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Water Ethics for First Nations and Biodiversity in Western Canada

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Abstract
The increasing division of academic disciplines and bureaucracy has led to the compartmentalization of knowledge on water security, biodiversity, Indigenous rights, and traditional ecological knowledge policy. The attempt to re-establish links among these issues in academic studies can shed light on integrated water governance and the establishment of water ethics. In order to facilitate this effort, this paper discusses three propositions: (1) the establishment of strong legal and ethical frameworks is needed; (2) policymakers and scientists alike need to recognize links between biodiversity and water security; and (3) they need to improve cross-cultural understanding and communication in using the traditional knowledge of Indigenous peoples and local people. This article examines these issues in Western Canada (British Columbia, Alberta, Saskatchewan, and Manitoba) because this region has invited cross-cultural and inter-jurisdictional conflicts since the twentieth century.

Keywords
water ethics, First Nations, biodiversity, traditional knowledge

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Water Ethics for First Nations and Biodiversity in Western Canada

Although Canada holds about 20 percent of the world's fresh water (Boyd, 2003) with 755,180 square kilometers of fresh water surface area (enough to swallow both California and Nevada), it still faces a number of challenges in securing safe and accessible water (Johns, 2008). Much of its fresh water is non-renewable and remains in the glaciers and aquifers (Dwivedi, Kyba, Stoett, & Tiessen, 2001). More than 60 percent of renewable fresh water in Canada flows into Arctic-bound rivers, whereas, about 80 to 90 percent of Canada's population is concentrated in the U.S. border regions (Boyd, 2003). As the competition for water has intensified since the mid-twentieth century, largely because of industrial development, urbanization, and wasteful lifestyles, the eutrophication, acidity, and chemical contamination of water has intensified (Postel & Richter, 2003).[1]

Water contamination has placed considerable strain on ecosystems and biodiversity (Inquiry on Federal Water Policy, 1984). In 2006, the reported release of pollutants from industrial facilities amounted to more than 2.1 billion kilograms, of which the release into Canada's surface waters amounted to more than 200 million kilograms (Commission for Environmental Cooperation, 2011). Household wastewater, another source of water contamination, contains flame-retardants such as PBDEs (Pynn, 2007; Stockholm Convention on Persistent Organic Pollutants, 2001), pharmaceuticals and personal care products (PPCPs), and other synthetic chemicals (Boyd, 2003; De Villiers, 2003; Wan, 2011).[2] In British Columbia, up until January 2007, untreated sewage discharged into the ocean had led to the closure of about 105,000 hectares of its coastline. It was no longer safe to harvest shellfish in this area, which includes the harbours in Nanaimo, Vancouver, and Victoria.

Wetlands, an important ecological service provider for water quality and biodiversity, have rapidly become depleted largely because of intensified agricultural activities (Johns, Sproule-Jones, & Heinmiller, 2005). By one economist's calculation, the disappearance of one-hectare of wetland means the loss of US$20,000 per year (Postel & Richter, 2003). This calculation does not include the cultural and economic values of Native and local peoples' harvesting activities, including hunting, trapping, fishing, and collecting plants (Marles, 2000; Moodie, 1991; Turner, 1998).[3] In the Fraser River delta of British Columbia alone, 80 percent of wetlands have disappeared (Boyd, 2003).

Environmental engineering technologies and legal frameworks have substantially improved our capacity to deal with environmental problems, but science and technology alone do not provide the ultimate solution to debilitating water problems (Heathcote, 1998). In this paper, I will examine three key propositions that help us better understand these water problems: (a) a strong legal and ethical framework needs to be established; (b) policymakers and scientists alike need to recognize links between biodiversity and water security (e.g., eco-centric approach); and (c) informed and participatory decision-making processes should incorporate better cross-cultural understanding, including the use of traditional knowledge of Indigenous and local peoples. Since the early twentieth century, the increasing division of academic disciplines and bureaucracy has led to the compartmentalization of knowledge on water quality, biodiversity, traditional knowledge, and Native rights, although these areas overlap and are considerably interconnected. Under these divided conditions, how can Canada restore the health of cultural diversity and ecology?

This paper explores this question by focusing on Western Canada– British Columbia and the three Prairie Provinces (Alberta, Saskatchewan, Manitoba). The examination of issues in these provinces is important, perhaps more than in the Arctic region, partly because most studies on Native traditional knowledge and biodiversity have not yet provided detailed studies on Western Canada. More importantly, the focus on

[1] According to Sandra Postel and Brian Richter (2003), worldwide human impacts on the hydrologic environment had increased by nine fold from 1950 to 2000, while the world population had tripled in that 50-year period.

[2] As Canadian wastewater facilities do not treat most of these chemicals, they run into lakes, rivers, and oceans. As a result, some unknown mix of these chemicals occurs. According to the International Joint Commission, the independent Canada-U.S. organization that monitors trans-boundary waterways, scientists can identify only 30 percent of chemical pollutants that are found in fish in the Great Lakes (De Villiers, 2003).

[3] For example, in Western Canada much of materials needed for weaving, wild rice, and other household materials come from wetlands.

this region can clarify Canada's entangled institutional problems with the implementation of inter-provincial collaboration and inter-cultural partnerships that are designed to sustain water quality, biodiversity, and cultural diversity.

In the following discussion, I introduce some representative ideas and practices in legal and political frameworks that are important to understanding issues related to Native traditional knowledge, biodiversity, and water. Then, I examine why existing legal and political frameworks cannot properly empower Native peoples in their efforts to fully participate in local environmental governance as not only stakeholders, but also as rights holders (Barsh & Henderson, 2003). I argue that the full participation of Native and local peoples in environmental governance is key to effectively sustaining local biodiversity and cultural diversity. If one seeks comprehensive approaches to water catchment or some ecosystem, existing legal and political frameworks need to be enhanced by not only science and technology, but also by ethical codes and long-term education efforts. In the last section, therefore, I explore the possible outlook for locally viable ethical principles for water and biodiversity.

History and Concept of Water Law and Policy in Western Canada

In Western Canada, more so than in Canada's northern region, the question of jurisdiction has considerably affected the outlook of law and policy related to natural resources, including those of water (Matsui, 2009). Under the British North America Act of 1867, provincial governments have jurisdiction over natural resources, although Alberta, Saskatchewan, and Manitoba have administered the resources since signing the natural resources transfer agreements of 1930. Even after 1930, water resources administration was never without jurisdictional conflicts. Within provincial boundaries there are areas, such as Native reserves and national parks, which are under the federal jurisdiction (although provincial authorities handle many aspects of administrative detail). All provinces in Western Canada have interprovincial waterways, which require the involvement of neighbouring provinces and the federal authorities. To make the jurisdiction question more complicated, the Agreement of 1909 between Canada and the United States established the International Joint Commission (IJC) to collaboratively manage the use and navigation of trans-boundary waters (Chacko, 1932).[4]

Within these historical contexts, the basic legal framework for the allocation and dispute resolution of water rights took shape in the period between the mid-nineteenth century and the early twentieth century in Western Canada with the mixed origin of civil law, common law, and American water law (Rueggeberg & Thompson, 1984). River lots, typical of the French seigneurial system in French colonies, extended in a limited way to some parts of the Prairie Provinces through Métis settlements in the nineteenth century, although much of Métis water management practices remain unknown (Harris, 1987). The establishment of the British colonies introduced common law, but the gold rush in the Fraser Valley in mid-nineteenth century British Columbia and growing interest in irrigation agriculture in late-nineteenth-century Prairie Provinces led to the introduction of the water doctrine of "prior appropriation" from the American West (Matsui, 2009; for detailed descriptions of water principles, see Kinney, 1912).

The American doctrine of prior appropriation soon became dominant in allocating water in British Columbia and the Prairie Provinces, partly because many political leaders and water law experts believed, at the time, that the doctrine would most effectively induce the development of mining and large-scale irrigation agriculture in arid and semi-arid lands. The recognition of water rights to non-riparian landowners by way of giving priority to early claimants provided a substantial economic incentive in the early twentieth century for developers to construct an irrigation system that would not only increase farmlands, but also raise the monetary value of land (Matsui, 2009). This legal arrangement was important for homestead promoters like railway companies and immigration promoters. In 1911, for example, the Canadian Pacific Railway, the major landowner in Western Canada at the time, sold 80-acre homesteads that were connected to the irrigation system in southern Alberta. The price of one acre for the ready-made homesteads was about $33; whereas, an acre of land without an irrigation system in neighbouring areas cost an average of $14.11 at the time (Kinney, 1912).

[4] In Western Canada, the IJC oversaw eleven trans-boundary waterways, including the Columbia River, the Milk River, and the Lake of the Woods.

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Since World War II, however, the concept of water rights as economic incentive has increasingly become plagued with water shortage and contamination problems. For example, with the population increase along the Fraser, Saskatchewan, and Bow rivers, the demand for domestic water began to compete with demand in the agricultural and industrial sectors. Industrial development (including mining and hydroelectric generation) and agriculture consumed water, but also began to release synthetic chemicals – by-products of a new scientific form of agricultural management – into waterways. Also, the industrialization of paper mills with the heavy use of methyl mercury poisoned fish and birds, along with some Ojibwa people in Ontario where the infamous Canadian Minamata incident (where people were affected by a neurological disorder caused by excessive consumption of methyl mercury) occurred in 1970 (Kinney, 1912).

These alarming conditions, in part, drove the federal government to pass the Canada Water Act in 1970 in order to articulate national interests in improving Canada's water quality. Whereas previous water law for both federal and provincial waters predominantly focused on the use and allocation of water rights along with some dispute settlements, this Act emphasized the importance of conservation as the way to optimize the public good. In its preamble, the Act acknowledges that the "pollution of the water resources of Canada is a significant and rapidly increasing threat to the health, well-being and prosperity of the people of Canada and to the quality of the Canadian environment at large" (Canada Water Act, 1970, Preamble, para. 2). It then proposes that the federal and provincial governments cooperate to undertake comprehensive programs for the conservation, development, and utilization of water resources. This proposal appeared to be a turning point in the history of water law in Canada as previous jurisdictional strife between federal and provincial governments had largely led to the over-allocation and pollution of water resources. The Act was also a significant legal document as it connected the health of the environment to the welfare and prosperity of people in Canada. It authorized the federal government to enter into agreements with provincial or other regional policymaking bodies to establish intergovernmental committees. The committees were to advise on water policies, research, planning, conservation, development, and utilization; they may also facilitate the coordination and implementation of water policies in respected regions. The idea behind the intergovernmental committees resembled the concept of the International Joint Commission, but the committees under the Water Act, unfortunately, have remained largely as ideals without a strong implementation mechanism (Canada Water Act, 1970).

A number of other federal laws and regulations followed the Water Act to deal with water quality issues, but the power of the federal government over terrestrial waters remained limited because, under the British North America Act, provincial authorities possess jurisdiction over water resources, including the management of fresh water quality, safe drinking water, and other water utility services. Canada does not provide nationwide legal and political frameworks for safeguarding the quality of water that are equivalent to the U.S. Clean Water Act and the Environmental Protection Agency (Boyd, 2011; Getches, 1990). The only exceptions may be the areas related to fisheries, navigation, shipping, and transboundary waterways. The Fisheries Act (1985) and its associated regulations provide control over water pollution, including effluents from meat and poultry processing, pulp and paper mills, metal mining, and petroleum refineries.[5] Other federal water laws mostly focus on marine waters or territorial water resources. Some representative laws focus on the less populated North, including the Mackenzie Valley Resource Management Act (1997), the Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002), the Northwest Territories Waters Act (1992), and the Yukon Water Act (1992). The federal agencies also administer other federal waters under the International Boundary Waters Treaty Act (1985), the Fisheries Act (1985), the Canadian Environmental Protection Act (1999), and the Canada National Parks Act (2000).

[5] For example, Chlor-alkali Mercury Liquid Effluent Regulations, C.R.C., c. 811 (2011), Fish Health Protection Regulations, C.R.C., c. 812 (2011), Fish Toxicant Regulations, SOR/ 88-258 (2011), the Management of Contaminated Fisheries Regulations, SOR/ 90-351 (2011), Meat and Poultry Products Plant Liquid Effluent Regulations, C.R.C., c. 818 (2011), Metal Mining Effluent Regulations, SOR/ 2002-222 (2011), Petroleum Refinery Liquid Effluent Regulations, C.R.C., c. 828 (2011), Potato Processing Plant Liquid Effluent Regulations, C.R.C., c. 829 (2011), and Pulp and Paper Effluent Regulations, SOR/ 92-269 (2011).

As the federal government realized that coordinated efforts with provinces regarding environmental problems were needed, in 1971 it established the Canadian Council of Resource and Environment Ministers (CCREM) (later to become the Canadian Council of Ministers of the Environment in 1988) to bring ministers from both provincial and federal governments together. In 1987, the Council issued the Canadian Water Quality Guidelines (CCREM, 1987) for provinces and territories to follow. It also developed a national freshwater quality index tool to help provincial and territorial governments establish standards for water quality administration. According to some political scientists, the Council has played a more visible role than the Water Act itself in coordinating cooperation among provinces (Johns & Rasmussen, 2008).

In Western Canada, the Prairie Provinces Water Board, which was originally established in 1948, took over responsibility for managing water quality in the interprovincial rivers of Alberta, Saskatchewan, and Manitoba after 1969. In that year the three provinces and the federal government signed the Master Agreement on Apportionment, which strengthened the interprovincial cooperation for water quality management. However, it took these governments more than twenty years to enter into a specific agreement on water quality management. This Agreement of 1992 clarified the role of the Board to "foster and facilitate interprovincial water quality management that encourages the protection and restoration of the aquatic environment" (Saunders & Wenig, 2007, pp. 129-130). The term aquatic environment was meant to include all living things within water and the environment, and the agreement clearly indicated the interests of the parties to deal with biodiversity.[6] Thus, before ratifying the Convention on Biological Diversity in 1992, governments in Canada showed interest in conserving biodiversity and also engaging in integrated water resources management through cooperation, participation, and partnership.

Problems in Canada's Water Law

One disturbing question we face is why industry can still discharge large amounts of hazardous chemicals into water even though Canada has established a number of important legal frameworks. According to Boyd (2003), these problems had been partly attributable to some problematic administrative procedures whereby provincial or federal governments provide pollution permits to industry.[7] The negotiation that determines the total allowable amount of hazardous wastes to be discharged into water is individually held without public review and, therefore, "susceptible to lobbying pressure, job blackmail, and threats of leaving the jurisdiction" (Boyd, 2003, p. 30). Also, the notion of "delusion is solution" appears to encourage industry to understand pollution control as the matter of market externality or administrative liability rather than corporate social responsibility (Boyd, 2003).

Others argue that many corporations, if not all, find that meeting environmental requirements is an important part of their social responsibility (Levy & Kaplan, 2008). However, corporations face the challenge of capital costs, along with other costs for planning, building, and maintaining pollution control equipment. Although the total cost for pollution control differs by type of equipment and governments often provide support by building their own facilities, pollution control projects still require a considerable amount of money from corporations. It also generally takes from six months to two years for completion. In addition, corporations must consider the risk of running into unpredictable problems with their equipment (Council of Industrial Boiler Owners, 2012). In the United States, the federal government alone spent about $17 billion on water pollution controls in 2002 (Crandall, 2012). Building and maintaining water treatment facilities for a municipality also places a huge financial burden on taxpayers. The cost of building a water treatment plant in Winnipeg, Manitoba that would draw water from Shoal Lake, located on the Manitoba-Ontario border, was estimated to cost $204 million for construction and $12 million per year for operation (City of Winnipeg, Water and Waste Department, 1999). Partly because of the huge cost of capital and maintenance, the City of Vancouver is only recently undertaking the nation's largest water filtration project, which is estimated to cost $820 million for capital

[6] See the website of the Prairie Provinces Water Board (http://www.ppwb.ca.), which include the text of the 1992 agreement on water quality.

[7] I learned from one scholar that problems are also related to a traditional scientific focus on relative environmental loads rather than total loads, as well as the reliance on the projection of additive and synergistic effects.

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alone (Metro Vancouver, 2010). Therefore, both corporations and municipalities tend to avoid building pollution control facilities (Wilson, 2002).[8]

Different sets of values about water use also affect the management behaviours of industry, science, and government; for example, an industry may continue to discharge chemicals into water to maintain its production and workforces and place other uses of water secondary. Likewise, government officials are not immune from particular social values when they interpret a certain quality standard of water to determine the amount of allowable hazardous discharge for industry. Legal frameworks for pollution control also carry different sets of values. The U.S. Clean Water Act includes recreational and cultural values when it emphasizes "clean" water that is fishable and swimmable (Perry & Vanderklein, 1996). On the other hand, laws and administrations in Western Canada that regulate and manage the consumption of "safe drinking" water tend to focus on so-called "water welfare," in which concerns for maintaining public health and alleviating poverty are predominant. Similarly, the United Nations (UN) Committee on Economic, Social, and Cultural Rights has promoted the idea of water welfare in connection with human rights since the late 1980s (Salman & McInerney-Lankford, 2004).[9] This emphasis on safety and access to water services does not include the needs of ecosystems that are stipulated in the United Nations Programme of Action for Sustainable Development (United Nations, 1992), the Convention on Biological Diversity (1992), and the Canada Water Act (1970). Different sets of values that are prescribed in legal documents pose the question of priority: What needs are more important than others?

The problem also lies in a gap between the environmental law and the property-driven natural resources law. Some American natural resources law experts point out that much of modern environmental law is "parasitic" in Western legal traditions because it developed around 1970, relatively recently, without a solid constitutional footing. Western legal traditions that are exemplified in the constitutions of Canada and the United States evolved within a market-oriented paradigm. As market values have dominated politics and legal development, which, in principle, have limited government intervention, environmental law and government conservation initiatives are vulnerable to other initiatives that are based on market-oriented reasoning. Tarlock (1993) believes that this market value supremacy will continue to influence the development of natural resources law in the future. He writes that "the fundamental problems environmental law will face in the future stem from the fact that the subject has become more and more divorced from the actual protection of the biosphere from serious degradation" (p. 164) (see also Saunders & Wenig, 2007).

Another related problem stems from the lack of effective long-term inter-jurisdictional collaboration between governments, ministries, agencies, local communities, and Indigenous communities. Inter-jurisdictional cooperation is often essential in controlling fresh water quality as water pollution problems occur in, and affect, more than one state or province. This point is particularly true in managing wetlands in the Gulf of Georgia, the watershed ecosystem in the Columbia River basin, and the North and South Saskatchewan rivers. Also, an effective mechanism is necessary to facilitate community-based participation, from planning through management, so that the federal or provincial government can financially aid and administratively empower in-situ, bottom-up efforts for biodiversity conservation, water quality management, Native rights, and other related issues. The Canada Water Act (1970) and the Canadian Environmental Protection Act (1999) can provide templates for these efforts, although, up to this point, most intergovernmental institutions tend to be top-down without sufficiently reflecting local or Indigenous people's needs. In addition, intergovernmental efforts have focused heavily on research and the promotion of ideas. In the 1980s, a federal inquiry on water issues pointed out this problem and initially stressed the importance of action plans rather than the past research-oriented collaboration. Nonetheless, the inquiry ended up producing a report that mostly stressed a need for further research and additional wastewater infrastructures (Inquiry on Federal Water Policy, 1984; Johns & Rasmussen, 2008).

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[8] In the 1990s, New York City planned to build a filtration plant as its drinking water sources from the Catskill Mountains had deteriorated below Environmental Protection Agency standards. It estimated that the capital cost of the plant (from planning to installation) would cost $6 billion to $8 billion dollars and the cost of maintenance $300 million per year. The city abandoned the plan and instead decided to spend about $1 billion to restore the Catskill watershed.

[9] In particular, see the Committee's "General Comment No. 15."

A challenge for community-based efforts to be properly incorporated into environmental policies is the fact that, from time to time, governments need to respond to new international agendas that require additional political strategies and institutional frameworks. These agendas do not always reflect what the communities want; for example, since the early 1990s, the Canadian government has ratified conventions related to biodiversity conservation, climate change mitigation and adaptation, and the prohibition of persistent organic pollutants. As federal or provincial funding is specific to each politicized environmental agenda, Indigenous communities and other local communities have very limited control over planning and directing project implementation. For example, for monitoring some endangered fish species, scientists or fisheries officials may collect Indigenous ecological knowledge to produce a progress report. They need cooperation from Indigenous knowledge holders; yet, Native peoples may not see any benefit to helping the Canadian government that does not settle matters related to the power of Native traditional governance over natural resources.

In Western Canada, Native peoples have not gained clear legal definition of the extent to which they are entitled to the governance of natural resources. Much of the legal discussion has been devoted to specific harvesting activities or health issues (e.g., water treatment). Courts also have mainly dealt with the definition of certain harvesting activities within the meaning of constitutional provisions or treaty rights. As discussed in this paper, the legal concept and policies of Native rights to water, for example, developed in the twentieth century largely to safeguard specific beneficial uses of water such as irrigation (Matsui, 2009). More recently, some legal scholars have proposed to regard Native water rights as human rights and constitutional rights (Boyd, 2011; Collins, 2010; Salman & McInerney-Lankford, 2004), with the emphasis on safety for domestic water consumption. This movement convincingly responds to urgent social problems in many Native communities, but it does not seem to connect to Indigenous sovereignty or self-government. The focus should include the recognition that Native peoples are capable of governing to conserve or manage the watershed environment for not only harvesting or specific economic interests, but also for more comprehensive approaches that include, for example, cultural needs.[10]

Biodiversity and Traditional Knowledge Policies

Without defining the extent to which Native peoples have self-governing powers over natural resources, Canada ratified the United Nations Convention on Biological Diversity in 1992. In the following year, it created a federal-provincial-territorial biodiversity working group by bridging agencies for parks, environment, wildlife, and forestry, but not including the Department of Indian Affairs, the Assembly of First Nations, or the Métis National Council. After two years of discussion, the working group produced the "Canadian Biodiversity Strategy" (Biodiversity Convention Office, 1995). This strategy basically meant to provide guidelines for sustainable use, education, and the extension of international conservation networks for biodiversity. In the beginning of its executive summary, it declares that biodiversity "supports human societies ecologically, economically, culturally and spiritually" (Biodiversity Convention Office, 1995, p. 2). The latter two terms were meant to include both Native and non-Native cultural and spiritual values that are associated with the distinctive natural environment in Canada.

One of the guiding principles of the strategy specifically mentions the traditional knowledge of Indigenous and local communities. It states, "the knowledge, innovations and practices of Indigenous and local communities should be respected, and their use and maintenance carried out with the support and involvement of these communities" (Biodiversity Convention Office, 1995, p. 15). This ethical

[10] The Gwich'in Tribal Council (2004) adopted the traditional knowledge policy within the Gwich'in Settlement region in 2004. It authorizes the Gwich'in social and cultural institute to improve general understanding of Gwich'in traditional knowledge about environmental assessment, heritage management and land, water and resource management and planning. However, detailed information about water management and planning is not yet available. See Gwich'in Tribal Council, "Traditional Knowledge Policy," approved by Gwich'in Tribal Council Board of Directors on June 22, 2004. Retrieved from http://reviewboard.ca/upload/ref_library/GTC%20_FINAL%20TK%20 POLICY%202004.pdf.

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principle is buttressed by another guiding principle that emphasizes the importance of local cooperation, including local, regional, provincial, territorial, national, and global levels, in sharing knowledge, costs, and benefits (Biodiversity Convention Office, 1995). The first principle was intended largely to respond to Article 8(j) of the Convention on Biological Diversity, in which ratified parties are bound to:

> Respect, preserve and maintain knowledge, innovations and practices of Indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices. (Convention on Biological Diversity, 2010, p. 6)

In comparison to this lengthy quote from the Convention, the Canadian strategy does not seem to reflect regional realities, such as inter-provincial and inter-cultural cooperation, although each ratified party should provide a specific institutional mechanism that is suitable to the political and cultural characteristics of each party in protecting Native knowledge, innovations, and practices.

Governments in Canada, however, did begin incorporating traditional knowledge within the framework of its environmental laws, especially in the North. In 1993, the Northwest Territories government introduced the traditional knowledge policy, in which the government acknowledged that Native peoples' 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..." (Usher, 2000, p. 184) and the government will "incorporate traditional knowledge into government decisions and actions where appropriate" (Usher, 2000, p. 184). The Canadian Environmental Assessment Act (1992) also included a provision that environmental assessments consider the traditional knowledge of Indigenous and local peoples (section 16).

The Canadian Environmental Protection Act (1999) enhanced the assessment policy with more substantial acknowledgement of the importance of traditional knowledge. In section 2, it stipulates that Canada will "apply knowledge, including traditional Aboriginal knowledge, science and technology, to identify and resolve environmental problems" (p. 3). This legislation is also significant as it adopted the precautionary principle (section 2), which largely corresponded with the spirit of the Rio Declaration on Environment and Development (United Nations, 1992) and the preamble of the Convention on Biological Diversity. The Canadian Environmental Protection Act (1999) authorizes the Minister of Environment to issue orders for environmental regulations, and the validity of these orders can be reviewed by designated officers, who have qualification in the fields of environmental conservation and protection in Canada, environmental and human health, administrative law on environmental matters, or "traditional Aboriginal ecological knowledge" (section 247).

Another significant legal establishment germane to Native traditional knowledge and biodiversity is the Species at Risk Act of 2002. It empowered the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which had existed since 1977, as the policy advisory body. COSEWIC then created subcommittees of specialists to assist with status reports or advise policy performance on wildlife species and "Aboriginal traditional knowledge" (section 18). These members are to be appointed by the Minister of Environment, and the qualification for appointment includes expertise in Native traditional knowledge. This expertise can be examined by a Native organization although the qualification for this organization is not clear. Section 15 also requires COSEWIC to take into account relevant treaty and land claim agreements (Species at Risk Act, 2002).

Along with the Canadian Biodiversity Strategy (Biodiversity Convention Office, 1995) and the Environmental Protection Act (1999), the Species at Risk Act (2002) emphasizes partnerships and community participation by introducing the idea of stewardship. In this Act, stewardship means the establishment of partnerships between Environment Canada and various local organizations or any persons for the purposes of education, endangered species protection and monitoring, and research. The partnership efforts are to be registered as stewardship action plans. These plans can include a commitment to establish "methods for sharing information about species at risk, including community

and aboriginal traditional knowledge" (section 10.2, p. 9). In doing so, parties involved must "respect, preserve and maintain knowledge and promote their wider application with the approval of the holders of such knowledge, with other governments and persons" (p. 9).

The traditional knowledge policy for biodiversity conservation, however, has remained almost silent about the location of intellectual property rights, cultural rights, and proper political and legal mechanisms that safeguard Native knowledge, innovation, and practices from misappropriation by those who are involved in the collection and use of traditional knowledge. An intriguing exception to this observation is the First Nations Oil and Gas Environmental Assessment Regulations (2007), which provide detailed provision for the disclosure of information. Types of information that are exempted from recording and public view in authorizing oil or gas extraction projects include trade secrets, confidential information (e.g., financial, commercial, scientific, or technical), and "information whose disclosure could reasonably be expected to result in the public becoming aware of aboriginal traditional knowledge that a first nation has always treated in a confidential manner" (section 52). When a project is reviewed with the submission of information to a project review panel, including traditional knowledge, the submitted information cannot be disclosed to the public without the authorization of the relevant person, body, or organization (First Nations Oil and Gas Environmental Assessment Regulations, 2007). To date, no equivalent provision exists in the Environmental Protection Act (1999) or the Species at Risk Act (2002).

International communities, however, have created some legal frameworks for safeguarding the intellectual property rights and cultural rights of Indigenous peoples around the world. As early as the mid-1980s, Canada actively participated in the discussion about the UN Draft Declaration on the Rights of Indigenous Peoples (2007). However, during Prime Minister Stephen Harper's administration, Canada changed its position and initially objected to the United Nations General Assembly's decision to adopt the Declaration in 2007 (although Canada did adopt it in 2010). The Declaration resolves to protect the rights of Indigenous peoples to "cultural, intellectual, religious, and spiritual property" (article 11). To be more specific, it provides that the Indigenous peoples have rights to "maintain, control, protect, and develop their sciences, technologies, and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games, and visual and performing arts" (article 31). Governments are also expected to provide "effective measures" to protect their rights (article 13).

The implication of this Declaration and other international "soft" laws in Canada is not yet clear as cultural appropriation of some Indigenous designs, sports, and medicinal knowledge are still ubiquitous, and quite often these cultural appropriation practices are protected under the legal grounds of free speech, patents, trademarks, and other intellectual property rights. Canadian courts have not yet clearly defined the extent to which property rights can favour Native control over the use of their cultural heritage in Canada, although, in the United States, some scholars argue that existing property laws have the potential to protect the cultural and collective rights of Indigenous peoples (Carpenter, Katyal, & Riley, 2008).

Challenges and Dilemmas in the Traditional Knowledge Policy

In incorporating traditional knowledge into water and biodiversity conservation, Canada has faced a number of challenges and dilemmas. When COSEWIC established a subcommittee on traditional knowledge under the authority of the Species at Risk Act (2002), for example, it was partially yielding to some political pressure from the Native majority, especially in the Territory of Nunavut. Since the establishment of COSEWIC in 1977, experts have focused on species-specific natural science management and lacked the capacity to embrace Native cultural perspectives within its management regime (Boardman, Clark, & Beazley, 2001). Environment Canada also lacked enough expertise on Native traditional knowledge as it heavily emphasized its roles in management categories that were closely associated with economic activities, such as forestry, fishing (the Ministry of Fisheries and Ocean took over this role in 1977), water, and wildlife (Nadasdy, 2011).[11]

[11] Wildlife Management is not very different from agricultural concepts.

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More relevant to Western Canada, the Mackenzie River Basin Transboundary Waters Master Agreement (1997), which came into effect in July 1997, established the Mackenzie River Basin Board (MRBB) partly to implement traditional knowledge policy for sustainably managing water quantity and quality within the basin.[12] This agreement clearly recognizes the importance of Indigenous people's participation in sharing their ecological knowledge with the scientific community and policymaking bodies. The board has 13 members who represent the federal government, three provinces, and two territories. Each province and territory sends one of its board members to represent Native perspectives.

However, the board has not yet established a mutually beneficial relationship with Native peoples in sharing ecological knowledge. The Board's 2006 to 2007 annual report shows that Native members "did not feel that the Board has demonstrated, through its actions, a real commitment to the inclusion of TK as a valued component of Board business" (Mackenzie River Basin Board, 2012, p. 8). The annual report also includes six recommendations from its workshop on traditional knowledge, in which the board renewed its interests in promoting the value of traditional knowledge to a greater extent at the policy level by educating personnel and establishing an internal traditional knowledge committee. As of 2012, however, this committee does not exist. One Native representative from Alberta is missing from the board. The course of action for establishing a mutually beneficial relationship with Native bands, traditional knowledge holders, youths, women, and elders is not yet clear.

Under these uncertain conditions that surround the traditional knowledge policy in Western Canada, the scientific opinion in legal and political frameworks has remained the dominant force in decision making for watershed and biodiversity concerns (Gratani et al., 2011). In addition, a number of consultants and scientists have become increasingly skeptical about the government's political experiment on traditional knowledge policy (Brook & McLachlan, 2008); for example, Widdowson and (2008), after observing traditional knowledge initiatives in the Northwest Territories as non-Native consultants, confess their culturally embedded beliefs in *Disrobing the Aboriginal Industry*. They contend that Indigenous peoples' ecological observation is "junk science" or a commodity for the politicized "Aboriginal industry." The validity of such observation or expression requires scientific testing before being considered even as knowledge.[13] Widdowson and Howard also dismiss the credibility of academic works that emphasize the importance of traditional knowledge in environmental management because most of these studies "simply provide random recollections from elders" (Widdowson & Howard, 2008, p. 237).[14] Although traditional knowledge should be scientifically validated, they continue, this task will pose some fundamental difficulties, as traditional knowledge and scientific knowledge are profoundly different (Widdowson & Howard, 2008). Their descriptions of science, in contrast, appear to uphold neutrality, preciseness, and reliability – the quality only possessed by non-Native people. Here, Widdowson and Howard do not seem to be aware of rich literature on political ecology and other academic studies, which examine the culturally-biased process of scientific knowledge making, as well as policymaking (Nadasdy, 2003).[15]

Peter Usher, veteran consultant on Native culture and history, also thinks that the traditional knowledge policy is not working well in Canada, partly because governments remain vague about road maps for policy implementation (see Northwest Territories Department of Environment and Natural Resources, 2009).[16] However, Usher distances himself from the position taken by Widdowson and Howard (2008) and acknowledges the importance of studying traditional knowledge. He does not define it as junk

[12] The full "Mackenzie River Basin Transboundary Waters Master Agreement" (1997) document was downloaded from www.mrbb.ca/uploads/files/general/19/mackenzie-river-basin-transboundary-waters-agreement-pdf.

[13] Arun Agrawal (1995) discusses the fallacy of polarizing Indigenous and Western knowledge.

[14] Their statement here seems to differ from the opinion of the Supreme Court of Canada, especially in its Delgamuukw decision. The decision acknowledged the importance and validity of elders' testimonies in courts.

[15] Some prominent cultural anthropologists like Bronislaw Malinowski have long advocated that all cultures possess science as well as religion and magic.

[16] The government of the Northwest Territories has improved its traditional knowledge policy considerably since the late 1990s. Its "Traditional Knowledge Implementation Plan" (2009) provides the policy roadmap by focusing on seven major implementation activities; (1) coordination; (2) awareness and training; (3) collaboration; (4) promotion; (5) support and guidance; (6) resource allocation; and (7) accountability. These activities are to be coordinated by a traditional knowledge coordinator in the Department of Environment and Natural Resources.

science, but rather as different types of in-situ knowledge for effective environmental management that can be acquired through years of experience and observation. Unlike Widdowson and Howard, Usher's definition of traditional ecological knowledge includes the one possessed by not only Native peoples but also local non-Native people. A difference between traditional and scientific knowledge in Usher's theorem does not appear to be as fundamental as Widdowson and Howard postulate. Usher (2000) argues that traditional knowledge is distinguished from the scientific when knowledge holders do not have formal science education. Unlike some other scholars who have studied traditional knowledge (see for example Berkes, 2012), Usher (2000) believes that traditional knowledge can be acquired within one generation as traditional ecological knowledge has adapted to environmental changes.

As many more studies on traditional knowledge have appeared and provided their own definitions since the 1990s (Brook & McLachlan, 2008)[17], this question of its applicability beyond a specific region and discipline has begun to afflict both policymakers and scholars. Unlike scientific knowledge, which has been internationally shared through periodicals, conferences, and databases, traditional knowledge studies have not sufficiently encouraged international, cross-regional, and cross-cultural exchanges. As most non-Native policymakers and scholars do not have enough experience among traditional communities, they have difficulty understanding the extent to which some successful collaborative environmental management in a particular area between Native people and government can provide a useful model to other regions or countries (Anderson & Barbour, 2003).[18] Because biodiversity and water conservation require inter-disciplinary (Dewulf, François, Pahl-Wostl, & Taillieu, 2007) and cross-regional approaches within one entire basin or ecosystem, this question of model application does not sound far-fetched to ask, especially if one aims to effectively incorporate traditional knowledge into participatory environmental governance.

Anthropologist Paul Nadasdy (1999) asks if traditional knowledge is culturally contingent or if knowledge in general can be cross-culturally integrated, given a widely-held impression that the traditional knowledge policy has achieved so little success in building inter-cultural partnerships. A related question may be whether a non-Native person or outsider can understand Native traditional knowledge. In Nadasdy's case study on the Kluane people in the southwestern Yukon, anthropological studies often appear to overemphasize men's roles in hunting partly because those studies do not take into account how women were part of important hunting ritual practices. He then continues to illustrate profoundly different ways that the Kluane people and government biologists perceive game management. The Kluane people focus on hands-on experience, while the biologists rely on number counts. In his conclusion, Nadasdy (2003) contends that cross-cultural communication is not impossible, but, since the process of acquiring both Indigenous and bureaucratic knowledge are socially embedded, "any attempt at knowledge-integration is at least as much a political process as an epistemological one" (p. 113). If one places this process within a context of colonial history and power imbalance, the politicization of knowledge means the marginalization of Indigenous governance over their own natural resources (Butler, 2006; Nadasdy, 2006).

In Western Canada, the problem is more complicated than the issues in Nadasdy's (1999) study, largely because there is a wide variety of cultural practices and economic interests even among Native peoples. Any effort to bridge these differences will pose a huge challenge for cross-regional environmental governance. For example, in the Northern Saskatchewan River valley that encompasses areas in Alberta, Manitoba, and Saskatchewan, the Assiniboine, Cree, Ojibwa, Blackfoot confederacy, Stoney-Nokoda, and Métis historically shared or competed for control over harvesting areas. The Blackfoot confederacy and Assiniboine do not have a reserve in the valley today, but they may have traditional knowledge related to the use of the watershed environment in the valley. In the nineteenth and twentieth centuries, newcomers from Europe began to occupy these Native territories. Those newcomers included Ukrainian farmers and other European immigrants who now have more than one hundred years of history in coping with that environment. How do these people share their traditional knowledge in cooperatively governing the environment of their neighbourhood?

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[17] Between 1980 and 2004, more than 421 articles discuss traditional knowledge, Indigenous knowledge, or local knowledge, most of which were published after the mid-1990s.

[18] Some researchers are confident that their model can be applied to different regions or cultural groups.

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The idea of using traditional knowledge for conserving biodiversity has raised another important question. Usher's study divides traditional knowledge into four categories (cited in Usher, 2000)[19] and places them within a context of a scientific paradigm. The first category of knowledge includes the rational one based on long-term or short-term observation of changes in the natural environment. Here, scientists want to know how Indigenous peoples have observed weather patterns, ice, sea levels, currents, and animal behaviour. The second category comprises the "facts" on environmental uses. The third one is defined by the expressions of moral or ethical values. The last category consists of worldviews based on cultural norms. Usher argues that the first two categories of knowledge, in particular, require descriptions of scientific methods and validation by scientists (Usher, 2000). In sum, Usher's compartmentalization of knowledge does not help explain the way traditional knowledge holders see the interactions between them and the natural environment. Usher's categorization may also misappropriate or assimilate cultural knowledge that mainly accommodates some government scientists (Nadasdy, 2006).

Today, Native band governments in Western Canada are involved in their own ways of environmental management, and, in many cases, they disagree with Usher's scientific paradigm. As their ancestors frequently adopted new Western technology and knowledge, such as guns and metals, to enhance their traditional activities, Native bands today take advantage of scientific methods and modern technology (e.g., GIS mapping of traditional land use) to enrich their governance of natural resources. Many Secwepemc individuals I know in the interior of British Columbia went to public schools and studied science. Leaders generally welcome such educated members or other non-Native individuals with training in science to work for their band as long as they follow Native protocols. This open policy for non-traditional elements does not mean that Native communities are getting less traditional, if one defines the term as dynamic and fluid in nature. In the case of traditional fishing, for example, some individuals are designated as fishery chiefs. They still control traditional protocols for their fishing activities, even though much of nineteenth-century fishing technology is no longer in common use. Usher's contention that traditional knowledge holders do not have formal science education does not apply to the Native peoples I know, for many traditional knowledge holders can handle both traditional and scientific knowledge. A clear-cut differentiation between traditional knowledge and scientific knowledge can limit the roles Native peoples can play in environmental governance.

Canada's policy on biodiversity conservation has posed another challenge to implementing collaborative or co-management policies for biodiversity conservation and traditional knowledge among Indigenous peoples, local people, government officials, and academics. As already stated, the Canadian Environmental Protection Act (1999) has promoted the precautionary principle and the concept of stewardship. The precautionary principle guides policymakers to take a preventive approach or action when necessary, without waiting for the daunting process of obtaining clear scientific evidence. To date, this principle has gained strong support from many European and American scientists and policymakers in dealing with the elimination of persistent organic pollutants (de Wit, Alaee, & Muir, 2009). Policies for biodiversity conservation and traditional knowledge, on the contrary, have mainly required top-down scientific validation, as the opinions of Usher and others above demonstrate. When Indigenous and local communities are asked to participate in government-led initiatives that are already planned by government and dominantly operated by scientists and technocrats, the idea of stewardship in the Canadian Environmental Protection Act (1999) cannot fully facilitate community participation among local and Indigenous peoples. Even though COSEWIC's subcommittee invites experts on traditional knowledge or the Mackenzie River Basin Board invites Native representatives, as long as its management mechanism does not appreciate Indigenous governance or empowerment for specific management projects, Native elders and technocrats continue to see the goal of biodiversity conservation and water quality matters with the use of traditional knowledge from very different standpoints. A similar case was reported in the Yukon (Nadasdy, 2006).

[19] Houde (2007), who has worked for a First Nation tribal council in Quebec, divides traditional ecological knowledge into five categories: factual observations, management systems, past and current uses, ethics and values, and culture and identity. He sees this categorization and the building of databases of traditional ecological knowledge as "a bargaining chip that can be used in negotiations with the state government or private companies" (p. 35).

Another challenge to traditional knowledge policy is that, as I have mentioned, above, Canada does not have a strong legal framework or institutions to safeguard the cultural and intellectual rights of Indigenous peoples from misappropriation. Various commercial activities have appropriated Indigenous peoples' traditional culture, knowledge, innovation, and practices (Tsosie, 2002). Under the current legal framework, traditional knowledge, which is communally shared and non-commercially maintained, can be regarded as public domain without federal protection (Howell & Ripley, 2009; McManis, 2009). As a result, government agencies, corporations, and researchers who are interested in traditional knowledge, biodiversity conservation, or water safety, can use ideas that are "inspired" from Native peoples and cultures without paying proper royalties or compensation (Oguamanam, 2006; Taubman & Leismer, 2008). The Convention on Biological Diversity (1992) and the Canadian Biodiversity Strategy (Biodiversity Convention Office, 1995) do call for "respect" and "prior informed consent," but these terms have not driven policymakers to establish a legal framework that prevents businesses and researchers from culturally appropriating Indigenous knowledge. The Convention also emphasizes equitable access and benefit sharing (ABS) if economic developments benefit from Native peoples, but, again, this ABS principle does not apply to those properties that only gained inspiration from Native peoples. Indigenous peoples in Canada, therefore, depend largely on individual agreements or non-legal frameworks with companies, government agencies, and academic organizations in order to deal with intellectual property rights and benefit sharing (de Carvalho, 2009).

Ethnics for Water and Biodiversity

Recognizing the limit of legal and political frameworks for protecting traditional knowledge, biodiversity, and water issues, United Nations agencies and some Native representatives have advocated establishing ethical frameworks (Schmidt, 2010). In general, ethical approaches provide more inclusive and participatory scope than legal and scientific approaches in dealing with traditional knowledge use and protection, biodiversity conservation, and water quality and quantity issues. Therefore, in this section, we will examine the potential outlook of ethical principles that enable us to deal with these three topics as interconnected matters.

Although ethical principles cannot legally bind nations or individuals, one cannot underestimate their long-term influence. Since the early twentieth century, international ethical principles have considerably influenced the development of legal and political frameworks as well as research activities in Canada and other countries. For example, the Nuremberg Code (1947) and the World Medical Association's Declaration of Helsinki (1964) have become the backbone of biomedical ethics for safeguarding the rights of human subjects in experiments. These principles include "free prior informed consent," which later influenced the Convention on Biological Diversity, especially its Article 8(j). The new development of ethical codes or principles for traditional knowledge, biodiversity, and water, therefore, is potentially influential for the future (Drinan, 1992).

In Canada, the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), and the Social Sciences and Humanities Research Council of Canada (SSHRC) adopted *the Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans* in 1998 and revised it in 2010 (Bannister, 2009). Its fundamental ethical principles include respect for participants' autonomy, meaning that researchers must obtain "free, informed, and ongoing consent" (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences and Humanities Research Council of Canada, 2010). Other principles include equity or justice, for example, in benefit sharing. As these councils provide Canada's major research grants and require researchers to agree to their terms and conditions, the Tri-Council's ethical principles carry a considerable weight in Canadian research activities. These principles may also help researchers and even government scientists to establish co-management protocols or research collaboration with Native peoples for water conservation, traditional knowledge collection, and biodiversity surveys.

The recent development of international ethical codes has also influenced the policies on biodiversity and Native traditional knowledge. In October 2010, the tenth meeting of the Conference of Parties to the Convention on Biological Diversity, which met in Nagoya, Japan, resolved to adopt an ethical code of

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conduct in order to "ensure respect for the cultural and intellectual heritage of Indigenous and local communities" (United Nations, 2010, p. 277). This code was mainly designed to provide ethical principles for parties to implement Article 8(j) of the Convention. These principles include prior informed consent, inter-cultural respect, collective or individual ownership, fair and equitable benefit sharing, and a precautionary approach. The principle for inter-cultural respect recognizes the intrinsic value of traditional knowledge and proposes to "avoid the imposition of external concepts, standards, and value judgments" (p. 282). This principle implicitly suggests that scientific validation of traditional knowledge may impose "external concepts" on Native traditional environmental governance, and, therefore, the validation should be done in a culturally appropriate way (Convention on Biological Diversity, 2010).

The Nagoya Code also recognizes that Indigenous and local communities are often inextricably bound to traditional lands, waters, and sacred sites both individually and collectively; therefore, their individual and collective rights to having access to these areas should be safeguarded by national and international laws, as well as ethical principles. The recognition of the cultural connection to land also suggests that cultural diversity may play a key role in sustainably using natural resources. When it is so, Indigenous and local communities should "be actively involved in the management of lands and waters traditionally occupied or used by them" (Convention on Biological Diversity, 2010, p. 6).

This point, however, needs careful examination because the active involvement of Indigenous peoples in Canada has been marred by legal constraints and scientific compartmentalization of knowledge. In Canada's Constitution Act of 1982, for example, section 35 recognizes "existing aboriginal and treaty rights," but the extent to which each Native band, tribe, or nation has control over natural resources on the off-reserve traditional territory has not been clear. Native hunters and fishers have too often been confronted by game wardens and fisheries officers, occasionally leading to arrests and court disputes. Thus, Native peoples and local communities remain limited to the role of passive participants in government-planned initiatives, rather than being co-planners and managers. Many Native bands in British Columbia are in the process of clarifying their title to traditional territories, as their reserves are much too small to have a band-based autonomous management of a river basin or ecosystem. Also, unlike the Navajo Tribal Council or other large tribal organizations in the American West, which have their own constitutions, courts, and natural resource management systems (Ambler, 1990), many band governments in Western Canada do not have an appropriate administrative mechanism to be able to deal on a par with the large mining, logging, or agricultural companies that encroach on their traditional territories. To fully implement Article 8(j), Canada needs to substantially empower Native bands with regard to environmental governance.

Another notable principle in the Nagoya Code is the issue related to fair and equitable benefit sharing. The 2010 Conference of Parties to the Convention on Biological Diversity and the World Intellectual Property Organization (WIPO) paid special attention to it (WIPO, 2011). The issue of benefit sharing has increasingly perturbed legal scholars, NGOs, and Indigenous peoples, among others, largely because, up until recently, businesses and intellectual property lawyers had treated Native cultural heritage mainly as public domain or economic externalities (Bell & Paterson, 2009; Brown, 2003; Young, 2010). Also, the protection of cultural heritage has not gained much attention in connection with the sovereignty and self-government of Native peoples (Tsosie, 2002). Nevertheless, a substantial discussion about benefit sharing at the tenth meeting of the Conference of Parties to the Convention on Biological Diversity has clarified that the collectively-held properties are also the subject of legal protection from misappropriation and theft. When someone benefits from legally using some aspect of Indigenous peoples' knowledge, the benefits should be returned to the original owners not only as royalties or monetary compensation, but also in the form of information and technology sharing that may enhance the capacity of Native polities in governing natural resources.

These principles took shape as a result of years of discussion among experts in United Nations agencies and Indigenous delegates. Most notably, the Akwé:kon guidelines (meaning "everything in creation" in the Mohawk language), which the Secretariat of the Convention on Biological Diversity issued in 2004, contributed considerably to the 2010 Nagoya Code. In fact, the guidelines go beyond the Code in terms of cultural insight, depth, and detail. Although the focus of the guidelines is on cultural, social, and environmental impact assessment and the contents may not be fully agreed upon by all Native and local

communities, the guidelines provide clear step-by-step instructions regarding how non-community members may approach and establish better cross-cultural understanding and collaboration. Akwé:kon also proposes that the full and effective participation of Indigenous and local communities should be observed from the preparation stage to decision making and monitoring. Here, not only government officials, but also all participants, are expected to engage in establishing "effective mechanism for Indigenous and local community participation" (Secretariat of the Convention on Biological Diversity, 2004, pp. 8-9). The participants should include women (McGregor, 2008), youths, elders, and other vulnerable groups. The effective mechanism can provide an agreed process and place for screening, reviewing, monitoring, and auditing, in which both Native and non-Native participants freely express their concerns and views in leading to some agreement or action plan on a proposed development (Convention on Biological Diversity Secretariat, 2004).[20]

Many Native organizations in Canada have also adopted ethical principles for traditional ecological knowledge and other environmental issues. The Métis National Council (MNC) established the National Environment Committee in 2011 to buttress the effort of members to sustain traditional environmental knowledge (Métis National Council, 2011). This Committee is represented by five provincial Métis organizations in Western Canada (Métis Nation of Ontario, Manitoba Metis Federation, Métis Nation-Saskatchewan, Métis Nation of Alberta, and the Métis Nation British Columbia). The MNC also has worked with the Women of the Métis Nation to issue the "Traditional Knowledge Policy Paper," in which the traditional roles of women in transmitting and protecting traditional knowledge are emphasized (Women of the Métis Council, n.d.). These Métis organizations are still refining their guidelines for traditional knowledge research that require partnerships with academic researchers. However, Clément Chartier, President of the MNC and Minister of Environment, has actively pursued establishing partnerships with academic researchers who are experts in historical economic and environmental issues. This partnership, in turn, has partly helped achieve a number of successful defenses of Métis harvesting rights in court, including *R. v. Powley* (2003) (cited in Ray, 2011).

There are, however, some shortcomings of ethical principles. The Akwé:kon guidelines and other similar works[21] do not guarantee the effective participation of many Native and local communities. Partnership or co-management requires a deeper cultural understanding of traditional protocols. The participation of youth, women, and elders does not always provide culturally engrained perspectives. One needs to know people in the community in order to identify traditional knowledge holders who are respected within their own communities. In the southern coastal communities of British Columbia, for example, the longhouse has functioned as an authentic venue to legitimize knowledge and expression,[22] but not all members of the community are entitled to speak, dance, or sing traditional matters. As reported by Johnston (1976), an intensive and rigorous process of training is required to become traditional medicine men, and, without knowing the cultural protocol, scientists, government officials, and consultants may easily fall prey to the sweeping claims made by Widdowson and Howard in their book. In a similar vein, fieldwork on traditional ecological knowledge may not appear to render positive insights for environmentalists or consultants in writing reports on environmental management, but this uncertainty does not mean that traditional knowledge does not exist there (Guidotti, 2007). It often requires trained eyes to understand different cultural expressions and practices; therefore, ethical guidelines require long-term support from educational institutions or cross-cultural collaborative programs to promote in-depth, cross-cultural understanding of these documents among potential consultants and scholars.

Ethical guidelines can also be used to deal with dispute resolution if some co-management or partnership runs into disagreement without relying on the court system. Academic researchers and Native leaders in Canada have collaboratively sought the possible shape of inter-cultural alternative dispute resolution

[20] This document was also published in the *International Journal of Cultural Property*, 24(4), 409-429 in 2007.

[21] Preceding the Akwé:Kon, for example, Indigenous peoples from thirteen countries met and adopted the Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous Peoples (Commission on Human Rights, 1993). It recommended that Indigenous peoples establish their own ethical code of conduct for external users.

[22] The University of Victoria and Royal Roads University have hired those who are well versed in traditional protocols as cultural liaison persons.

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methods, which incorporate traditional models. The traditional models vary by band, tribe, or nation, but many Indigenous models apply certain fundamental ethical notions, such as trust, reconciliation, healing, and forgiveness. The Tsuu T'ina Nation near Calgary, for example, has a court, where Native judges and prosecutors work with peacemakers to resolve conflicts by relying on the traditional concept of healthy human relationships (Dewhurst, 2004). These new attempts mainly focus on inter-personal disputes, but they can be applied to other types of disputes, including water shortage or contamination, biodiversity or conservation or loss, and the validation of traditional knowledge that we have examined above.

Another challenge to these ethical guidelines can be related to the question of how they can be linked to watershed management. Proponents of biodiversity conservation have long noted that a healthy watershed environment has provided the basis for both cultural and biological diversity, and vice versa. Postel and Richter (2010) elaborate on this question by drawing on the teachings of environmental ethicist and ecologist Leopold (1949), who proposed an examination of the health of the environment within a context of ecological whole. They introduce the idea of *water ethics*, in which ecological needs are fairly represented in water management systems, and contend that the precautionary principle can function as a safety valve to deal with the uncertainties of scientific management. As the scientific projection models of river flow patterns and the quantity of available water may go wrong, often because of the unpredictable nature of weather conditions, the precautionary principle gives good reasons for decision makers to save "a large enough share of natural river flows [in rivers] to ecosystem support" (p. 119). For Postel and Richter, the principle of public trust, rather than public dependency on sciences and technologies, should guide water ethics for action.

In *Water for Life*, Wescoat and White (2003) emphasize the importance of changing social values in our attitude towards environmental conservation. For example, wetlands were once regarded as the source of disease vectors and pests, but today ecologists and others have come to realize their important ecological functions. In a similar vein, traditional knowledge on water use and conservation can be elevated from the notion of archaic or outdated practices to that of a potential asset to sustainable development. Here Wescoat and White (2003) do not mean that traditional knowledge and practice can directly apply to rapidly changing contemporary conditions. Traditional practices need further adjustment with the supplement of scientific environmental knowledge. The ethical principle of cross-cultural respect and autonomy, along with others, can facilitate further works that bridge scientific and Indigenous or local communities in Canada (Sandford & Phare, 2011).

Conclusion

These contemporary attempts to establish ethical principles similarly stress the empowerment of people, cross-cultural respect, ecological needs, equity, precautionary principle, and self-government. Ethical principles and education have nourished changing social values and are expected to continue doing so in the future. Keeping this point in mind, let us revisit the question I raised in the introduction: How can Canada achieve comprehensive water governance and improve water quality for both humans and biodiversity?

The first step toward this goal is to identify challenges to achieving comprehensive governance. We have observed some challenges in legal and political frameworks. We also looked at the gap between science and traditional knowledge. Here I use governance rather than management, for management tends to operate in a linear way and cannot be comprehensive. Wescoat and White (2003) point out that a basic challenge to water management in the twenty-first century is "to identify which combinations of research and administrative policy offer promising opportunities to exercise genuine positive methods of achieving a sustainable world" (p. 25). In this predominantly technocratic scenario of environmental management, the voice and insights of Indigenous and local communities continue to be marginalized. Governance, on the other hand, has the potential to embrace different cultural and political views without relying solely on experts to make decisions for local people. Then the ideas of self-government (self-determination), the precautionary principle, equity, and cross-cultural respect can work better to empower people.

Another important step is to acquire a deeper level of cultural understanding about traditional knowledge. Through learning about traditional knowledge, local community members can gain not only

ecological knowledge, but also a sense of belonging that is distinctively attached to the local environment. Here I do not mean that in Western Canada local knowledge can be isolated from the influence of the mass communication systems. Many Native and local communities have increasingly experienced the disorientation of their sense of belonging to the local environment, but the rediscovery of locally engendered knowledge can re-orient community members to maintain or develop intimate relationships to their local environment and people. My proposal for water ethics, therefore, is to add to the ideas of Postel and others who suggest that the sense of belonging and stewardship for the local environment can come from traditional knowledge education. This also aligns with what Leopold (1949), Naess (2003), and Shiva (2003) have proposed – to place one's daily activities within a context of biotic community and rediscover one's "ecological self."

The ideas and actions for comprehensive governance cannot be complete without acknowledging the importance of traditional knowledge not only for specific environmental management, but also the interconnected issues of biodiversity, climate changes, natural disasters, public health, sustainable agriculture, and water quality. These approaches, however, should not exempt learners from establishing clear ethical and legal protocols for safeguarding traditional knowledge.

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