locally. The community facilities would connect through the regional hubs where the major services would lie.”*

Beacons of the North also made a number of recommendations regarding the role of community based facilities, including:

- Community research facilities be integrated into the network and enabled to provide educational opportunities to local residents through their links to colleges and universities;
- A comprehensive surveillance and monitoring system be established, possibly based on a multitask constellation of satellites, with provision for regular upgrades. The network would promote monitoring initiatives from community observing initiatives to monitoring for national and global data requirements;
- Special facilities should be established to address needs in the health and social sciences, including communications networks for tele-health, video conferencing and e-library facilities, translation and linguistic services, state of the art communications networks, and the means to develop northern databases.

- Network facilities would act as *foci* for data management and archiving. Access to data is an issue in all research communities. A principle of open access must be adopted, subject to ethics and intellectual property constraints.

### **Conclusions**

- The limited response from outside researchers seems to indicate that in general outside researchers are not likely to be actively engaged in pursuing such a facility in Dawson for their own needs.
- Professional research locations are determined by a variety of factors with funding sources and areas of expertise and interest being two of the most important. A research station is likely a bonus, rather than an incentive when determining the location of research projects.
- A number of features were identified that would likely make a research facility useful:
  - Office space with access to computers and internet
  - Laboratory with drying ovens, burning oven, fume hood, chemical storage and sieve for samples
  - Storage such as a small walk-in closet size space (approx 3m<sup>2</sup>)
  - Field space and farming equipment (i.e. 2 acres, tractor) for agriculture research
  - Living space with self-catering facilities
  - Local technician to take care of things, make sure chemicals etc stored properly, manage safety
  - Interaction with other researchers and the community including local monitors

Excluding accommodations, \$50,000-\$100,000 is estimated for a useful facility. However, a lot of these features duplicate facilities that already exist (or will exist) at Yukon College (i.e. lecture room space, projector, storage space, computers and internet). Likewise, many government departments have existing facilities that they can utilize as research space in Dawson. Unique features might include the drying ovens, chemical fume hood, burning ovens, chemical storage and storage space.

- If a centre was to focus on the needs of outside researchers, it would be necessary to target quite specific fields if the appropriate equipment and resources are to be supplied (i.e. make the centre of direct relevance to certain research fields, rather than partially relevant to a broad number of fields)
- The Beacons of the North report recommends a network of research facilities in the north. One level of these facilities would be *'community centres'*, based on the premise that *'culturally appropriate space for community research where other research could also be accommodated would facilitate research, research communication, and hiring locally'*. A research centre in Dawson would best fit into this category, both in scale, but also objective (i.e. community research).

### **Recommendations**

The CAVIAR study concluded that strategies to facilitate adaptation to climate change, should include:

- 1) Increasing monitoring and knowledge of the local environment

2) Taking steps to increase local community resilience through developing:

- The level of *education* of its inhabitants,
- Their sense of *connection to the place*,
- The *demographic mix* of the residents,
- Their general level of *wealth*,
- The institutional *memory and traditional knowledge* retention of the community

While professional research could increase monitoring and knowledge it would have a marginal impact on community resilience in Dawson. True resilience requires the community to be actively engaged in tracking and managing its own environment for its own purposes and self-determined future. For this reason the following is recommended:

- 1) Further study should focus on a bottom-up grass roots centre rather than a top-down professional one.
- 2) The research centre should have direct value to the local community and be accessible to the broadest possible cross-section of residents, rather than focused on the needs of outside researchers.
- 3) Once the centre is established, the facilities should be built organically around the local collaboration and participation in research and monitoring.
- 4) As the centre becomes established consider catering towards outside researchers and courses.

This will allow the community to determine their areas of interest, rather than the centre's areas of interest being identified by outsiders. This approach is known as **community based monitoring**.

From this point forward, work focused on the feasibility of a community based monitoring program supported by a community research centre linked into existing research networks.

## PART TWO

### TOWARDS A COMMUNITY BASED MONITORING PROGRAM

In 2001-02, the Ecological Monitoring and Assessment Network – Coordinating Office and Canadian Nature Federation, now Nature Canada, (EMAN-CO/CNF) conducted pilot studies of 31 Community Based Monitoring (CBM) projects in communities across Canada. The work generated a toolkit of resources and information on best practices and success factors for implementing CBM, summarized in the report, 'Improving Local Decision Making Through Community Based Monitoring: Toward a Canadian Community Monitoring Network', (*Ecological Monitoring and Assessment Network and Canadian Nature Federation, 2003*). A second study, Community-Based Ecosystem Monitoring in British Columbia: A Survey and Recommendations for Extension, (*Patrick Yarnell and Donald V. Gayton, Forest Research Extension Partnership (FORREX), 2003*) provides additional direct case study expertise on the subject.

EMAN-CO/CNF noted that information provided by external agencies to communities is often:

- Not accessible to the people who need it;
- Driven by what data is available, not by what data is needed;
- Narrowly focused and not integrated across issues;
- Difficult to understand;
- Not locally relevant; and
- Provided too late to avoid or mitigate major problems.

And as a result, local environmental decisions are often:

- Band-aid measures, taken at crisis points, not at early stages when intervention and public participation are most effective;
- Extreme, reactionary, not adaptive;
- Confrontational, not collaborative; and
- Not based on options and public choice.

This resonates with the experiences of those involved in preparing the Adaptation Plan and community interviewees to date and the implementation priorities of the Local Advisory Committee.

EMAN-CO/CNF recommends Community Based Monitoring as the means by which a community can work together to gather and deliver information and to adapt to change, not as isolated agencies, but as a

network that learns from each other and shares resources. This aligns with the key strategic finding of the work to date in Dawson – that an alternative, CBM program is the best approach to generating the knowledge required for effective management of the Dawson climate change adaptation scenario.

From *Wikipedia*:

*“Community based monitoring (CBM) of environmental resource management is a mechanism to engage communities in ecological management in ways that contribute to local sustainability. Ecological CBM enables community members affected by a particular environmental condition or resource depletion to gather and feedback relevant information to the government or organizational body in charge.*

*CBM enables concerned citizens, government agencies, industry, academia, community groups and local institutions to collaborate to monitor, track, and respond to environmental issues of common community concern.”*

***This feasibility analysis explores a Dawson CBM program principally using the EMAN-CO/CNF tools and recommendations but with additional guidance from the FORREX study and others as appropriate.***

## **BENEFITS TO THE COMMUNITY**

So just what are the potential benefits of Community Based Monitoring?

CBM can make a significant contribution to answering the following questions raised to date in Dawson climate change adaptation planning:

- How can a better sense of community belonging and stewardship be encouraged?
- Who is interested in these issues in our community?
- How can we develop and use environmental information to better guide adaptation decisions?
- Is our local environment becoming better or worse? How will we know?
- Are there choices we should be making now?
- How do we address environmental issues without involving confrontation?
- Must scientific information be so difficult to understand? We don't know how to use it or even what questions to ask.
- Why do we have to rely on outsiders to tell us what's happening in our own backyards?
- What can individuals do to 'make a difference' and contribute towards creating and managing a sustainable community?
- What tools are needed and where can these be found?

From EMAN-CO/CNF:

### Key Learning

- Providing information is not enough to lead to better decisions. A two-way dialogue is necessary to collectively determine what type and form of information is needed to improve the knowledge of decision makers.
- Environmental indicators have to be based on the delivery of the information needed, not the data that is easily collected.
- When participants in a CBM project know that their efforts are making a real difference, it creates a sense of ownership over the project, fosters a sense of place, and generates commitment within the community.
- CBM is self-reinforcing. Capacity building feeds into dialogue for effective information delivery and use. The effective use of locally collected information and the power to change decisions leads to stronger and wider community engagement, and so on. This positive feedback cycle builds social capital, which is one of the most valuable benefits of CBM.

## Observed Benefits

- CBM brings people together from different groups, sectors, and jurisdictions, to form partnerships. Through these partnerships, the community can identify common concerns and possible solutions through the collection, evaluation, and sharing of information.
- CBM networks seek out meaningful collaboration between citizens and government, thereby improving public involvement in community decision-making.
- CBM enhances local governance structures by combining the creativity, skills, and resources of many different individuals and groups toward solving a problem.
- CBM allows communities to increase knowledge about their environment by generating locally relevant monitoring information. CBM brings to monitoring a unique understanding of the local situation and the needs of individual communities. Communities can then use this information to set their own limits on development and measure whether they are met.
- CBM gives local decision-makers the information and tools they need to make informed policy choices and management plans which are adaptive and responsive.
- CBM contributes toward building “social capital” in participating communities. Increased social capital improves the community capacity to deal with the many complex issues and choices associated with sustainability.

## THE FOUNDATIONS OF COMMUNITY BASED MONITORING

Dawson is relatively advanced in having already developed both a joint Tr'ondëk Hwëch'in/City of Dawson Integrated Community Sustainability Plan (ISCP) and Community Climate Change Adaptation Plan. The ICSP includes a local vision of community goals and values that include:

**The natural environment** – protection of natural resources through careful stewardship, including reduction, reuse and recycling

**A sustainable society** – management of resources and partnerships for the long-term health and prosperity of the community

The Adaptation Plan Local Advisory Committee vision of a successfully adapted community is:

***Dawson City and its hinterlands will be a self-sustaining society, a community that lives within the limits of the local ecosystem and serves as a haven for its residents in an uncertain world.***

It will achieve this by:

- Taking steps to increase its resilience,
- Actively promoting self sufficiency
- Increasing our knowledge of the environment around us.
- Developing ways to adapt to sudden changes in society and the climate

However, there is no clear definition of sustainability as regards specifically valued ecosystem functions and characteristics that answers the question, "What would we not wish to compromise in the pursuit of local development?" Only then can scientific indicators based on standardized methods or "protocols" be provided for tracking these key features.

The basic procedural principles of an effective CBM program are:

- 1) To conduct an environmental inventory of the area using locally appropriate protocols. This will:
  - Foster a sense of ownership and place
  - Establish present conditions
  - Define an acceptable reference point
  - Identify issues of community concern
- 2) To carry out subsequent monitoring using those protocols to indicate when sustainability, as locally defined, is going off track and provide an early warning system to decision-makers of possible threats, which can feed into adaptive responses.

3) To verify problems, investigate causes, research mechanisms, and develop management options.

Environmental information required for community-based decision-making should be:

- Targeted and relevant to problems and players;
- Accessible and understandable to the audience;
- Integrated;
- Usable (form and context); and
- Timely.

To be effective, the delivery and communication of monitoring information should in addition:

- Suggest a course of action;
- Allow decision-makers to weigh consequences; and
- Make those involved feel they are in control of the problem.

EMAN-CO/CNF used the experiences of the 31 communities in their Canadian Community Monitoring Network (CCMN) pilot project to develop a model (page 18) for communities wishing to begin CBM based on a solid foundation of experience and success and a number of critical factors in that success (page 19).

The remainder of this feasibility study assesses Dawson against the model and success factors, identifies strengths, weaknesses and gaps in preparation and makes recommendations as to the feasibility of a CBM program and the necessary next steps in planning an implementation to overcome the barriers.

### **CCMN MODEL FOR COMMUNITY BASED MONITORING**

#### **COMMUNITY MAPPING**

Gathering information helps to design CBM that is unique to the community and its interests. It provides the opportunity for decision-makers to describe their information needs and the chance to maximize collaboration between partners.

- 1) **Information Gathering** to understand local context.
- 2) **Governance Analysis** of the main groups within the community that influence environmental planning, management & reporting.
- 3) **Decision Making Support** that provides opportunities for the community to identify their information needs.
  - What is the nature of the information needed to make decisions?

- What monitoring is already taking place?
- Who are the key groups and networks that could be involved?
- What are the best ways to engage each different group?
- Is the community interested in monitoring?

## **PARTICIPATION ASSESSMENT (Proponents and Partnerships)**

Understanding the groups and people involved generates knowledge about how to engage them, use their skills, and meet their needs. Participation Assessment helps find the best approaches to build capacity.

- 1) **Consultation & Outreach** activities that seek interested participants.
- 2) **Champion Identification** of those individuals or groups driving CBM.
- 3) **Citizen Engagement** of various stakeholders and partners.
- 4) **Visioning** to define a desired future for the community.

- Are the values of monitoring commonly understood?
- What are participants' motivations and expectations?
- What kinds of skills and expertise are available locally?
- What resources, training and equipment are needed?
- Who are the potential champions?
- What are the common community values and goals?

## **CAPACITY BUILDING (Governance, Functional Needs, Education, Training, and Financial Resources)**

Enhancing the ability to carry out monitoring requires capacity in the form of resources and skills, both social and technical. Good coordination, training, and information delivery mechanisms are essential.

- 1) **Partnerships** maximize capacity by expanding the pool of resources and expertise.
- 2) **Organizational Structure** may help to facilitate CBM activities.
- 3) **Communication** is essential at all levels and stages of CBM.
- 4) **Resource Support** is needed to maintain coordination and communication systems.

- What partnerships can be created or expanded?
- What data management systems are required?
- What communication mechanisms are needed to deliver ecological information?

- What sources of in-kind and financial support are available?

## **INFORMATION GATHERING & DELIVERY (Knowledge Dissemination)**

Communication flows through all aspects of CBM. Educating people about monitoring, identifying local priorities, and reporting back the results rely on effective communication. When information needs are identified, monitoring becomes demand driven, which informs the development of more effective tools and solutions for local environmental issues. The decision-makers then need to feed this knowledge and skill into appropriate local choices that are adaptive.

- 1) **Ecological Monitoring** defined and driven by community interests.
- 2) **Information Reporting** that changes raw data into meaningful information for decision-making.
- 3) **Achieving Influence** on government policies, public values and industry practices.

- Is monitoring data turned into useful information?
- How should the results of monitoring be communicated?
- In what ways can decision-makers use the new information?
- How can monitoring continue in the future?

### **CCMN CRITICAL SUCCESS FACTORS**

1. Approaches to engaging the community are context specific.
  - Approaches are appropriate to local context and adaptable.
  - The ongoing cycle of community mapping, participation assessment, capacity building, and information gathering and delivery is continued.
2. Information delivery mechanisms are established.
  - Information needs are identified and communicated.
  - Community Based Monitoring programs are demand driven.
  - Data is communicated as meaningful information.
  - New information is integrated into decisions and policies.
3. The experience must be meaningful for participants.
  - Common concerns are acknowledged.
  - Local and traditional knowledge is respected.
  - Benefits of ecological monitoring are understood.
  - Adequate training and equipment for CBM are provided.
  - Monitoring results are communicated to the public.
4. Coordination is critical.
  - Communication, facilitation, negotiation and mediation skills are developed.

- Volunteer groups and CBM participants are coordinated at a local scale.
  - Broader partnerships and networks among communities are maintained.
5. Partnerships in pursuit of sustainability are necessary.
- Partnerships to maximize capacity and resources are developed.
  - Partnerships to address ecological issues at regional or landscape scales are developed.
  - Existing contacts in the community are linked together.
  - Existing environmental initiatives are built upon.
6. Collaborative approaches are implemented.
- Forums for multi-stakeholder discussion are encouraged.
  - Community visioning to define common challenges and goals is conducted.
  - Influence on government policies, public values, and industry practices are achieved.
7. Ongoing support for a coordinated network.
- Commitment to community initiatives is demonstrated.
  - Support in the form of resources, expertise, and staff is provided.
  - Established networks and partnerships are maintained.

Local capacity has emerged as one of the strongest factors for communities to effectively generate, deliver and use ecological monitoring information.

The FORREX study also identified clear characteristics of successful community-based stewardship:

- History of concern in the community and community support
- Focus on primary issue (or place, feature, or species) or message
- Strong, articulate leadership and passionate, committed members
- Strong organizational capacity to co-ordinate resources and people
- Connections all governments at the technical, management, and political level
- Connections with the media, learning institutions, First Nations, other NGOs, or industry to provide required leverage or resources
- Skill at securing funding
- Inclusion of a broad cross-section of people and interests

And clear potential limitations of community-based stewardship:

- Information from non-professional lay people can be poorly collected and collated or lost because of an absence of qualified personnel
- Information that has already been collected by agencies may be inadvertently re-collected because of poor communication among groups
- Programs may be incorrectly implemented and have negative environmental impacts

- Activities undertaken by the community may be of low effectiveness or low management priority
- Money redirected through layers of bureaucracy may see effectiveness diluted by administration
- Money provided to the community can reduce the total available for paid agency professionals

## PART THREE

### **CCMN MODEL – AN ETERNAL READINESS ASSESSMENT**

Application of the model must be done with care as the approach to engaging the community should be appropriate to the local context and adaptable. Importantly, the ongoing cycle of community mapping, participation assessment, capacity building, and information gathering and delivery is not a one-time only affair and should be continued indefinitely on a regular basis.

#### **SUMMARY OF WORK TO DATE**

- 1) Work and communications to date have served to verify the difficulties associated with developing a community based monitoring program and leave its eventual feasibility still in doubt. While a generally positive outlook is expressed, the capacity and will of the key partners to follow through is yet unknown.

The enthusiasm of the champions and interested parties for increased monitoring and regional research support has frequently moved ahead of the planning required. A considerable number of the original objectives of this study have proven to be 'ahead of the game'.

#### **Recommendation**

*The champions should focus on community mapping and participation assessment and determine a very clear vision of the community based monitoring network, its values and its strategic objectives before taking any further steps.*

Initiatives of this size and nature can typically be expected to take 1-2 years of hard research and planning if guided by a strong and passionate leadership group.

- 2) Developing a network like this must be meaningful for all participants and it is understandable that the community and funding agencies may want to see some measurable results and actions as the planning process unfolds in order to forestall the interminable feeling of 'planning to plan'.

#### **Recommendation**

*Develop and follow a strategy that mixes coherent long-term strategic visioning and planning with compatible and achievable short-term goals*

This 'Next Steps' strategy is outlined in part five, at the end of this report.

- 3) Resources will be necessary to continue this work. A coordinator who can work with the local community to solicit input, promote CBM, act as a technician, begin to organize and maintain local data in a format that means it is accessible to other researchers (especially local researchers), identify and seek funding to increase the resources as the community identifies what these might be and promote partnerships. A coordinator would then also be able to collaborate with outside researchers and act as a conduit to locals who may be interested in participating in projects. The coordinator could also facilitate hosting of lectures and project reports from outside researchers, further opening the avenues for connections.

### **Recommendations**

- *Designate the Conservation Klondike Society Adaptation Plan Implementation Plan coordinator officially as the Dawson CBM planning coordinator.*
- *Identify simple resources for local community research and monitoring, and work on having these available in an accessible form as part of the network (for example, binoculars, GPS, cameras, library, computers and internet).*

## **COMMUNITY MAPPING**

Gathering information helps to design CBM that is unique to the community and its interests. It provides the opportunity for decision-makers to describe their information needs and the chance to maximize collaboration between partners.

### **Critical Success Needs:**

A history of concern in the community and community support

### **Organizational Strategies:**

- 1) **Information Gathering** to understand local context.
- 2) **Governance Analysis** of the main groups within the community that influence environmental planning, management & reporting.
- 3) **Decision Making Support** that provides opportunities for the community to identify their information needs.

### **Planning Questions and Key Findings**

- **Is the community interested in monitoring?**

Yes. There is a high level of interest in expanding knowledge of the local environment if this can be done without impeding upon existing capacity and if it is targeted at clear and meaningful objectives. Tr'ondëk Hwëch'in runs existing monitoring programs, PlantWatch and Christmas Bird Counts are popular and there is much anecdotal evidence of personal monitoring exercises underway. Tr'ondëk Hwëch'in Elders in particular have expressed a strong interest in seeing better air and water monitoring in light of apparently increased health problems and cancer rates.

Expanding the knowledge base for its own sake or as a contingency against unknown outcomes is less well supported. This is to be expected and can be addressed through the 'next steps' visioning and strategic planning process.

- **Who are the key groups and networks that could be involved?**

There is a huge range that could be involved. The following is an initial list; others will emerge through the visioning and strategic planning process.

Core Active Participants:

- Conservation Klondike Society
- Tr'ondëk Hwëch'in Natural Resources Department
- Tr'ondëk Hwëch'in Heritage Department
- Town of The City of Dawson
- Yukon Government Department of Environment
- Dawson District Renewable Resources Council
- Yukon College Dawson Community Campus
- Friends of Dempster Country Society
- Robert Service School

Important Advisory Partners:

- Yukon Government Climate Change Secretariat
- Yukon College Research Centre of Excellence
- Yukon College Northern Climate Exchange

Additional Desired Participatory Expertise:

- Yukon Environmental and Socio-Economic Assessment Board
- Trinke Zho Daycare and Dawson Daycare
- Klondike Active Trails and Transportation Society
- Parks Canada
- Private Sector Tour Guides
- **What are the best ways to engage each different group?**

Participation should be maximized through early engagement of all parties to ensure the network will best reflect a cross-section of interests and effectively deliver useful information.

- **What is the nature of the information needed to make decisions?**

Throughout the Adaptation Plan a large number of *potential* climate changes and impacts are mentioned that become possible monitoring subjects. These include:

- Weather: Snowfall, temperature, precipitation, lightning strikes, frost-free periods, growing degree days, wind, farming yields and crops, ice fog
- Wildlife: Birthing, hibernation, ranges, migration patterns and timing, diseases, small mammals, trapping returns local and traditional knowledge
- Water quality Turbidity, water table, sediments, storm drain run-offs

- Permafrost Mapping distribution, discontinuity, deepening of active layer, subsidence and slope failures
- Hydrology: Stream flow, freeze-thaw cycles, spring flooding,
- Forestry: Fires & regeneration cycle, white spruce condition, tree lines, hibernations
- Flora: Lichen loss, flower blooming times, rare plant and invasive species
- Air quality: Smoke and dust Highway vulnerability
- Human activity: Employment and health
- Insects Hatching timing
- Fish
- Farming

The quality of information is as important as the quantity. Adaptation planners reported frequent frustrations with the limitations of climate data in particular due to changes in source locations and closed or limited access. This particularly inhibits the ability to assess natural climate variability and improve projections. Monitoring should be planned with a long-term commitment.

Such a large amount of information is both available already and could be collected that a coherent rationalization of information needs is necessary. Environmental information in this context can be segmented in a number of ways:

By cause and effect:

- 1) Actual climate observations that verify change and increase predictive capacity and accuracy
- 2) Real impact observations that act as early warning signs and facilitate adaptation decisions

By known and targeted use:

- 1) Relevant to, and clearly targeted at, specifically and presently identified key decisions
- 2) Incidental that is deemed likely to be of future but yet unknown value

By tactical objective:

- 1) Central collation and dissemination of existing regional archival research reports
- 2) Central collation and dissemination of existing and ongoing monitoring results
- 3) Development and implementation of new monitoring programs

### **TARGETED INFORMATION USES – COMMUNITY PRIORITIES**

Throughout this study during interviews with decision-makers, stakeholders and residents, a small

number of anticipated climate change impacts were repeatedly raised and represent the core of community concern at which first phase monitoring efforts should be targeted:

- 1) **Food Security**
- 2) **Energy Cost and Security**
- 3) **Permafrost**
- 4) **Air Quality**

- **What monitoring is already taking place?**

A considerable amount of 'community based monitoring' is already taking place, even if not under that name, such as PlantWatch, Christmas Bird Counts and personal records.

Tr'ondëk Hwëch'in Heritage Department received funding from IPY Canada to document traditional knowledge in relation to climate change and its effects in the Traditional Territory. This project included archival research, fieldwork and oral history interviews. The goal of the project was to gain insight from local, long-time observers of the natural world in order to help understand climate change in the north and develop strategies to adapt. A 2010-2011 environmental observation calendar has been developed and distributed to citizens to assist in recording community knowledge of occurrences and there is hope to maintain this monitoring program into the future.

Tr'ondëk Hwëch'in Lands and Resources Department received funding from Health Canada to undertake baseline data collection on the Yukon and other regional rivers in 2010. This will include thermal temperature, surface and sub-surface run-offs, dissolved oxygen and nutrient data from water sampling, working with Al von Finster and Laberge Environmental Services. The project, though one year only, will develop important capacity through training, education and equipment purchase.

However, these are also more examples of knowledge collection seemingly acting independently of a clear strategy for use and sharing of information to best common effect.

While some considerable time has been spent attempting a full inventory of existing monitoring in the region, developing an accurate inventory of all the monitoring already taking place has proven to be a significant research project of its own. The amount of work that has taken place and in some cases, continues to take place is overwhelming. It is symptomatic of the problem at hand that there is no coherent targeted collection of, dissemination of, or access to, this information and that while much of it is available to and extremely useful to the purposes of the current collector, little to nothing is being done to facilitate the mining of this information for climate change adaptation or other big picture environmental

planning needs.

With limited capacity available, the full inventory process has not been completed and it is not recommended that it should be completed at this time in Dawson. While this certainly is important, it will be best done at a later stage in the program development. Subsequent to a full visioning process, the strategic planning process should develop filters that allow a first phase inventory of existing monitoring relevant to the priorities to be completed.

## **PARTICIPATION ASSESSMENT**

Understanding the groups and people involved generates knowledge about how to engage them, use their skills, and meet their needs. Participation Assessment helps find the best approaches to build capacity.

### **Critical Success Needs:**

- Focus on primary issue (or place, feature, or species) or message
- Strong, articulate leadership and passionate, committed members

Partnerships in pursuit of sustainability are necessary to:

- Maximize capacity and resources
- Address ecological issues at regional or landscape scales
- Link together existing contacts in the community
- Build upon existing environmental initiatives

Collaborative approaches are implemented to:

- Encourage forums for multi-stakeholder discussion
- Conducted community visioning to define common challenges and goals
- Achieve influence on government policies, public values, and industry practices

### **Organizational Strategies:**

- 1) **Consultation & Outreach** activities that seek interested participants.
- 2) **Champion Identification** of those individuals or groups driving CBM.
- 3) **Citizen Engagement** of various stakeholders and partners.
- 4) **Visioning** to define a desired future for the community.

### **Planning Questions and Key Findings**

- **Who are the potential champions?**

Interviews have identified interest in core participation from Conservation Klondike Society and possible interest from Tr'ondëk Hwëch'in and City of Dawson as well as Yukon College and a number of federal

and Yukon Government departments such as Environment Canada and Environment Yukon subject to further information and ratification by appropriate political bodies.

Conservation Klondike Society is well positioned as the project champion as a NGO with broad community support and access to funding opportunities not available elsewhere. The project should however be developed as a community based partnership and a management and operational governance structure modeled upon that used at the School of Visual Arts (SOVA) is recommended. This is familiar to the likely participants and utilizes the strengths and capacity of each partner to best effect. A copy of this partnership agreement is available for reference upon request.

This structure was discussed with SOVA representatives for insights and the need for the involvement of an accredited research institution to back the program is notable, providing key links to academic and government resources. This institution should be Yukon College, associated with University of Alberta and other universities.

The following questions will be addressed through the 'next steps' visioning and strategic planning process:

- **What are participants' motivations and expectations?**
- **What are the common community values and goals?**
- **Are the values of monitoring commonly understood?**

#### **CAPACITY BUILDING**

Enhancing the ability to carry out monitoring requires capacity in the form of resources and skills, both social and technical. Good coordination, training, and information delivery mechanisms are essential.

Local capacity has emerged as one of the strongest factors for communities to effectively generate, deliver and use ecological monitoring information.

#### **Critical Success Needs:**

The FORREX study also identified clear characteristics of successful community-based stewardship:

- Strong organizational capacity to co-ordinate resources and people
- Connections all governments at the technical, management, and political level

- Connections with the media, learning institutions, First Nations, other NGOs, or industry to provide required leverage or resources
- Skill at securing funding
- Inclusion of a broad cross-section of people and interests

And clear potential limitations of community-based stewardship:

- Activities undertaken by the community may be of low effectiveness or low management priority
- Money redirected through layers of bureaucracy may see effectiveness diluted by administration
- Money provided to the community can reduce the total available for paid agency professionals

Coordination is critical

- Communication, facilitation, negotiation and mediation skills are developed.
- Volunteer groups and CBM participants are coordinated at a local scale.
- Broader partnerships and networks among communities are maintained.

Ongoing support for a coordinated network

- Commitment to community initiatives is demonstrated.
- Support in the form of resources, expertise, and staff is provided.
- Established networks and partnerships are maintained.

### **Organizational Strategies:**

- 1) **Partnerships** maximize capacity by expanding the pool of resources and expertise.
- 2) **Organizational Structure** may help to facilitate CBM activities.
- 3) **Communication** is essential at all levels and stages of CBM.
- 4) **Resource Support** is needed to maintain coordination and communication systems.

### **Planning Questions:**

The following questions will be addressed through the 'next steps' visioning and strategic planning process:

- **What data management systems are required?**
- **What communication mechanisms are needed to deliver ecological information?**

- **What resources, training and equipment are needed?**
- **What kinds of skills and expertise are available locally?**
- **What partnerships can be created or expanded?**
- **What sources of in-kind and financial support are available?**

However, at the direction of the Stage One scoping, some assessment of the feasibility of options to increase the training of the community in the necessary skills was completed prior to the adoption of the CCMN model for CBM development and are reported below:

**a) Validate feasibility of environmental monitor and field assistant training**

Discussions with the Dawson Community Campus Coordinator were positive, particularly as such training would relate closely to that needed for a rapidly expanding regional mineral exploration and development sector. Advertisements of an anticipated offering in Spring 2011 of an Environmental Monitor Assistant Program (eight week field program) were subsequently made available by Yukon College in Dawson with a curriculum including:

- Environmental protection
- Safety and bush skills including map, compass and GPS
- Note taking and photography
- Sampling theory
- Monitoring terrestrial environments
- Monitoring aquatic environments
- Cultural resource management
- Monitoring air quality
- Reclamation
- Natural resource industries and development
- Environmental legislation and policy
- Teamwork and leadership
- Effective communication, conflict resolution and stress management

This curriculum is extensive and beyond that which many CBM participants would need but could be critical for program leaders and community information managers. Despite extensive inquiries, it has not to date been possible to identify the source of the course advertisement, the instructor, budget and cost or specific infrastructure requirements, or if a shortlist of interested participants answered the call.

*Note: The absence of a Campus Coordinator in the latter stages of this project posed a significant challenge to assessment of educational and training options inherent in this feasibility study.*

Yukon Wildlife Preserve has developed a 1.5-hour environmental monitoring workshop being held in Whitehorse to assist in taking part in NatureWatch programs. Conservation Klondike Society is investigating bringing this workshop to Dawson to further test feasibility of such training and community interest levels.

**b) Validate feasibility of university level credit course options in Dawson (field programs)**

A number of case study course and instructors were examined including those run by University of Ottawa (Antoni Lewkowicz and Luke Copeland), Carlton University (Christopher Burn), University of Oslo, UNIS (Svalbard, Norway), University of Alaska (Fairbanks, USA) and Dechinta Institute, NWT.

Interesting potential curriculum and study areas advantages include the boreal forest, access to tundra, the Dempster and Top of the World Highways and interesting permafrost. Best courses would likely include variations such as examining working in the north.

Reference Case Study: University of Ottawa - Antoni Lewkowicz Svalbard, Norway

[http://www.unis.no/studies/geology/ag\\_330.htm](http://www.unis.no/studies/geology/ag_330.htm)

[http://www.unis.no/studies/geology/ag\\_330\\_more\\_info/unis%20web%20further%20details%202009.pdf](http://www.unis.no/studies/geology/ag_330_more_info/unis%20web%20further%20details%202009.pdf)

This is a four-week course. The instructor is invited to Norway and the University pays his way. 20 graduate students from all over Europe attend (with about half Norwegian). The course is a field based/lecture based course, oscillating between the two on a daily basis, for example. This University is well set up, however, and therefore has appropriate equipment for fieldwork, particularly in the colder months. He does not think a winter course in Dawson would be viable.

Logistical requirements:

- Agricultural science courses require a field site
- Accommodation and food provision are very important
- Lecture room – seating for twenty students, powerpoint facilities, internet
- Instructors such as northern leaders, experts, Elders and university professors.
- Suitably low living costs - \$35 day for food and accommodation
- Students commonly pay travel, maybe some other expenses for fieldtrips

## Conclusions

The lack of affordable accommodation (with self-catering facilities or budget catering) would be one of the most limiting features of offering any kind of university studies for outside people. Much of the success of Kluane Research Station seems to be that they offer these basic requirements.

Funding support from government or a local institution (i.e. Yukon College) would be essential in being able to offer regular university-level field courses in Dawson.

In summary, while the idea is appealing, without some significant funding from a source such as government, running a field course out of Dawson may not be feasible.

## **INFORMATION GATHERING & DELIVERY**

Communication flows through all aspects of CBM. Educating people about monitoring, identifying local priorities, and reporting back the results rely on effective communication. When information needs are identified, monitoring becomes demand driven, which informs the development of more effective tools and solutions for local environmental issues. The decision-makers then need to feed this knowledge and skill into appropriate local choices that are adaptive.

### **Critical Success Needs:**

Information delivery mechanisms are established such that:

- Information needs are identified and communicated.
- Community Based Monitoring programs are demand driven.
- Data is communicated as meaningful information.
- New information is integrated into decisions and policies.

But:

- Information from non-professional lay people can be poorly collected and collated or lost because of an absence of qualified personnel
- Information that has already been collected by agencies may be inadvertently re-collected because of poor communication among groups
- Programs may be incorrectly implemented and have negative environmental impacts

### **Organizational Strategies:**

- 1) **Ecological Monitoring** is defined and driven by community interests.
- 2) **Information Reporting** changes raw data into meaningful information for decision-making.
- 3) **Influence Achieved** on government policies, public values and industry practices.

### **Planning Questions:**

- **How should the results of monitoring be communicated?**

While it is actually too early at this stage to consider and decide the best avenues for communication information before the nature of it, or its purpose has been clarified, given the clear objective to better

engage residents in their environment, some suggestions were made:

a) Public access concept (resident & visitor) for interpretation, including, but not limited to:

- Website
- Physical interpretive displays in community and 'live feeds'
- Lectures and 'socials'
- One-day or half-day climate change and local environment tours for visitors

b) Case study Dawson specific seminars & conferences to encourage cross-discipline collaboration

The above and following questions will be addressed through the 'next steps' visioning and strategic planning process:

- **Is monitoring data turned into useful information?**
- **In what ways can decision-makers use the new information?**
- **How can monitoring continue in the future?**

## PART FOUR

### **OBSERVATIONS ON ADAPTATION PLAN IMPLEMENTATION**

#### **1) MAINSTREAMING**

There has been some success in integrating recommendations of the adaptation plan into standard community plans, most notably in emergency measures planning. That said, the adaptation plan remains distant from the most vital community actors. Climate change, both mitigation and adaptation, is still not a priority concern that Dawson wishes to address with clear commitments and actions at the highest level.

There are many concerns in the community that compete for attention, including infrastructure, housing, recreation and the economy. In this short-term need context, climate change and addressing possible impacts are perceived as long-term issues beyond the scope of local governments, community groups and individual citizens. There is a poor level of understanding that appropriate adaptation to most projected impacts could be achieved by adjustments within existing planning mechanisms and capacity.

An informed, connected and passionate leadership is key to the successful planning and implementation of any initiative, particularly which is competing for attention in a busy field. A strength of the Adaptation Plan process was the utilization of a Local Advisory Committee (LAC) to bring a range of perspectives to the plan from key stakeholders including Tr'ondëk Hwëch'in, City of Dawson, industry and NGOs.

#### **Recommendation**

*Conservation Klondike Society, with an existing implementation coordinator allocated and demonstrated Board level support, should act as the champion to use the development of Community Based Monitoring as the springboard to the creation of a community-wide Climate Change Adaptation Committee including representation from all the key partners and technical advisors as appropriate.*

#### **2) COMMUNICATIONS**

The highest barrier to adaptation success is the lack of communication between climate change related agencies. Despite the best efforts of the dedicated professionals involved, actions and knowledge are not shared effectively and efforts are being duplicated. Recent hiring in key positions at the Climate Change Secretariat and Yukon Research Centre of Excellence and formation of a Yukon Climate Change Committee (YG, Yukon College and CYFN) other forums should greatly assist in overcoming this barrier.

### **Recommendation**

*The Climate Change Adaptation Committee should act as the focal point to streamline the exchange of information and strategically coordinate efforts and resources both within and outside of the community.*

### **3) IMPLEMENTATION WORK PLAN**

The Adaptation Plan recommends a large number of actions, both immediate and long-term and the LAC set criteria for first stage implementation project selection. A number, including this one, have moved forward subsequent to an RFP process.

However, in the absence of a body responsible for implementation, no work plan has been developed that clearly identifies ***agreed*** responsibilities, sets targets and allocates resources to ensure success. This accentuates the difficulties associated with mainstreaming.

### **Recommendation**

*The Climate Change Adaptation Committee should develop an Implementation Work Plan as a first priority. This should include a mechanism for accountability to the Committee and the wider community.*

## **PART FIVE**

### **NEXT STEPS SUMMARY**

#### **Climate Change Action**

- 1) *Conservation Klondike Society, with an existing implementation coordinator allocated and demonstrated Board level support, should act as the champion to use the development of Community Based Monitoring as the springboard to the creation of a community-wide Climate Change Adaptation Committee including representation from all the key partners and technical advisors as appropriate.*
- 2) *The Climate Change Adaptation Committee should act as the focal point to streamline the exchange of information and strategically coordinate efforts and resources both within and outside of the community.*
- 3) *The Climate Change Adaptation Committee should develop an Implementation Work Plan as a first priority. This should include a mechanism for accountability to the Committee and the wider community.*

- 4) *Consideration of an independent research centre should be referred to the longer-term paleontology lead process. Communication to remain open such that needs of wider fields such as climate change are met by that facility and collaborative benefits (academic, management and cost) are maximized.*

### **Community Based Monitoring Network**

- 1) *Designate the Conservation Klondike Society Adaptation Plan Implementation Plan coordinator officially as the Dawson CBM planning coordinator.*
- 2) *The champions should focus on completing an extensive community mapping and participation assessment and determine a very clear vision of the community based monitoring network, its values and its strategic objectives before taking any further steps.*
- 3) *Develop and follow a strategy that mixes coherent long-term strategic visioning and planning with compatible and achievable short-term goals*

### **PRIORITY MONITORING SUBJECTS**

Two themes of community concern and vulnerability stand out for the development of local research and monitoring:

- 1) **Food**
- 2) **Permafrost**

These themes of interest, closely followed by energy and air quality, should act as the core around which the program is envisioned and planned.

Under normal circumstances, commencing planning of monitoring projects before the full visioning and strategic planning process is complete would not be recommended. However, in this case, this should be balanced against the need for near-term observable and meaningful actions that can build community support and demonstrate the value of the program.

There do exist monitoring projects and programs in the community, region and nation linked to these themes that should be considered immediately for how a CBM program can successfully contribute as a launch pad for future initiatives.

## WORK PLAN

### July 2010

- Form Climate Change Adaptation Committee (Exploratory)  
**Objective: Confirm key groups and networks involved**
- Host Environmental Monitoring Workshop  
**Objective: Confirm community interest in monitoring**
- Facilitate CBM Awareness Exercise  
**Objective: Confirm participant's motivations and expectations**  
**Confirm best ways to engage each different group**

### August 2010

- Facilitate Visioning Exercise clearly considering and segmenting goals by cause and effect between:
  - 1) Actual climate observations that verify change and increase predictive capacity and accuracy
  - 2) Impact observations that act as early warning signs and facilitate adaptation decisions**Objective: Confirm common community values and goals**
- Develop CBM Vision and Mission Statements

### September 2010

- Facilitate Strategic Planning Exercise No.1 clearly considering and segmenting information needed by known and targeted use between:
  - 1) Relevant to, and clearly targeted at, specifically and presently identified key decisions
  - 2) Incidental that is deemed likely to be of future but yet unknown value**Objective: Confirm nature of information needed to make decisions**
- Inventory Existing Monitoring Related to Needed Information  
**Objective: Confirm related monitoring already taking place**

### October 2010

- Undertake Monitoring Gap Analysis
- Facilitate Strategic Planning Exercise No.2 clearly considering and segmenting tactical objectives between:
  - 1) Central collation and dissemination of existing regional archival research reports
  - 2) Central collation and dissemination of existing and ongoing monitoring results

3) Development and implementation of new monitoring programs

**Objective: Confirm priority monitoring projects**

**November 2010**

- Inventory Existing Skills and Expertise Related to Priority Monitoring  
**Objective: Confirm skills and expertise available locally**
- Undertake Resources, Training and Equipment Gap Analysis including:
  - Data management systems
  - Communication mechanisms
  - In-kind and financial support**Objective: Confirm needs for capacity building program**

**December 2010**

- Complete and submit funding proposal for 2011-12 CBM capacity building program

## APPENDIX ONE

### STAGE TWO CONTACTS

Carolyn Relf	Yukon Geological Survey
Matt Ball	Agriculture Branch, EMR, Yukon Government
Antoni Lewkowicz	University of Ottawa
Lewis Rifkind	Yukon Conservation Society
Sylvia Frisch	President, Friends of Dempster Country Society
Julie Frisch	Treasurer, Friends of Dempster Country Society
Steven Bigras	Executive Director, Canadian Polar Commission
Bill Kendrick	Lands and Resources Officer, Tr'ondëk Hwëch'in
Jackie Olson	Heritage Director, Tr'ondëk Hwëch'in
Alex Brook	Dawson Campus Committee Chair, Yukon College
Caili Steel	Coordinator, Conservation Klondike Society
John Bryant	President, Conservation Klondike Society
Heather Milligan	Policy Analyst, Dept. of Environment, Yukon Government
Eldo Enns	Administrator, KIAC SOVA
Lori Marcantonio	Manager, Youth Engagement, Nature Canada
Jennifer Eakins	Climate Change Outreach Coordinator, Yukon Climate Change Secretariat
Johanne Ranger	National Wildlife Research Centre, Environment Canada
John Overell	Director, Conservation Klondike Society
Norm Carlson	Superintendent of Public Works, City of Dawson
Shelby Jordan	Manager, Dawson Designated Office, YESAB
Syd Cannings	Environment Canada
Jim Coates	YG Infrastructure Vulnerability to Permafrost Degradation Coordinator
Dorothy Cooley	Regional Biologist, Dept. of Environment, Yukon Government
Chris Hawkins	Vice-President of Research, Yukon College
Frank Duerden	Ryerson University
Shirley Dawson	Yukon Placer Secretariat
Eric Schroff	Director, YG Climate Change Secretariat

### STAGE TWO CONTACTS UNAVAILABLE

Marianne Douglas	University of Alberta
Anita Day Nutall	University of Alberta
Chris Burn	University of Ottawa

Fiona Schmiegelow	Northern Research Institute, Yukon College / University of Alberta
Norm Easton	Yukon College
Cindy Dickson	Arctic Athabaskan Council
Rick Janowicz	Hydrology, Yukon Government
Michael Gates	Cultural materials research

**REMAINING IDENTIFIED CONTACTS REQUIRING FURTHER FOLLOW-UP**

- Carl Bridges                      Scientific Advisor to the Executive Council
- Dave Mossop                      Northern Research Institute, Yukon College
- Jill F. Johnstone                      University of Alaska
- Thomas Jung                      YG Dept. of Environment
- Bruce Bennett                      YG Dept. of Environment
- Patrick Sack                      Northern Climate Exchange, Scenarios Project
- PlantWatch                      Yukon Science Club
- Yukon Biodiversity Forum
- Aurora Research Institute, Inuvik
- BEAHR Aboriginal Training Network
- Earthwatch Institute

## APPENDIX TWO

### STAGE TWO PRINCIPLE REPORTS REVIEWED TO DATE

- Beacons of the North: Research Infrastructure in Canada's Arctic and Sub-arctic  
Canadian Polar Commission, 2008  
<http://www.polarcom.gc.ca/media.php?mid=3408>
- Dialogue towards a University in Canada's Far North  
Walter and Duncan Gordon Foundation, 2010  
[http://www.gordonfn.org/resfiles/Dialogue\\_Towards\\_a\\_University\\_in\\_Canada's\\_Far\\_North.pdf](http://www.gordonfn.org/resfiles/Dialogue_Towards_a_University_in_Canada's_Far_North.pdf)
- With Respect, Canada's North  
6th Report of the Standing Senate Committee on Energy, the Environment and Natural Resources, 2009  
<http://www.parl.gc.ca/40/2/parlbus/commbus/senate/Com-e/enrg-e/rep-e/rep06may09-e.pdf>
- Source: From Crisis to Opportunity, Rebuilding Canada's Role in Northern Research  
NSERC and SSSHRC, 2000  
[http://www.nserc-crsng.gc.ca/\\_doc/Northern-Nordique/crisis.pdf](http://www.nserc-crsng.gc.ca/_doc/Northern-Nordique/crisis.pdf)
- Climate Change in Dawson City, YT: Summary of Past Trends and Future Projections  
Pacific Climate Impacts Consortium, 2009  
[www.pacificclimate.org/docs/publications/Dawson.City.Climate.Report.pdf](http://www.pacificclimate.org/docs/publications/Dawson.City.Climate.Report.pdf)
- Yukon State-Of-Play Report 2006-07  
Canadian Climate Impacts and Adaptation Research Network (C-CIARN), 2007  
[http://www.c-ciarn.ca/reports\\_e.html](http://www.c-ciarn.ca/reports_e.html)
- Yukon Government Climate Change Action Plan  
Yukon Government, 2009  
<http://www.environmentyukon.gov.yk.ca/monitoringenvironment/ccactionplan.php>
- Climate Change Adaptation in Dawson City: An Examination of European Adaptation Planning and Potential European Partners for the Dawson City Steering Committee  
Lesley Cabott, 2009  
<http://www.taiga.net/nce/adaptation/dawson.html>
- CAFF Work Plan 2009-2011 Ministerial Period  
Conservation on Arctic Flora and Fauna, Arctic Council, 2009  
[http://arctic-council.org/working\\_group/caff](http://arctic-council.org/working_group/caff)
- Community-Based Ecosystem Monitoring in British Columbia: A Survey and Recommendations for Extension  
Patrick Yarnell and Donald V. Gayton, Forest Research Extension Partnership, 2003  
[www.forrex.org/publications/FORREXSeries/fs13.pdf](http://www.forrex.org/publications/FORREXSeries/fs13.pdf)

Improving Local Decision Making Through Community Based Monitoring: Toward a Canadian Community Monitoring Network

Ecological Monitoring and Assessment Network and Canadian Nature Federation Network, 2003

[www.ccmn.ca/english/library/ccmn.pdf](http://www.ccmn.ca/english/library/ccmn.pdf)

The Nova Scotia Marine Community Monitoring Manual

Saint Mary's University Community Based Environmental Monitoring Network

<http://www.envnetwork.smu.ca/resources.html>

A Strategy For Facilitating and Developing Community-Based Monitoring – Approaches in Arctic Biodiversity Monitoring

Conservation on Arctic Flora and Fauna, Arctic Council, 2008

<http://web.arcticportal.org/en/caff/caff-document-library>