

Report of Traditional Knowledge Project

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nwmo

NUCLEAR WASTE
MANAGEMENT
ORGANIZATION

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DES DÉCHETS
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Nuclear Waste Management Organization

The Nuclear Waste Management Organization (NWMO) was established in 2002 by Ontario Power Generation Inc., Hydro-Québec and New Brunswick Power Corporation in accordance with the *Nuclear Fuel Waste Act (NFWA)* to assume responsibility for the long-term management of Canada's used nuclear fuel.

NWMO's first mandate was to study options for the long-term management of used nuclear fuel. On June 14, 2007, the Government of Canada selected the NWMO's recommendation for Adaptive Phased Management (APM). The NWMO now has the mandate to implement the Government's decision.

Technically, Adaptive Phased Management (APM) has as its end-point the isolation and containment of used nuclear fuel in a deep repository constructed in a suitable rock formation. Collaboration, continuous learning and adaptability will underpin our implementation of the plan which will unfold over many decades, subject to extensive oversight and regulatory approvals.

NWMO Social Research

The objective of the social research program is to assist the NWMO, and interested citizens and organizations, in exploring and understanding the social issues and concerns associated with the implementation of Adaptive Phased Management. The program is also intended to support the adoption of appropriate processes and techniques to engage potentially affected citizens in decision-making.

The social research program is intended to be a support to NWMO's ongoing dialogue and collaboration activities, including work to engage potentially affected citizens in near term visioning of the implementation process going forward, long term visioning and the development of decision-making processes to be used into the future. The program includes work to learn from the experience of others through examination of case studies and conversation with those involved in similar processes both in Canada and abroad. NWMO's social research is expected to engage a wide variety of specialists and explore a variety of perspectives on key issues of concern. The nature and conduct of this work is expected to change over time, as best practices evolve and as interested citizens and organizations identify the issues of most interest and concern throughout the implementation of Adaptive Phased Management.

Disclaimer:

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NWMO TRADITIONAL KNOWLEDGE PROJECT 2008

Background

The overall goal of the NWMO Aboriginal Dialogue is to create the needed foundation for a long-term, positive relationship between the Nuclear Waste Management Organization and the Aboriginal Peoples of Canada.

In June, 2007, the Government of Canada selected Adaptive Phased Management as Canada's approach for the long-term care of used nuclear fuel. Part of the process for achieving this goal is to develop a better understanding of the traditional knowledge of Aboriginal peoples. In addition to the ongoing dialogue with Aboriginal organizations and the Elders' Forum, a Traditional Knowledge project was organized to focus interaction between traditional knowledge holders and scientists.

Introduction

The NWMO initiated the Traditional Knowledge Project (2008) to explore two very different ways of 'knowing' or 'world views'. It provided an opportunity for NWMO staff to experience, both on a personal basis and through a more formal process, the life style and knowledge of Aboriginal peoples. The experience also provided Aboriginal participants with an opportunity to learn about Western Science and the technology associated with nuclear waste management. The approach encouraged dialogue and exploration of the interweaving of these world views in the work of the NWMO through a variety of techniques, including traditional story telling as used by Aboriginal Elders, as well as facilitated discussions lead by Joanne Barnaby and Alan Emery specialists in bridging understandings between Traditional Knowledge and Western Science.

Participants learned that Traditional Knowledge is a broad-based knowledge system used by Aboriginal people in all aspects of their lives and culture, including high level decision making. This compares with Canadian planning and high level decision-making that uses Western Science along with other Western knowledge and value systems, both cultural and spiritual. The Project experience allowed participants to see the differences between these two culturally based knowledge systems and world views. It also showed how the NWMO has modified its' planning and decision making processes to include Aboriginal practices, as well as to consider Aboriginal spiritual beliefs and social values. These insights should help the NWMO to work effectively with Aboriginal communities and when presenting their decision-making model to all Canadians. Furthermore, this approach encourages ongoing dialogue and exploration of how these two distinct world views can interweave in the work of the NWMO.

The Traditional Knowledge Project was conducted in three parts:

Part 1

Personal Experience - Introduction to Scientific approach in a deep geological repository

In this part, one Niigani Elder and youth and the NWMO technical and engagement team participants visited the OPG Deep Geological Repository (DGR) site at Kincardine, ON. They observed the technical research being conducted at this site in preparation for a planned deep geological repository for low and intermediate level waste.

This visit presented Aboriginal participants with the challenge of understanding the techniques used and gave them a chance to view first hand, the operations associated with understanding the technical characteristics of the proposed site. It also presented the NWMO technical staff with the challenge of presenting information that is highly technical in nature to people with a limited technical background and who come from a very different world view.

Part 2

Personal Experience – Cultural Immersion in Traditional Knowledge on the Mackenzie River

In this part, participants learned about Traditional practices from a First Nation family in the North West Territories through personal experience at their family Fish Camp near Fort Good Hope.

This experience was designed to provide a natural environment for the sharing of traditional knowledge while providing the opportunity for technical staff to develop and increase their skills in transmitting scientific knowledge to Aboriginal Elders and youth. Participants engaged in activities for both enjoyment and education.

Part 3

Workshop - Building on the strengths of Traditional Knowledge and Western Science

Location: Toronto, ON

NWMO participants of the OPG Deep Geological Repository and Fish Camp experiences developed presentations for this Workshop based on their personal and professional experiences at the camp. Resource people with relevant experience presented information on their models and discussed both the opportunities and challenges inherent in this approach. These presentations together with those developed by Facilitators Joanne Barnaby and Alan Emery were designed to bridge understandings and to explore the challenges in drawing from the distinct strengths of each knowledge system.

Participants were invited to discuss their own experiences and observations with each other. They were presented with the opportunity to understand the basic differences and similarities between Western Science and Traditional Knowledge and to learn from others about the benefits of utilizing both.

The workshop experience was designed to enhance both interest and ability to communicate effectively between these systems. It was attended by NWMO Technical and Management staff as well as Traditional Knowledge practitioners and resource people experienced in working with both knowledge systems.

Visit to the Bruce Facilities and the Deep Geologic Repository Site in Kincardine, Ontario

One Niigani Elder and youth and the NWMO technical and engagement team participants visited the Bruce Facilities and the OPG Deep Geological Repository site at Kincardine. The purpose of the visit was to introduce the Aboriginal participants to the challenge of understanding the techniques used and gave them a chance to view the operations associated with understanding the technical characteristics of the proposed site first hand. It also provided the NWMO technical staff with the challenge of presenting information that is highly technical in nature, to people with a limited technical background and who come from a very different world view.

The group began with an introduction at the Visitor's Centre to understand the basics of nuclear generation and the types of radioactive waste that a nuclear facility generates in its normal operations. A brief tour of the Bruce low- and intermediate-level radioactive waste management operations began with passing through the extensive security arrangements that would be typical of any facility dealing with nuclear waste. The group also saw the mechanical operations used to handle and package these materials into the containers in which they are stored on an interim basis. The large above-ground warehouses and below-ground storage demonstrated the way that these types of radioactive waste are currently handled and gave participants an idea of the scale of the current operations.

The experience of watching the low- and intermediate level radioactive waste-handling contrasted sharply with the manner in which the spent fuel bundles or used nuclear fuel are contained and managed for storage. Because it is the used nuclear fuel that will be the subject of the NWMO responsibility, this was an important fact to have demonstrated. Here the packaging is much more elaborate and secure with layers of concrete and steel containing the used fuel in a large upright container known as a Dry Storage Container. The large size of these containers also emphasized the scale of the future operation.

The proposed location near Kincardine for the low and intermediate waste material was instructive because it introduced the group to both the theoretical and the practical aspects of the work involved in characterizing a site for the long-term management of radioactive waste. The group was introduced to the concept of the internationally accepted method of storing highly radioactive nuclear waste: the deep geological repository (DGR). This was done through a series of scientifically-oriented explanations including illustrations of sediments, charts and graphs showing the different variables to be considered and how the scientists consider these variables in defining what would define a good location for a DGR.

These variables included protection from both introduced and background levels of radiation in the storage unit, the depth of the chamber that would hold the material, the very low

permeability of the rock (to contain or keep the movement of water to a very slow rate of travel), the rock stratigraphic makeup, and the area's geological stability.

Two borehole operations were active (one drilling, one monitoring) while the group was there, each intended to make careful indirect measurements of the potential location for the DGR. The group was able to see what borehole studies are like. This was a useful insight and predicted what level of impact such an operation might have on characterizing a different site for a potential DGR for high-level radioactive waste materials.

Finally, both the Aboriginal and non-Aboriginal members of the group were able to ask questions directly of some of the scientists assigned to the project to learn about the technical research being conducted at this site, the interpretation of variables from a scientific perspective and for the Aboriginal members of the group to share some of their own understanding.

Perhaps the most impressive lesson learned was the potential scale of the development of a repository from many perspectives; physical, ecological, economical, social, and finally the very long time scale involved.

Traditional Knowledge on the Mackenzie River

Introduction

One of the primary reasons for creating an immersion opportunity was for NWMO participants to be exposed to traditional knowledge in a natural setting. It was thought that while it was important to have intellectual discussions about traditional knowledge, it was as important to expose participants to real people, living very different lifestyles that use and depend on their own distinct knowledge on a daily basis.

The camp the participants went to is owned by Judy and Michel Lafferty of Fort Good Hope and is one of several camps that they use depending on the time of the year. It is located north of Fort Good Hope, Northwest Territories near the Arctic Circle. Their son Joel helped set up the guest tents and with boat transportation to the camp, and their daughter Melissa helped with meal preparation and camp maintenance. Judy, an expert dry fish maker, ensured that everyone's needs were addressed and Michel, a hunter and trapper, was responsible for catching the fish with nets and took care of transportation and wood for heating the tents. Elders, Edward Gardebois and Gabe Kochon shared both personal life stories and legends. They used traditional teaching techniques in the same way they would have taught children as they assumed the participants' knowledge of what they were talking about would be equivalent to that of a child. They tried to answer all the questions and were very open and kind. They often used humour (as did all of the hosts) to communicate both feelings of happiness and as a way of making their guests feel comfortable. Gabe's granddaughter Malaine also participated as a youth interested in learning and to help her grandfather.

The participants quickly found the rhythm of fish camp life and participated in all of its normal activities. This included setting and checking fish nets, picking blue berries, splitting and packing fire wood, plucking ducks, setting and checking rabbit snares, and helping with cooking and keeping the camp clean. In addition, participants went hiking and explored the area and came back with items that caught their interest that they found on the land (feathers, petrified wood, fossils and rocks).

Regular camp fire discussions were held so that participants could share their observations, raise questions, discuss their understandings and explore interpretations of what was occurring. Often, the Elders would join in to share traditional knowledge and stories.

Going Fishing

The party arrived by boat to the fish camp and after settling briefly into their tents were offered a snack of dried fish (Inconnu). This is one of the staple fish for the winter in much of the north of Canada. The main intent of the fish camp for the Lafferty family is of course to collect fish for their year round use. In the planning for the visit to the fish camp the Lafferty's had asked if it would be possible for the visitors to demonstrate the rod and reel method of fishing. This was done on the day of arrival and a small number of fish were caught.

Next the participants accompanied the host family to a location in the river that was heavy with silt swept up from the bottom by powerful currents. They traditionally would have used a fibre net woven from roots and sinew, but modern nets are made from monofilament and routinely used by the native people. The experienced eyes of the hosts measured the surface patterns looking for a spot that was most likely to congregate fish and that was out of the worst of the current so that the net would not be swept away. Needless to say the method of using nets in the murky waters of the MacKenzie River was much more efficient than the methods of the participants and the Elders demonstrated their excellent local knowledge of the species to be caught and how best to do it. If they wanted different species, they would move to a different location that to the visitors' eyes at first was not much different in character. Each time the story was similar. They caught a net full of fish, the net did not get swept away, and they immediately took the fish back to camp to be processed for the winter.

Judy Lafferty prepared each species of fish traditionally for drying and smoking. Each type of fish was handled differently according to what was the most effective way to use it. Whitefish were prepared with the entire body opened out and dried and smoked as a single piece. Inconnu (conies) were dried and smoked in strips. No matter what the species, essentially all of the fish was used, including the whole head and internal organs, some of which was used as food for the guard dogs.

The entire operation was handled using simple knives but in the hands of a true expert the process was speedy and effective. Drying racks were simple poles set up in the wind and sun, and were subsequently moved to a smoke house. The method of preparing the fish was elegantly suited to this simple technology. Thousands of fish are handled by a single family each year with essentially no waste.

Berry Picking

During the time the party was in the fish camp, members had the opportunity to participate in collecting berries, one of the few sources of fruit in this area, and to appreciate how critical this is to maintaining proper vitamin balance. Each imagined having to rely on this not-so-easily collected resource for the winter months. The group returned with a supply only big enough to meet the group's immediate needs.

Snaring Rabbits

The two Elders took some of the members on an expedition to collect wild rabbits. Rabbits are used for food, sinew, and fur. Here again the use of extensive local and traditional knowledge was of critical importance to catching the rabbits. The Elders quickly located faint traces of rabbit trails and assessed which trails would have the rabbits moving on them later that evening and night. To capture the rabbits and ensure the least suffering, snares were set with a noose attached to a branch overarched the trail (set in place by the Elder). To guide the rabbit into the noose, the Elder placed a small stick on each side of the trail just in front of the noose. The Elder could predict which way the rabbit would move on the trail by examining the tracks.

The next morning the group returned to the nooses and found the rabbits already dead, having been dispatched quickly by the special noose that tightened but did not release unless manipulated with a person's fingers.

Here members were introduced to the spiritual aspect of the hunt, although at the time the participants were unaware of it. One of the rabbits was not trapped but not killed by the noose. The Elder approached and immediately fell to his knees to speak quietly to the rabbit as he used a quick and relatively painless way to stop the rabbit's heart. The participants learned later that his message to the rabbit was to thank him for offering himself to the hunter and to apologize for his being only partly captured by the snare and for the hunter not reaching him earlier.

Once again, all parts of the animal were used either in the cook pot or as material for other purposes including tanning the fur for clothing, trim or blankets. Any small pieces not used were given back to the earth where nature recycles the material.

Fire Circle Discussions

A very important part of the fish camp experience was the circle around the fire held several times a day to discuss the experiences and discoveries. In the conversation it became clear that worldview differences set the stage for new understandings, but also for the challenge to find common ground between western science and traditional means of developing knowledge.

For example one scientist acknowledged the obvious very large body of local knowledge and "how-to" information such as where and how to set snares for rabbits. He wondered if traditional knowledge has the equivalent of defining processes and relationships such as embodied in scientific equations constructs such as the theory of evolution. To a certain degree the understanding of generalities such as deducing the presence of eddies beneath the surface of a fast flowing stream provides evidence of using indirect evidence to indicate other properties an

equivalent of a predictive model. Deducing even these limited results from the experience indicated that there was a great deal more to understand.

In a follow-up discussion, the idea that while the native people can certainly live on the land, that is not a skill or knowledge that NWMO needed, was countered by the idea that while NWMO might not need it, the native people might want to use that as model for how to judge the goal of the degree of acceptable impact. Within that larger model, traditional knowledge can also suggest where minor changes in the overall plan can significantly improve the overall result.

Some NWMO participants wondered why there wasn't more ceremony. It was explained that unlike some cultures, the Dene often conduct 'ceremonies' such as 'feeding (thanking) the land or water' or thanking the spirits of animals harvested, without any fanfare. Often these activities are conducted on an individual basis several hundred times a day without others observing them. It is a normal part of daily life.

One thing that the group did not dwell on at the fish camp was combining TK and science knowledge. Judy and a scientist shared knowledge about fish anatomy. Others shared knowledge about rocks and fishing using gill nets. The Elders described their original gill nets made from roots and tendons. This was compared to a high-tech Swedish net made of monofilament with the weights designed as part of the top line of the net. This design has less drag in the water and might work better. There was genuine interest in sharing the knowledge and learning.

In many ways, the fish camp experience set the stage for the workshop that followed in which the NWMO participants shared their experience and understandings gained. Everyone built on the experience to help take the next steps in the process of finding ways to understand the potential benefits of using both western scientific knowledge and traditional knowledge to solve the same problem.

Insights and Concepts

Traditional knowledge is a complex system of integrated information about the relationships of events, animals, plants, the universe and the spirit world, developed over thousands of years to enable people to live full lives on the land within nature. The members heard many stories from the Elders about the historic evolution of the spiritual relationship between humans and other life forms and how some traditional knowledge and many traditional laws come from these. Everyone also heard of the importance of maintaining some of the data that would inform people about specific things such as safe travel routes or good fish lakes.

By comparison, the western science method is a simple set of principles about repeated observations in order to gather data to guide research in discovering what the universe contains and how it all works and western science is then a system of integrated information about relationships built upon this data. The application of the results of western science has powered much of the vast modernization of the world in all its dimensions.

For the NWMO participants, attending the fish camp was a chance to be part of a normal working family activity to capture and prepare food of different kinds in preparation for the

coming winter months. Because the Lafferty family uses traditional methods to harvest animals and plants from the land and water, and because at least to some extent they are also living traditionally, the experience was a learning opportunity for those with a science background to gain some insight into the differences and similarities between traditional knowledge and the practical relationships involved in living off the land and the scientific knowledge with which they normally work.

The modern term “environmentally responsible” was clearly built into the very fabric of their knowledge and was part of everyday practice.

This was an example of western science recently developing a similar concept that western culture is slowly accepting as an ethic. By comparison, this ethic and its practice are an integral part of the traditional knowledge the the participants all saw and experienced. Later it was explained that this ethic comes from being a part of Mother Earth, rather than considering everything to be a resource. Humans are not seen as being better than plants and animals but instead as brothers and sisters to plants and animals.

Building on the strengths of Traditional Knowledge and Western Science

Introduction

Within the broader NWMO goal of establishing an effective, respectful relationship with Aboriginal peoples, it is critical to understand the distinct knowledge system that they possess. To do so will take time and a concerted effort. It will require an ongoing effort to both comprehend and apply traditional knowledge in a manner that is both respectful and helpful in dealing with highly technical challenges. This workshop was seen as one small but important step towards developing a basic understanding necessary to evolving a commitment to ongoing education and exploration.

The Objectives of the workshop were:

1. To understand the basic differences between western scientific and traditional knowledge
2. To identify both opportunities and limitations of western scientific and traditional knowledge
3. To provide an opportunity to exchange experience between participants

The workshop was designed to engage NWMO staff actively in open discussions that challenged in a non-judgemental manner participants to consider both their own world view, beliefs and values and how these shape what they ‘know’. They explored some of the differences as well as the similarities between western science and traditional knowledge and

began thinking about the challenges and opportunities associated with working with both systems of knowledge.

A series of presentations were designed to raise awareness, encourage discussion and inform. Resource people with experience from other parts of Canada were brought in to share their experience with this challenge and to offer insights into the opportunities.

Setting the Stage

The workshop began with a traditional smudge and prayer. Following a short video presentation to describe some of the activities at the Fish Camp experience each of the members of that group described briefly the key discoveries that they made. In each case, they had had several months to synthesize their impressions. In addition to the observations and conclusions formed at the camp, a number of new insights were presented. This was followed by a series of presentations intended to add understanding about traditional knowledge and its relationship to the NWMO project. Each presentation was then followed by a discussion.

Sharing the Fish Camp Experience

While the traditional knowledge that was observed was only during a brief exposure, this discussion acknowledged that the long periods of time the Aboriginal people have had on the land gives them knowledge of cycles and events that transcend years, decades and even centuries. While the spiritual nature of traditional knowledge and practice was not always obvious during the stay the experience underscored that spirituality is integral to traditional knowledge and to daily life and the practice of living on the land in a traditional manner. Although the participants did not understand the language, it was apparent that language is an important component of understanding traditional ways. This will present a challenge to the future interplay of traditional knowledge and the processes that NWMO will ultimately employ in deciding where and how to implement the DGR. Even discourse in English required some learning because what in white culture might be a nod of agreement, in the culture of the family we met, a similar nod merely meant the listener heard what was being said.

Simple events sometimes revealed important truths in traditional knowledge. One of the participants found a frog which she brought to one of the Elders to ask about it. Once the discussion was done, the Elder asked her to return the frog to where she had found it, rather than releasing it where they were discussing the frog. An implication for NWMO's work, is that Aboriginal participants in dialogue have sometimes noted that nuclear waste might be returned to its original state.

By hearing first hand about changes imposed by modern hunting regulations, it was apparent that sometimes the changes predicted by science and traditional knowledge are quite different. Reconciling these differences, especially when the explanations for the traditional knowledge predictions do not have the same rationale as the scientific explanations will be a challenge. Examples were discussed where the traditional knowledge models which have worked for centuries were better than those based on the theoretical models of science. In the end, the key may not to try to "reconcile" scientific knowledge and traditional knowledge, but rather to build a greater whole from both knowledge bases.

The youngest member of the group – a student – explained that she had difficulty seeing the linkages between science and traditional knowledge. This she explained will make it difficult to understand what NWMO wants to do and why. Her conclusion was important. She noted that people learn in different ways and it will be helpful to have many different learning experiences to ensure full understanding. Everyone seconded this notion and agreed that different techniques of communicating the information and allowing time for the people to understand will need to be a part of NWMO's strategy.

A profound difference in the way scientific and traditional knowledge are presented was apparent; science is usually presented in a prescriptive fashion based on observations and experiment, whereas traditional knowledge is presented in the form of stories that contain both information and also ways for the listener to learn by subsequent discovery on his or her own.

The Importance of Aboriginal Language

As the group's earlier observations hinted, this presentation underscored that there is much in the Aboriginal languages that never gets translated into English, primarily because the worldview is so different. For example the word "De" is a root word meaning: "a spirit being that has been gifted by the creator". Because this word is an integral part of many Dene words, understanding its implications adds new meaning that is not carried in normal English translations. For example, the word Dehcho (the Dene name for the Mackenzie River) most often gets translated as 'big river' when in fact it's meaning is much deeper and carries with it information about the Dene relationship to the river, the acknowledgement that it is a gift from the Creator and that we as humans have stewardship responsibilities for it.

In another example, the Tahltan people and scientists in an environmental assessment proposed different solutions in a safety analysis: one was from a scientific point of view, the other from the Aboriginal perspective of the safety of Mother Earth, a key ingredient of the Tahltan and most other Aboriginal cultures. Given that NWMO's work is primarily in English¹ it will be a key task to explain nuclear waste in ways that will allow the people to make informed decisions about their land. Aboriginal languages reflect the relationship of the place, its surroundings and the life cycle e.g. the word for "leaf" embodies the sound of wind moving through the leaves; the word for "rock" embodies the weight of the rock pressing on the earth and the earth supporting the rock.

The Significance of World View

This presentation was a guided interaction of free-form concepts to reveal similarities and differences in the worldviews of people in the workshop.

The first question was to invite the participants to use words to describe a wide range of possible Canadian views of the land. It is important to note that these terms were identified as representing a diversity of possible views and do not necessarily reflect the views of the

¹ Key NWMO documents and abstracts are routinely translated into French.

participants. The following answers illustrate the wide diversity of views because both Aboriginal and non-Aboriginal people were contributing;

Resources, Economics, Ownership, Life line, Diversity, Beautiful, Abundant, Respect, Wasteland, Remote, Tendency to view “far north” as barren/useless, Wilderness, Landscape, Food, Provider, Identity, Nurture, Mother Earth, Money-making, Removed from daily life (Tourism/vacation/recreation)

The second question asked about concepts of power and where it comes from.

Informal Vs. Formal, Heredity, Knowledge, Wisdom, Age, Physical Strength, Forcefulness, Tyranny, Fear-Based, Words, Weapons, Natural Power (Wind, Water), Political/Title, Higher Power, Understanding, Personal Charisma, Spiritual

The third question asked what are considered important personal achievements. Both Aboriginal and non-Aboriginal participants were asked to offer suggestions about what was an Aboriginal perspective of achievement, and secondly what was a “Canadian” perspective of achievement.

Aboriginal Achievements:

Survival (Hunting/Trapping/Fishing/Harvesting Skills), Medical Knowledge, Life Cycles, Becoming an Elder, Engineering (I.E.; Birch-Bark Canoe Making/Natural Elements), Parenting, Power Of Observation (I.E.; Hunting/Tracking Abilities), Relationship To The Land, Adaptability, Respect, Inclusivity

Canadian Achievements:

Career, Education, Multiculturalism, Location (Ability To Colonize), Science & Technology (CANDU), Lifespan, Peacemakers, Medical Advances, Quality Of Life, Mutual Respect, Safety And Security, Sports, Good Energy Users And Exporter

Finally, the fourth question posed was: “How important is individuality in mainstream Canadian culture compared to Aboriginal cultures?” This question was more complicated to answer but reflected a similar divergence in worldview.

- Aboriginal sense of individuality has been influenced by western cultures
- Are Aboriginals more communal?
- Sometimes reflective of housing/abilities
- Canadians not as connected to each other
- Reward individual achievements more so than collective achievement, we say we support teamwork but recognize individuals (by awards, etc.)

- Canadian individuality vested in ownership, recognize individual responsibility, mainstream Canadian culture sees Six Nations individually as anarchists, but on the whole a collective or “communal”
- Canadians are prone to speak out, demonstrate individuality and individually take leadership, not as a community
- Aboriginal culture is built on a foundation of consensus-based decision-making.
- Aboriginal ownership embodies a spiritual association with the land and personal responsibility to the land which requires them to honour and respect it.

To summarize,

Aboriginal people tend to be communal and closely connected to each other. Decisions are made mostly on the basis of consensus. These decisions tend to recognize the strengths of the collective so individuals are less likely to voice an individual opinion. Individuals take a strong personal role in being responsible for their impact on the land.

By comparison, mainstream Canadians live in cities where communal networks are relatively limited. Instead of consensus decision-making, mainstream Canadians rely primarily on elected representatives to make community decisions. The tendency for people within cities to be more isolated often provides incentive for a high degree of individual opinion and motivation to express those opinions. Recognition of the overall strength of the collective (everything from teams to communities) is often claimed, but the rewards are almost always bestowed on individuals. While individual mainstream Canadians are increasingly taking responsibility for their impact on the land, they traditionally rely on the elected leaders to shoulder the bulk of the responsibility for actions.

Recognizing these general differences can often ease the ability of mainstream Canadians and Aboriginal people to communicate effectively.

The diversity of such views indicates the importance of checking assumptions and acquiring a good understanding of underlying world views and values of positions taken. To ignore these assumptions and differences in worldviews can and has led to dire consequences and can be destructive to an entire way of life and culture. Thus, when two groups (such as the NWMO and an Aboriginal community) find themselves moving in different directions they need to dig deeper and find the source of conflict.

The challenges

Experience has shown that attempts to integrate or combine traditional and scientific knowledge bases have most often resulted in the science perspective dominating. In most cases, traditional knowledge is seen as a source of data to be added to the science databases. It is rare that traditional knowledge holders are invited to be part of the recommending or decision-making aspects of projects. The most successful approach has been to interweave the two knowledge systems at the decision level and not just at the data level. Even this has its own challenges and difficulties. Two examples of this approach were presented and used as the basis for discussion.

Suggestions and Observations derived from the Discussions

Place Names: Because place names hold the roots of words that relate to traditional equivalent of ecozones or to hunting and trade routes, or to natural vs. unnatural (made by humans) changes, naming in the original language is important

Harvester Stories Important information can be derived from Harvesters' stories based on the changes they observe over time. It is therefore important to include their observations in establishing baseline information about past conditions and to involve them in any future monitoring program established with the project.

Aboriginal Advisory Committees These committees were often able to bring language specialists together with knowledge of local sites. One important technique that has now found much success is the use of an iterative approach to translation. The Aboriginal language is translated in to English. It is then translated back to the original Aboriginal language from the English and presented to the Committee or the original speaker. Corrections and adjustments are then made in the original language and re-translated in to English. This is done several times until the translated and original are close enough to satisfy the Committee or original speaker.

Questionnaires and Surveys Survey techniques using questionnaires do not work well for Traditional Knowledge. Researchers must be trained in open-ended interview techniques in the Aboriginal language and be able to glean data out of stories shared as well as the analysis, predictions or lessons learned from these stories. Milestone comparisons of results with scientific research indicates the closeness or distance of the results of each type of approach.

Planning A number of different studies have shown that the key to success of interweaving of scientific knowledge and traditional knowledge is through early Aboriginal participation in project planning in partnership approach (followed by joint implementation and co-management). The process can take a long time but the improved results are well worth the investment of time and effort to get everyone on the same page before the actual collection of information begins or decisions are made.

Determining Criteria This stage is where worldviews begin to shape the biases, issues and concerns. Communication issues arise when trying to shape the questions to be addressed. Research is directed, whereas traditional knowledge is about consensus. Setting priorities in a traditional setting is difficult; how does one choose between water and caribou? It is critical therefore to be open to differences in the sequence of topics to be addressed and the importance each knowledge system places on each.

Making the Knowledge Generally Available One of the difficulties with the process is that the information collected tends to stay within the group of people who have collected it, especially the traditional knowledge. One of the challenges is to find ways to disseminate the information. Gathering traditional knowledge goes far beyond just listening to Elder's stories. To be effective, it must also involve a process on how to effectively 'translate' the story form into other formats that might be better understood to non-Aboriginal audiences.

Withholding information In general information needs to be shared and made public. Certain exceptions can occur if the information might transgress sacred protocols or endanger a species.

Making judgements In general the value structure is best seen through the eyes of the Aboriginal community. They can also best determine if proposed or actual changes will have an impact on the way of life of the community. Where possible, communities might look for the positive intersection of Aboriginal and mainstream Canadian laws and legal systems. When both mainstream Canadian and Aboriginal laws or policies are the same or similar it provides a solid foundation for working together or working towards a consensus solution.

Differences and Similarities of Traditional Knowledge and Western Scientific Knowledge Systems

Not all traditional knowledge systems are the same, but there are numerous elements that are either the same or very similar. The following was the basic information presented to create a foundation on which to take the first tentative steps to understanding how to weave science and traditional knowledge together. This recognizes that the two knowledge systems compliment each other and that by building on the strengths of each the two together provide a much greater base of information at the data, relationship and predictive model levels.

Information Flow

Western Scientific Knowledge	Traditional Knowledge
Publication is reviewed and refereed at a primary level. The process of science updates theories and models through publication and practical experience	Elders review initial data and modify interpretations of oral records as appropriate
Everyone understands the basics, but each scientist has their own expertise in a specific area. These areas, and related publications, are categories of “ologies”	Everyone understands the basics, but each member has an emphasis in applied areas such as medicine, hunting, etc.

Similarities

- Both operate in a methodological framework
- Both are based on field observations and experimentation
- Both create testable hypotheses to derive relationships
- Both create predictive models
- Both use recent data to update existing baselines and existing predictive models. TK is immediate by consultative reporting, whereas science is through subsequent publication

- Both are moderated, science by peer review, traditional knowledge by Elders
- Interpreting both science and traditional knowledge requires expertise
- Traditional knowledge and western science are both based on observation and experiment, but traditional knowledge is regionally usually much older

Differences

- Traditional Knowledge is a way of life and knowledge is shared through daily interaction among people and the land
- Western science is built on the scientific method of research but the results sometimes become part of western life styles
- Western science is intellectual
- Traditional Knowledge is spiritual, practical, experiential
- Western science is predictive, based on abstractions of nature into models
- Traditional Knowledge is also predictive but is usually based on indirect relationships
- Western Science accumulates knowledge by physical records
- Traditional Knowledge records through oral traditions such as stories, songs, practices, dance
- Western science results in an understanding of the physical universe
- Traditional knowledge is a way of understanding the interrelationships of all universes, physical, spiritual, emotional, etc.
- Traditional Knowledge classifies animals and plants based on use and spirit
- Western science classifies based on genetic ties
- Traditional Knowledge is all-encompassing (holistic) and tends to be focused on integrating information
- Western science is analytical and tends to be focused on teasing out the influence of individual variables, in order to build integrated models
- Western science is not practical by nature but yields knowledge, techniques, and technology that can be practical
- Traditional Knowledge is practical knowledge
- Traditional Knowledge includes variables that can be derived from spiritual understanding and beliefs
- Western science variables are not intended to be based on belief systems

- Western science strives to avoid moral or spiritual value statements and the inclusion of such values in results
- Traditional Knowledge is a value system and embodies values in the results
- Western science requires extensive and diverse infrastructure
- Traditional Knowledge requires extensive and diverse protocols

Western Science Uncertainties with Traditional Knowledge

- Distrust of non-scientific data or data that are derived from spiritual sources
- Uncertainty of accuracy of data and repeatability of derived relationships
- Uncertainty about how to deal with a mix of secular and sacred information
- Stereotyping of Traditional Knowledge as data-level information only
- Dismissal of non-familiar indicators of change in biological systems

Traditional Knowledge Uncertainties with Western Science

- Distrust of scientists who have no relationship to subject of study
- Distrust of sampling approach (seen as incomplete)
- Stereotyping as data-level information only with no understanding of the 'big picture'
- Dismissal of conclusions reached over short study periods (years versus centuries)

Much of the confusion about the way each system handles information was summed up by one commentator: Science says "Show me and I will believe you." Whereas traditional knowledge says "Believe me and I will show you."

Finding Common Ground

While it is important to understand the differences and similarities between the two knowledge systems, it is far more productive to focus on the means of finding common ground so that productive work together can be achieved. This session asked the group to consider everything they had heard and experienced in the previous sessions and from that foundation attempt to describe how both knowledge systems could be brought together to share similar values or goals, activities or tasks, philosophies or principles.

Breakout-groups were formed to carry out the assignment. Each breakout group then reported back to the entire group in plenary session and a brief discussion followed each report.

The reports were as follows:

Group 1

- Safety and security for our earth and all its elements
- Long term thinking for future generations
- Respect and recognition of both Traditional Knowledge and Western Science

- Willingness to understand differences that will come up and a willingness to work through them together
- Reciprocity: chain of responsibility both back (within the nuclear production chain) and forward (to future generations)
- Identification of principles and values
 - Meaning
 - Interpretation
 - Methods for resolving differences that are dependent on working through the differences collaboratively
 - Goes beyond current methods such as mediation and arbitration

Group 2

- Protection of people and environment
- Sustainability
- Identification of Valued Ecosystems Components (VECs)
- Creating opportunities for sharing of understanding
- Research agenda and methodology
- Identifying study area
- Review of findings, assessment of results, interpretation of the results

Group 3

- Develop common principles before stepping out
- Form a group of both Traditional Knowledge and Western Science holders to discuss philosophical, spiritual, and physical observations
- “Get to know each other” through events and interaction not related to the project including spiritual ceremonies
- Identify concerns of both
- Traditional Knowledge and Western Science both able to draw conclusions from physical observations

Each breakout group came up with a unique set of ideas but finding common ground at least at this level of interaction amongst the Aboriginal and non-Aboriginal members of each group was not difficult.

Interweaving Scientific and Traditional Knowledge Systems

Strong Like Two People

Working together has often presented challenges despite good intentions. One of the successful models presented— named “Strong Like Two People” – was derived from the Tlicho Chief Jimmy Bruneau. He spoke of the importance of a model of bicultural and bilingual education where equal emphasis must be given to educating children in two cultures. The Tlicho have also

incorporated this concept in their bi-cultural approach to building an economy that seeks to support choices to participate in both the wage and the traditional economy. This concept also underlies the unique commitment to non-Dene representation in the Tlicho Government. The Tlicho have recently concluded an Impact Benefits Agreement that focuses on using payments to bolster their traditional economy and to avoid growing economically dependent on mining. In project monitoring they have struck an agreement to establish baseline data that goes back well over 150 years based on Traditional Knowledge, and are now working to actively include harvesters and Elders observations in monitoring change.

Traditional knowledge is embedded knowledge that can sometimes be extracted by observing daily activities. The Elders talk of three different levels of knowledge: Ancient Knowledge which is the source of many predictive models and wisdom, Old Knowledge which is a source of laws, agreements made between different beings on “what should be”, and living Knowledge which is an evolving system of knowing based on observations, dreams and spiritual understandings.

Understanding that the Elders are often reporting on ancient knowledge and so are essentially living repositories of understanding and wisdom built up through generations. They are not necessarily the authors of the information.

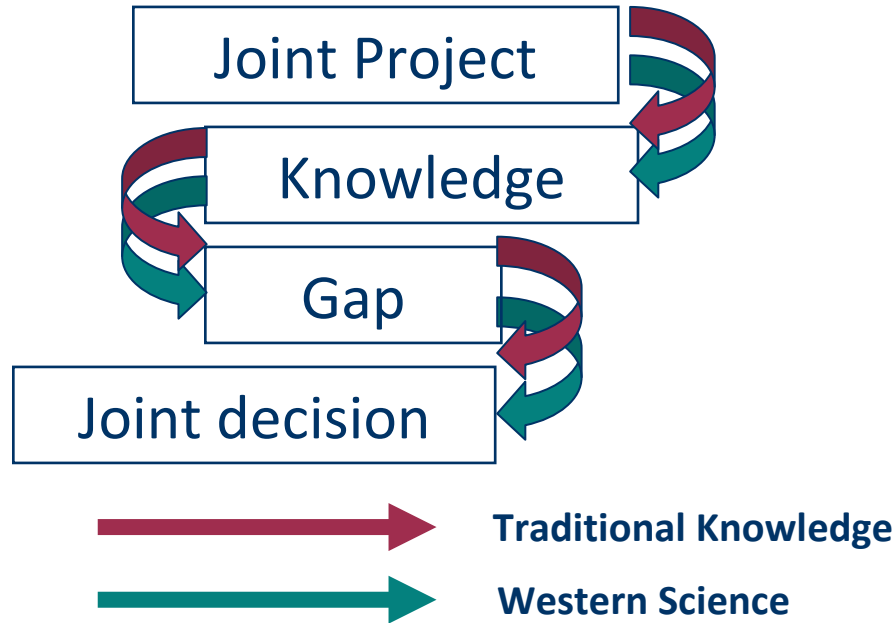
In the discussion, the issue arose about what NWMO would do if needed knowledge was clearly not scientifically based and came from ancient traditional knowledge. The NWMO goal in this respect was stated as follows:

Our goal would be that work with the community and traditional peoples would have been done long before the process of the Environmental Assessment hearing, including what information can be shared publicly and what is kept within the learning about the Traditional Knowledge of an area and is held by the Traditional Knowledge person –however, we will need to determine how we work with a community to develop the data or knowledge sharing that can be translated into the scientific realization of that knowledge; the outcome of each step then forms the next steps for NWMO and the community....we want to ensure that this is done in a respectful way

In part the answer also lies in the assumption that if the Elders make a pronouncement based on ancient traditional knowledge, the scientists can go out and prove it to themselves in their own scientific manner. The basis of the interweaving model is not to attempt to reconcile two different answers in some arbitrary or abstract manner, but rather to build on the basis of both systems. The discussion acknowledged that in some situations, computer modeling in the sciences is so advanced that the computer scientists may be too distant from any fieldwork to have a real feel for what is the reality being simulated by the models.

To illustrate these points, several examples were given where Elders were able to provide knowledge of mechanisms that were beyond what might be considered normal human abilities to discover. In one instance the flow of groundwater was defined by Elders correcting the computer models scientists had developed. In another, Elders directed scientists to a source of toxins many trophic layers distant from the species causing a disease in humans.

An Interweaving Model



The term “interweaving” is used because in this model, the two knowledge systems each approach the problem with their own system and knowledge base. During the research phase, the two groups come together to share their findings and review the knowledge that has been gained to date. Gaps in the necessary information are identified jointly and then each goes out to fill the gap. On occasion it may be necessary to re-visit the joint planning stage and reset the plan somewhat based on the findings. This iterative process continues until the stage is reached where recommendations and decisions are jointly prepared. The key elements are time, patience, preparation and a close examination of the underlying principles, values, and differences in the two cultures.

In this model building trust is central to people sharing openly what they know. The intellectual property involved belongs to each group, but internally to the project the knowledge must be shared equally. Trust is achieved through demonstrated respect for the application of knowledge to decisions that are made. Neither system is superior both systems have valuable contributions to make to good decisions. Research agendas and priorities must be set by the respective ‘experts’ in each system. Any research or documentation of traditional knowledge must be directed by Traditional Knowledge holders.

An approach that has worked is to ensure that traditional knowledge holders have an opportunity to carry out the research, to document and share knowledge in a manner with which

they are comfortable. Training traditional knowledge researchers just like scientific researchers takes time. It is important to learn to listen and observe:

- Interview Guidelines – not questionnaires.
- Listening while interviewing.
- Learning language of the land from those who know.
- Documenting and archival storage.
- GPS and GIS – if necessary

In carrying out the research on traditional knowledge, working with the Elders is similar to having a living textbook in a scientific format. Often the research is not collecting original data, but instead having the results, theories, and models presented orally. Elders may want to go out on the land to be closer to the site in question as a means of ensuring that they are respectful of the site in question and remember well the knowledge that has been passed to them –they should decide where camp will be. Listen to the many, many oral narratives of the area before going. In the camp, documentation and learning are combined. On returning to the community, the researchers talk about observations and what they learned from the harvesters and Elders. Elders identify gaps and direct the interviews or discussion groups to fill in those gaps.

Researchers listen to audio recordings and clarify concepts and words that they don't understand with Elders and language experts. Lots of listening and questions of clarification are required – it takes time. In writing the reports, the key points, analysis and conclusions are verified with harvesters and Elders. All members of the traditional knowledge team should be part of the writing and thereby also “own” the document.

A typical challenge arises when the two knowledge systems do not agree. To ensure one knowledge system does not subsume the other, equal consideration needs to be given to both systems and the people involved need to stay accountable for what they propose. Before embarking on any project it is important to agree on how differences will be resolved. Collaborative decision making is where joint responsibility and accountability are shared equally.

Creating Cross-Knowledge Learning Opportunities; Finding ways to apply Traditional Knowledge

In this final breakout session, each group was asked to attempt to find ways in which NWMO could develop cross-knowledge learning opportunities. This was different than cross-cultural opportunities in that it specifically was aimed at pointing NWMO to participate in the application of traditional knowledge. The groups were asked to think of opportunities to build on both sides to understand both Traditional Knowledge and Western Science.

The ideas generated during the small group work are summarized below. The brainstorming ideas, summarized below were not evaluated in any way or reviewed for overlaps or clarity and no conclusions were drawn on the concepts.

NWMO could:

- Participate in exchange programs, spending time with Aboriginal organizations who are working with both TK and WS- ie: THREAT (the BC project we heard about)...best practice-exchange
- Look for project opportunities where environmental aspects of WS & TK tackle the same problem on their own and compare the similarities and differences (then reconcile the gaps)
- Participate in University level training in TK (ie; Lakehead University, First Nation University)
- Develop corporate consciousness of TK
- Experiential learning (ie; fish camp, Aboriginal community experience)
- Hydrogeological learning example (scientist and holder of traditional knowledge of water)
- Sponsor more cross-cultural immersion opportunities for staff and for youth – both Aboriginal and non-Aboriginal youth in a science camp taught by both Elders and scientists
- Aboriginal language commitment – provide resources to group to produce glossary of terms as an example
- Visit operating facilities for TK holders to understand the science and technology used
- Attend EA hearings – to sit and listen as a means of learning about the challenges involved in bringing forward both TK and WS in the regulatory process
- Develop Research indicators – questions we could address that may be site specific
- Internal training program at NWMO (WS & TK for new employees)
- High-level strategic planning being done now---will be able to have input on the draft process for site selection
- Consider the development of a dispute resolution system
- Develop opportunities to inform processes – case studies of Kincardine (for example)...ask how the processes went...opportunities missed...
- Design a pilot study (for example, consider a site that would never be a potential host community, e.g. ...as a study case to learn more about interweaving TK and WS.)

During the breakout session, the question was raised as to how NWMO could engage with any Aboriginal community without implicating the community as a potential site for the deep geological repository. This was a powerful question because it underlies the importance of finding a way for participation to be included as an important learning tool without severely limiting the scope of opportunities to engage with traditional knowledge holders.

During the discussion it was useful to examine the fish camp experience as a case study of how one might prepare an engagement process when not in an actual siting process. The fish camp was brought about through the assistance of a third party. In this work, it is important to be

invited into a community. Through the third party, the Lafferty family invited NWMO to participate with them at their fish camp. This can be used as an example for other types of research opportunities available for community's to think about the community vision of itself; in this case the community would look at what they consider community well-being and how development might have an impact on them and what they would want as their community vision.

For example, a project might be conducted where if there is a community with a technical problem to solve...perhaps they would like to have both TK and WS participation in addressing the problem; the NWMO might also offer some support and use that experience to learn and to practice, so that NWMO brings technical capacity. This would give a hands-on opportunity to learn while the community benefits. The end result provides interweaving practice and builds various skills.

The idea of a mock pilot project relying on the communities to invite NWMO to work with them with the understanding that the idea is to develop information about the NWMO's work and general concepts that would be useful to the community in thinking through what their concept of their community's well-being might be. As a general principle, the more intact the traditional knowledge system in a community, the better equipped that community will be to satisfy the goals for cross-knowledge learning experiences. Many safeguards and ideas for caution were expressed at this point.

In one commentary, the idea was taken further. One member of the fish camp experience suggested that through his learning and personal experience so far he is understanding the importance in TK of the giving and taking with Mother Earth... If we ask Mother Earth to take the used fuel, then we should try to give something back to Mother Earth directly, and not simply to local human communities.

Conclusion

The Traditional Knowledge Project (2008) provided a good opportunity for NWMO to explore two very different ways of 'knowing'. The combination of the cultural immersion approach together with the intellectual discussions enabled participants to engage at a personal level as well as at a professional level. The use of both traditional teaching methods (hands on sensory with reflection) and more academic approaches enabled participants to appreciate another aspect of the two systems that may be valuable to future programming.

The approach encouraged dialogue and exploration of the interweaving of two distinct world views in the work of the NWMO. It opens the way for continued and meaningful exchanges between both views.