

# **Traditional Ecological Knowledge: Barriers and Solutions in Canada and British Columbia**

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## **Abstract**

This paper explores the application and integration of traditional ecological knowledge (TEK) in land management in Canada and British Columbia. A description of the increasing awareness of TEK and its meaning provides the context for examining the barriers to implementing TEK. Environmental impact assessments (EIAs) and co-management arrangements are suggested as two methods to overcome barriers.

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## **Introduction**

Natural resource managers are continually under pressure to meet numerous environmental, social, and economic demands. While economic demands have generally remained the same, environmental and social demands have changed. The environmental movement has created social demand for environmental stewardship and sustainability. First Nations have joined the human rights movement and demand more decision-making power on their land. Vast amounts of knowledge are required to successfully balance and meet these changing demands. While current management frameworks rely on western science, traditional ecological knowledge (TEK) is an untapped tool for sustainable resource management. TEK adds to natural resource managers' knowledge and ensures environmental stewardship while meeting societal demands to include First Nations in land management. An exploration of TEK's meaning, barriers and methods to overcome barriers demonstrate the relevance and opportunity TEK offers.

Though the current growing awareness of TEK seemingly makes its implementation more likely, this has not been the case. In this paper, an exploration of the rise of TEK, its meaning and its key components provides the foundation for understanding how it could be applied and why TEK is relevant to natural resource management. A detailed examination of the barriers to TEK provides insight on the effectiveness of two methods to overcome barriers: environmental impact assessments and co-management systems. TEK has a place in sustainable natural resource management, and when used it helps meet other environmental and social demands.

## **Traditional Ecological Knowledge Policy**

The pursuit to integrate and apply TEK has come alongside increasing social awareness of the importance of sustainability (Murray, 2000). The overlap of the environmental movement and the aboriginal rights movement is in part due to the acknowledgement that TEK can increase or maintain biodiversity as a tool to ensure sustainable resource management (Berkes et al., 2000; Murray, 2000). Due to the aspirational nature of the policy regarding TEK, few policies enforce its use. Rather, most policies respect and/or recognize TEK, or suggest its use (Murray, 2000). Examining policy surrounding TEK identifies current areas where TEK may be used while explaining its lack of application. The importance of TEK has been acknowledged at international, national, provincial and regional political scales.

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The United Nations (UN) Convention on Biological Diversity, the UN Convention to Combat Desertification and the Ramsar Convention on Wetlands all acknowledge the use of TEK and the protection of indigenous rights (Murray, 2000). Canada is a signatory on all three documents (Murray, 2000). More recently, the UN Convention on Biological Diversity committed to the following:

“By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels (Secretary of CBD, 2010, p. 9)”.

This statement demonstrates a stronger commitment to the use of TEK than previous statements as it provides a target date and a description of how TEK will be applied. Canada was the first nation to support the UN Convention on Biological Diversity (Murray, 2000). Aside from supporting international documents, Canada has its own policy affecting the use of TEK. The National Forest Strategy of 2003-2008 was a document signed by all provinces and territories except Quebec. Objective 3 in this document recognizes signatories should:

“Accommodate Aboriginal and treaty rights in the sustainable use of the forest recognizing the historical and legal position of Aboriginal Peoples and their fundamental connection to ecosystems.”

*Vision for Canada's Forests: 2008 and Beyond* replaced the National Forest Strategy. *A Vision for Canada's Forests: 2008 and Beyond* states one of the “desired outcomes related to forest sector transformation” is for “Aboriginals to participate meaningfully in an innovative forest sector, including use of their insights and expertise” (CCFM, 2008, p. 11). Both statements, particularly the desired outcome from the *Vision for Canada's Forests* are too broad and vague to have much effect. Other documents, such as the *Canadian Environmental Assessment Act*, are equally as broad, stating that “Community knowledge and aboriginal traditional knowledge may be considered in conducting an environmental assessment” (section 16.1). Northern Canada has the most concrete policies regarding the implementation of TEK. The Northwest Territories established a TEK policy which states:

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“The Government recognizes that Aboriginal traditional knowledge is a valid and essential source of information about the natural environment and its resources, the use of natural resources and the relationship of people to the land and to each other, and will incorporate traditional knowledge into government decisions and actions where appropriate.”  
(Government of NWT, 1997)

While policy is increasingly acknowledging TEK and recognizing it for the potential benefits it offers, there are some problems which impede its widespread use. The first major problem is misunderstanding the meaning of TEK.

## **The Meaning of Traditional Ecological Knowledge**

TEK is a more than just knowledge, it is a world view. TEK is:

“...a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment” (Berkes, 2008, p. 7).

The number of aspects mentioned in this definition conveys the complexity of TEK. Knowledge, spirituality and the belief that humans are part of nature are key aspects of TEK. While the definition itself can be challenging to understand, the term ‘traditional ecological knowledge’ also generates misconceptions.

General problems with the term conflict with the understanding of what TEK is, preventing more widespread application by non-aboriginal users. The word ‘traditional’ implies rigid, unchanging facts (Menzies, 2006). TEK is knowledge that has been gathered over long periods of time. It is dynamic as it is based on observations. Observations are used to continuously update data and reflect the changes in a given ecosystem (Menzies, 2006). Some may use terms such as local knowledge or indigenous knowledge to avoid confusion by eliminating the term ‘traditional’. This can generate further confusion as there are now three terms which seemingly refer to the same type of knowledge. TEK encapsulates the meaning of both terms (Berkes, 2008). The other seemingly contradictory aspect of TEK is ecological knowledge (Berkes, Sacred Ecology, 2008). The phrase ‘ecological knowledge’ is associated with western and ecological science (Berkes, 2008). Though TEK conveys information about ecology, it is very different

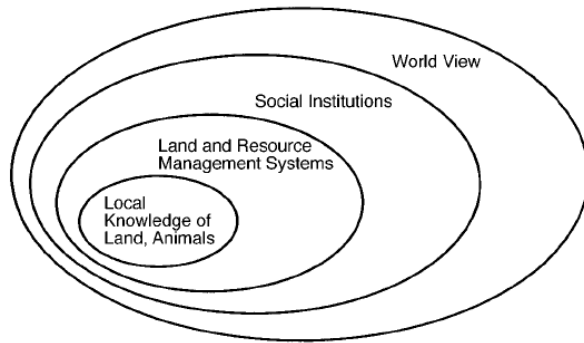
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from western science. If ecological knowledge is thought of as knowledge of the interactions of organisms with their physical environments, the western-traditional contradiction is eliminated (Berkes, 2008). Having addressed the problems with the term 'traditional ecological knowledge', there are other aspects of TEK which are just as important as understanding its contradictory name.

Though the precise definitions vary, all authors agree that TEK is more than facts or knowledge. TEK describes the spiritual relationship First Nations share with the land (Berkes, 2008). This spiritual aspect can be confusing from a scientific perspective as it associates inert objects with human qualities such as sentience (Berkes, 2008). TEK is also a process rather than just knowledge (Berkes, 2008). It is a process of gathering knowledge and drawing conclusions. The inferences drawn from TEK generate information which is then passed on to the next generation (Berkes, 2008). While the aforementioned aspects are also used to explain why TEK is different from western science, it is important to realize that western science and TEK are fundamentally both bodies of knowledge collected in different ways (Berkes, 2008). An understanding of the term and its key components contribute to the understanding of how TEK is gathered.

The TEK system of gathering knowledge can be described as a "knowledge-practice-belief" system (Berkes, 2008, p. 17). There are four levels of knowledge with gradients between each level (see Figure 1) (Berkes, 2008). The first level is local knowledge. Local knowledge is information on local environments such as plant and animal species, life history, behavior, landscapes and soils (Berkes, 2008). This information is at risk of being taken out of context, as it most effectively applies to areas where it was gathered (Berkes, 2008). The second level applies local level knowledge in a 'land and resource management system' of 'practices, tools and techniques' (Berkes, 2008, p. 18). The third level establishes social codes of conduct which allow for harmonization between functional groups such as hunters. At the fourth level, worldviews interpret the information gathered in the form of religion or belief systems (Berkes, 2008).





**Figure 1:** Traditional ecological knowledge's four levels of knowledge (Berkes, 2008, p. 17).

An important component of TEK is passing knowledge on to the next generation. This occurred gradually, beginning with young members helping their family harvest natural products (Turner, n.d.). This teaching method imparted respect for the resource, as well as the techniques for harvesting it. Stories were passed along at this time, maintaining the cultural and spiritual component of TEK (Turner, n.d.). Rituals, such as the potlatch, provided the opportunity to pass on knowledge to members inheriting land. Important knowledge regarding management techniques and the care required to maintain their resources were shared with the member (see Figure 2) (Turner, n.d.).

TEK is a holistic approach to land management. It ensures sustainable harvests and healthy ecosystems. Yet TEK is not widely applied on the land. While defining TEK has already highlighted some barriers, there are other key barriers which have prevented the use of TEK.

Management practices based on ecological knowledge
Practices found both in conventional resource management and in some local and traditional societies
Monitoring resource abundance and change in ecosystems
Total protection of certain species
Protection of vulnerable life history stages
Protection of specific habitats
Temporal restrictions of harvest
Practices largely abandoned by conventional resource management but still found in some local and traditional societies
Multiple species management; maintaining ecosystem structure and function
Resource rotation
Succession management
Practices related to the dynamics of complex systems, seldom found in conventional resource management but found in some traditional societies
Management of landscape patchiness
Watershed-based management
Managing ecological processes at multiple scales
Responding to and managing pulses and surprises
Nurturing sources of ecosystem renewal
Social mechanisms behind management practices
Generation, accumulation, and transmission of local ecological knowledge
Reinterpreting signals for learning
Revival of local knowledge
Folklore and knowledge carriers
Integration of knowledge
Intergenerational transmission of knowledge
Geographical diffusion of knowledge
Structure and dynamics of institutions
Roles of stewards/wise people
Cross-scale institutions
Community assessments
Taboos and regulations
Social and religious sanctions
Mechanisms for cultural internalization
Rituals, ceremonies, and other traditions
Cultural frameworks for resource management
World view and cultural values
A world view that provides appropriate environmental ethics
Cultural values of respect, sharing, reciprocity, humility, and other

**Figure 2: Applications of traditional ecological knowledge (Berkes, Colding, & Folke, Rediscovery of Traditional Ecological Knowledge as Adaptive Management, 2000, p. 3).**

## Why is Traditional Ecological Knowledge not being used?

While an increasing body of literature suggests there many benefits of TEK, and numerous politicians and aspirational documents support its use, there are many reasons why TEK is not being used. Much of the available research reveals consensus among researchers of the barriers to employing TEK. These barriers can be broken down into categories: conflicts with western science, integration; and logistical, trust, and policy.

### Conflicts with western science

One of the most significant barriers TEK must overcome is the differences between TEK and western science (Murray, 2000). There are many reasons scientists resist the application of TEK. Mistrust between TEK and western science, misapplication of TEK and the clashing world views make this the largest barrier to successful implementation of TEK.

TEK is challenging to implement in part due to the oral tradition of First Nations. There is a lack of trust in the oral tradition of aboriginal cultures. Western cultures write important knowledge down for future use. It is difficult to comprehend how a culture could store a large amount of knowledge in their memories and recall it with accuracy (Menzies, 2006). When oral data is gathered through interviews, the data is not considered objective and is not viewed with credibility (Sallenave, 2007).

TEK and western science have very different perspectives of nature (Martinez, 2005). TEK sees humans as part of the environment while western science sees humans as separate from the environment (Martinez, 2005; Casmirri, 2003). This creates many challenges. One challenge is western people applying TEK to western problems. The western paradigm is not necessarily conducive to applying TEK and may not yield the desired results (Casimirri, 2003). Research methodology is also usually designed for problems outside of First Nations communities which eliminates the applicability of site specific TEK. Scientists also lack the cross-cultural training needed for working with different cultures (Murray, 2000). Another factor contributing to the misunderstanding of TEK in western science arises from TEK articles being published in anthropology journals rather than biology journals (Murray, 2000). More barriers arise when TEK and western science are integrated.

### Integration barriers

Integration barriers are a result of trying to combine two very different knowledge systems from two very different cultures. In addition to being unable to communicate in a common language, some key words cannot be translated into aboriginal languages. Words such as sustainability and conservation have no direct translation in aboriginal languages, which demonstrates the cultural differences between western beliefs and First Nations beliefs (Nadasdy, 1999). The integration of these two knowledge systems requires that TEK be expressed only as information. To do this, TEK must be separated from its cultural and spiritual components and distilled into information so it is in the same form as western science. Only then can TEK and western science be combined and implemented together (Nadasdy, 1999). This separation is challenging because TEK is more than information, it is a way of life. Western

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science also categorizes information into areas of expertise, such as forestry or fisheries (Nadasdy, 1999). When separating the information from the cultural aspects of TEK, it can be challenging to categorize the information. Over time, forestry information has grown and the sector has evolved to the extent that TEK pertaining to forestry has little to do with how forests are managed currently and may not compliment forest management practices, so such information is omitted (Nadasdy, 1999). In addition, much of the information of TEK is passed on in a variety of means such as stories, personal relations and practices and to distill such knowledge into data is challenging (Nadasdy, 1999). This distillation also sends a negative message to informants that only parts of their information are important. Furthermore, if informants cannot provide information considered 'pertinent' they are not taken seriously. First Nations use their own time to participate only to feel their experience is not valued (Nadasdy, 1999). Integration barriers aside, logistical issues arise when working cross-culturally and in different languages.

**Logistical barriers**

Logistical barriers are those which impede the integration, collection or application of TEK. As it is an oral tradition, there are logistical challenges to collecting TEK. Language barriers impede the flow of TEK to western science. The First Nations most knowledgeable about TEK are the elders, but many do not speak English (Martinez, 2005). When TEK is translated, some of the meaning is lost from the original language (Casimirri, 2003). In addition, once the data has been translated, it becomes separate from the knowledge holders and excludes First Nations from decision-making (Casimirri, 2003). Perhaps as a consequence of this, TEK is often misapplied when it is taken out of context, or forcibly integrated with western science (Casimirri, 2003).

Not only is it challenging for land managers to implement TEK, it is challenging for new entrants in the field of ecology. TEK as is still a relatively new component of resource management and not yet a part of the curriculum (Murray, 2000).

Some researchers feel there is a need to quickly to collect and preserve traditional knowledge due to the rapid change occurring in indigenous cultures (Murray, 2000; Casimirri, 2003). However, documenting a system which functions well because it is dynamic is not the most conducive to storing information from this knowledge system (Agrawal, 1995). While concerns about First Nations loss of language and thereby loss of TEK are valid, it is important to recognize TEK as a knowledge system. Knowledge systems are subject to change, just as western science techniques change and develop (Casimirri, 2003).

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The collection and application of TEK is expensive and challenging for scientists to undertake (Murray, 2000). Conducting interviews and analyzing the findings can take hundreds of hours (Murray, 2000). Travel is often necessary and can be expensive. Gathering TEK requires a skilled interviewer as it can be challenging to collect useful information (Murray, 2000). In addition to having interviewing skills, the interviewer must be knowledgeable about the topics as interviewees are unlikely to take the time to explain them (Murray, 2000). If informants feel the interviewer does not understand a topic, they may omit it completely (Murray, 2000). This begins to expose the trust barrier between First Nations and researchers.

**Trust barriers**

Trust barriers arise between First Nations and non-aboriginals. Some First Nations do not trust researchers. A history of TEK abuse which has negatively impacted some aboriginal communities has resulted in this mistrust. (Houde, 2007). One may find elders who are able to communicate in English but may not be willing to impart their knowledge as a consequence of historical misuse (Martinez, 2005). Fuelling this mistrust are the political challenges with respect to intellectual property rights (Murray, 2000). Bio-prospecting has resulted in exploitation of certain species. In other cases, fishing or hunting areas have been over-used by outsiders gaining access to traditional information (Murray, 2000). Awareness of the history of abuse and education of etiquette are important tools in re-gaining trust.

**Political barriers**

Political barriers are those which arise from power imbalance or policy. One of the most significant barriers is the power non-aboriginals hold in decision-making. In the collection of TEK in co-management scenarios, First Nations are often out of their element while other scientists and politicians are very comfortable in conference rooms or offices (Nadasdy, 1999). Non-aboriginals often control meetings and pose questions (Nadasdy, 1999). This is a reflection of the power problem of co-management and must be addressed to see success in the application of TEK.

Political issues such as 'lip service', confusion of the meaning of TEK and power are barriers to TEK do not help to re-gain the trust of First Nations (Nadasdy, 1999). Current policy frameworks require the application of western science, not TEK. Policy that does acknowledge the use of TEK is aspirational. While some policy enforces the use of TEK, such as in Northern Canada, and provides detailed information, in most regions there is no explanation for how to implement and integrate it into decision

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making (Usher, 2000). This also weakens the policy enforcing TEK by making it hard to understand and easy to work around. In order to properly incorporate TEK, changes would be required in current policy (Sallenave, 2007).

In some environments, there are unsettled First Nations land claims. BC in particular has a complex political indigenous environment. In these areas, questions about the right to use TEK become very important (Murray, 2000).

The barriers to applying TEK are complex, inter-related and numerous. Can the major hurdles of TEK be overcome for sustainable land management?

### **Overcoming Barriers**

TEK can be applied in two ways: environmental impact assessments and co-management scenarios (Usher, 2000; Freeman, 1992).

#### **Environmental Impact Assessments (EIAs)**

Environmental assessments are used to determine the adverse environmental impacts of potential projects before the project is implemented (CEAA, 2011). These assessments identify negative environmental impacts, identify ways to reduce these impacts and determine whether environmental impacts can be effectively reduced by mitigation efforts (CEAA, 2011). In Canada, environmental assessments are regulated by the Canadian Environmental Assessment Act. In this act, section 16.1 states "Community knowledge and aboriginal traditional knowledge may be considered in conducting an environmental assessment" (Government of Canada, 1992).

The application of TEK is effective in these assessments because of the long period of time over which knowledge has been gathered. Such historical information is powerful in creating baselines against which to judge environmental impacts (Sallenave, 2007). Environmental assessments also have difficulty linking environmental impacts to social impacts. TEK can be used to address this problem as it integrates the social and environmental components (Sallenave, 2007). Although policy advocates the use of TEK, EIAs do not overcome many of the barriers mentioned earlier.

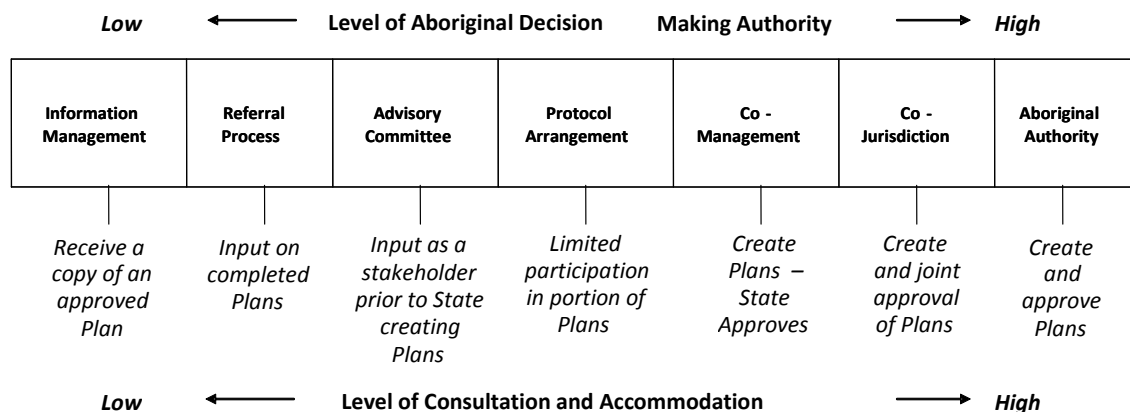
There are three major barriers EIAs fail to overcome: integration barriers, logistical barriers and political barriers. Integrating TEK with the assessment process requires distillation and categorization of knowledge. This leads to additional problems mentioned earlier, such as informants feeling that much of

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their knowledge is not valued. Logistical barriers arise in EIAs when knowledge is taken out of context. This could easily happen if the site specific traditional knowledge gathered is applied on a broader scale. Incorporating TEK with EIAs will be very costly and time consuming as there is much information that must be gathered, distilled and combined. Political barriers pose the biggest challenge to the successful incorporation of TEK with EIAs. This is due to the fact that power remains with the government. Once First Nations have provided the TEK, their role in the EIA process is complete and they are no longer involved. This leads to further concerns of TEK being separated from its cultural context, trust barriers and intellectual property rights (Usher, 2000). Although the use of TEK in the EIA process is moving forward in the application of TEK, it still faces many barriers. Co-management is another system which applies TEK, but successfully overcomes some of these barriers.

### Co-Management

Co-management, co-jurisdiction and joint ventures are synonymous terms with gradients between each (Hawley, Sherry, & Johnson, 2004). While there are numerous terms which describe First Nations partnerships with other institutions, such as government, industry or environmental non-governmental organizations, there is one important distinguishing characteristic: the level of power First Nations have (see Figure 3). The basic principles within each term are very similar in that two groups share power and responsibility (Grainger, Sherry, & Fondahl, 2006). Co-jurisdiction, or joint decision making, is a management system in which First Nations are equal partners (Casimirri, 2003).



**Figure 3:** The gradient of decision-making power First Nations have is shown above in a spectrum of management systems (Forsyth, Trosper, Hoberg, & Bull, 2010).

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Co-management scenarios are suited for integrating knowledge systems because two or more groups share power and can ensure that knowledge systems are applied appropriately. Rather than considering TEK to be data and integrating data with western science, a co-management system can be applied. Co-management allows for more natural integration of TEK, preventing categorization and distillation of knowledge (Casimirri, 2003). Other benefits to co-management scenarios are fair decision-making, equal power-sharing and commitment to act on decisions (Treseder & Krogman, 1999). Co-management also offers solutions to many of the barriers mentioned earlier.

Co-management has the potential to overcome integration, logistical and political barriers. In joint-management, First Nations are able to oversee how their TEK is used and ensure it is applied correctly. From a logistical perspective, they are directly involved in the process of management so there is no need to spend nearly as much time or money to collect information. In this partnership, First Nations are able to make decisions which affect the land, rather than providing the knowledge and being excluded from decision-making. This management system overcomes political barriers. However, co-management has had limited success due to the conflicting world views described in the 'conflicts with western science' barrier (Hawley, Sherry, & Johnson, 2004). Another difficulty in co-management systems is power bias towards non-aboriginal parties (Treseder & Krogman, 1999). This is why co-jurisdiction arrangements are more successful in the application of TEK. However, the John Prince Research Forest (JPRF) demonstrates that it is possible for co-management to overcome this power struggle for successful forest management.

The JPRF in BC is an example of a working co-management system between the Tl'azt'en Nation and the University of Northern British Columbia (UNBC). Established in 1999, the JPRF allowed UNBC to meet First Nations needs while providing research opportunities (Grainger, Sherry, & Fondahl, 2006). The Tl'azt'en Nation used the JPRF to solidify their Rights to the land and provide jobs and education to their nearby communities (Grainger, Sherry, & Fondahl, 2006). In contrast to EIAs, co-management often benefits all parties.

While there are many barriers to TEK, EIA and co-management prove that these barriers can be overcome. Where EIA is weak, co-management is strong. Co-management is able to overcome the integration, logistical and political barriers that EIA cannot. Although co-management struggles with power balance, co-jurisdiction systems are one way to correct these balance problems.



## The Tradition of Aspiration

When Liberal leader Gordon Campbell was re-elected in 2005, a key component of his platform was building a *New Relationship* with First Nations. One of the goals of the *New Relationship* document is “To ensure that lands and resources are managed in accordance with First Nations laws, knowledge and values” (Province of British Columbia, 2008). This statement recognizes, respects and allows application of First Nations’ traditional ecological knowledge (TEK). Unfortunately, the *New Relationship* was never passed into legislation and has no political power. TEK is an important source of knowledge, yet it has repeatedly been ignored or has lacked policy support. The challenge of TEK is aptly described by Deborah McGregor:

“Most work in the field of TEK comprises collecting and documenting information. There is little in the way of meaningful application. This results from the fact that Aboriginal and non-Aboriginal people are coming from different world-views and their perceptions and experiences of the very same concepts, such as TEK and Sustainable Development, are quite different” (McGregor, 2004).

Policy can be an important tool in shifting from data collection to implementation of TEK. However, if land managers misunderstand TEK, it could create more problems than solutions. Current aspirational policy serves to recognize the important contributions First Nations and TEK can provide, while ensuring that those using TEK are doing so because they understand it and can implement it successfully. Government has supported the implementation of TEK through policy as much as they are currently able, but must provide more support for TEK to be successfully applied. Land managers and natural resource companies must take the initiative to partner with First Nations so TEK can be applied with the guidance of those who have gathered it for generations.

There is no doubt that Canadians appreciate their environment and what nature provides through forests. As we shift to sustainable, ecosystem-based management and become partners with First Nations, forest managers and First Nations should seek to create mutually beneficial management arrangements. Information regarding what forests used to look like and which past management practices were most effective can help forest managers maintain healthy forests which provide jobs, recreation, and wildlife habitat and ecosystem services. In BC and in Canada, the forest is managed for the benefit of millions rather than a few. For future natural resource management success, partnerships and collaboration are key.

Forest management in BC reflects the environmental and aboriginal rights movements. Priorities have shifted from maximizing revenue from our forests to sustainable forest management and collaborative efforts with First Nations. Ensuring our forests are as healthy for the present generation as they are for the next remains a management priority. Severe disturbance events in BC such as the Kelowna forest fires of 2003 and the current mountain pine beetle epidemic signal that perhaps past management was misguided. Unable to accurately predict what our future forests may look like as climate change effects become more pronounced, TEK provides an opportunity to re-focus on the most important environmental, social and economic benefits our forests provide. As First Nations continue to attain Rights and Title through the BC Treaty Commission, they will become equal partners in forest management in the future. In the meantime, TEK provides opportunity for First Nations involvement in land management.

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