Role, Place, and Value of Indigenous Voices in IWRM: Lessons from Canada, Australia, and New Zealand

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Abstract
This case study focuses on the importance of indigenous presence in the establishment of effective integrated water resource management systems. It examines where each of Canada, Australia and New Zealand stands in terms of its water management systems, and the initiatives they have taken to implement inclusive policies that preserve nature and respect the rights of First Nation communities. The effects of colonialism continue to this day, but societies and governments are slowly progressing in their reconciliation plans. Specific watersheds in each country, Syilx Okanagan and Cowichan Watershed in Canada, Murray-Darling Basin in Australia, and Waikato and Waitaki River in New Zealand, are discussed to provide an overview of the policies and their implementation and reconciliation plans. The case study also includes recommendations for more effective integrated water management methods that can be implemented worldwide.

Introduction
There is widespread global awareness regarding inadequate safety, sustainability, and cleanliness of water in many developing countries. It is nevertheless important to remember that developed countries like Canada, Australia, and New Zealand also face challenges in managing water, particularly in indigenous communities. Thus, this paper delves into the significance of incorporating indigenous knowledge and perspectives into integrated water management (IWRM), which aligns with many United Nations Sustainable Development Goals (SDGs). Specifically, it addresses SDG indicator 6.5.1 by exploring the importance of indigenous knowledge and perspectives within integrated water management. Further, it sheds light on the barriers to equal access to safe drinking water within the three nations, as related to indicator 6.1.1. Furthermore, it emphasizes the importance of comprehensive water management systems, which integrate all stakeholders, for efficient water use, as per indicator 6.4.1. Consequently, the paper argues that improved water management practices will result if indigenous leadership, science, and community engagement are included, based on a review of the literature. However, IWRM decision-making processes have not yet been effective in adequately representing indigenous voices in Canada, Australia and New Zealand. Thus, in accordance with SDG 6.b.1, this paper examines policies and mechanisms that support meaningful and comprehensive stakeholder participation in three countries. This paper delves into the extensive indigenous connection to water management across cultural, political, economic, and regulatory spheres as well as NGO involvement and community empowerment. Some current issues facing water management in Canada, Australia, and New Zealand are evaluated through specific case studies, which offer suggestions for effective IWRM strategies and priorities that could be pursued in each country, or perhaps implemented across the three.

Indigenous water management under settler colonialism
Colonialism is a process of oppression and subjugation at a macro level, where one civilization forcibly imposes its way of life and will on another, typically motivated by economic exploitation; colonized people may be displaced or assimilated into the colonized culture as a result (Kohn & Reddy 2023). Throughout the centuries before Eurocentric colonialism began to impact our focus countries, indigenous communities had managed their land and waters through the use of

their own unique traditional practices which were passed down through generations under their own supervision (Hartwig et al, 2022). However, colonial authorities decided to disregard and actively displace these practices by preventing indigenous peoples from having legal rights to their ancestral land and water sources, and they further attempted to assimilate them through practices of cultural genocide, such as forcibly moving children away from their homes and sending them to residential schools (Hartwig et al, 2022; Robison et al, 2018). Ultimately, the long-term and lasting effects of the settler regime on indigenous water rights are still felt in our three focus countries today, as institutional remnants of the British Commonwealth remain; it also systematically weakened the foundations of indigenous self-determination through forced assimilation, cultural genocide, and ecological exploitation (Hartwig et al, 2022; Robison et al, 2018). Fundamentally, to gain complete control, colonial occupations in Canada, Australia, New Zealand, and beyond targeted indigenous governance structures for demolition, attempting to annihilate indigenous self-determination in their political, economic, and socio-cultural affairs (Jackson, 2018). Thus, even though it has been many decades since initial settlement, and there have been many reconciliation efforts, settler thinking remains deeply rooted in social and legislative systems. The result is that they still do not fully recognize or integrate indigenous sovereignty and water management practices into action (Hartwig et al, 2022; Jackson, 2018).

Water and reconciliation in Canada, Australia, and New Zealand

The process of reconciliation is the adoption of mutually re-evaluated steps to address the injustices committed by colonization and its lasting harmful effects on indigenous communities (Sterritt, 2023). The long-term goal of the settler state, as it is currently structured, is to establish a new relationship with indigenous peoples that recognizes their rights, promotes mutual respect, and fosters cooperation. However, colonialism's legacy has had a profound and far-reaching effect on indigenous societies, attempting to eradicate their ways of life through decades of attacks on their land rights, education, economic and social health, and liberties. For true reconciliation to occur, it must be approached and dealt with holistically to restore indigenous sovereignty and governance. Reconciliation has become widely recognized as an essential process that should be addressed by the federal legislature of the Commonwealth, so it is essential that considerations go beyond current political rhetoric (McGregor, 2018). To be effective in the reconciliation process, it is imperative to support broader areas, such as indigenous water security and indigenous rights, to govern watersheds in Australia, Canada, and New Zealand (McGregor, 2018).

Ultimately, water security and environmental justice are crucial for the human security and health of indigenous communities on a physical, social and spiritual level (Wilson et al., 2019). Furthermore, the commodification of the natural world by colonial powers not only affects the material security of indigenous people, but also their relationships with their land, knowledge systems, spiritual practices, and community processes (Coté, 2016). For one example, the rights and livelihoods of indigenous fishers in numerous communities across our focus three nations are threatened by anthropogenic climate change, the negative biophysical effects of upstream agricultural activities, exploitation from recreational fishing, and the loss of biodiversity, which all continue to negatively impact food security, the economy, and connections to nature (Bodwitch et al., 2022; Ligtermoet, 2016; Nesbitt et al., 2016). In addition, in both Canada and Australia, the right to safe drinking water has been a major focal point in reconciliation due to long-standing unsafe drinking water advisories (Bradford et al., 2016; Human Rights Watch, 2016). Furthermore, water rights are important not only for material benefits, but also because indigenous perspectives often transcend human dimensions when it comes to reconciliation, community, and culture; their vision is that reconciliation with nature leads to justice; they recognize that their ancestral and traditional territory isn't a commodity, but something deeply and innately valuable (McGregor, 2018). Overall, it is clear that reconciliation and empowerment of indigenous water governance go hand in hand, as colonialism's harmful

impact on indigenous people's relationship with water has lasted generations and must be addressed.

Water personhood rights

Since 2017, Canada, Australia, and New Zealand have observed cases of the granting of water personhood rights to water bodies. This legal concept entails the recognition of water bodies as having inherent rights, which allows for recognized bodies to be represented by people in court seeking to stop actions that cause environmental harm to them (Clark et al., 2019). Examples of this include the granting of rights to the Whanganui River in New Zealand (through the Te Awa Tupua Act in 2017), the Magpie river in Canada (through two resolutions of the Innu Council of Ekuanitshit in 2021), and the Birrarung/Yarra river in Australia (granted through Act of Parliament in 2017) (Erueti, 2016; O'Bryan, 2019; Talbot-Jones & Bennett, 2022). However, water personhood rights have also been criticized for potential ineffectiveness. For example, in the famous case of the Te Awa Tupua, the Whanganui has status as a legal person but not necessarily the corresponding rights needed to function as a person, i.e., inability to hold property thus excluding its own right to water (O'Donnell, 2021; Stewart-Harawira; 2020).

The value of water

In 1992, the Dublin Principles articulated four declarations about water including its significance as an economic good (Keulertz & Riddell, 2022). However, the specific applications of this principle are yet to be agreed upon on globally. A major example of water acting as an economic good is as an agricultural input, which has contributed significantly to the economy but also has detrimental impacts on water security where depletion has occurred.

This section examines how water is perceived in each of the three countries. Water is a source of life, national prosperity, and an important connection between the planet and its citizens. In each country, the different values of diverse indigenous communities and cultures, as well as the priorities of government agencies, indicate what perspective they have and what their next steps towards water security might be. Current conditions are not always accurate representations of beliefs and strategies. For example, in Canada, where water is considered a source of life, 73% of Indigenous communities' water systems are at risk of contamination (The Council of Canadians, n.d.).

Water has shifted to become a commodity in many contexts including in Canadian First Nations where there exists a lack of clean water (Black & McBean, 2017b; The Council of Canadians, n.d.). There is recognition that treatment and distribution infrastructures must be built to accommodate these needs, and that the implementation and operation of the facilities could provide career opportunities for community members. In an inspection of 807 existing systems, 39% were determined to be at high risk for contamination (Black & McBean, 2017b). The study also finds a link between the lack of resources provided to staff in maintaining and operating the facilities. Resourcing needs include proper training and certifications, payroll, and equipment.

In Australia, there is a focus on water for agriculture and electricity generation. Historically, the settler view of water was as a means for economic development in Australia; and Indigenous nations were stripped of their economic right resulting in their owning only 0.2% of water rights in Australia (Jasper, 2022). Indigenous communities in Southeastern Australia rely on the Murray- Darling Basin for agricultural purposes (Bischoff-Mattson et al., 2018; Tardieu, 2018). Although Australian Native Title law considers inclusive water rights for indigenous peoples for domestic use to a certain extent, it does not consider their commercial and economic water rights (Bischoff-Mattson et al., 2018). The Basin plan trading rules support trade of resources without restrictions other than some hydrological limits and irrigation infrastructure operator ones (Bischoff-Mattson et al., 2018). As a result, indigenous communities do not have the opportunity to contribute to farming and food security as well as the economic

benefits involved. In addition, there has been environmental destruction to the basin due to agricultural production prioritization and depleting withdrawal practices (Bischoff-Mattson et al., 2018). Consequently, ecosystems are disturbed, and droughts are increasingly likely (Bischoff-Mattson et al., 2018). In New Zealand, the preservation of rivers such as the Clutha River serves the economy through tourism, the service sector, and real-estate surrounding the river (Chakraborty et al., 2018).

The Dublin Principle vaguely defines the economic utilization of water. It was a critical principle to establish and consider when practicing water management because it has created job opportunities for the communities close to water resources such as water treatment facilities as well as agricultural products granting food security locally and externally. However, detailed international guidelines and laws are needed to avoid pursuing economic prosperity at the cost of inequality, unsustainable food and water security, and environmental damage. Unsustainable depletion of water resources also hinders the economic security in the long term.

Indigenous knowledge in water management

Although there is a lot of empirical evidence to support the effectiveness of indigenous water management, western science has yet to fully appreciate or acknowledge indigenous contributions to freshwater preservation adequately (Gratani et al., 2014; Tsatsaros et al., 2018). Overall, there is an incredible diversity of indigenous knowledge systems, which include various traditional ecological conservation practices, kinship protocols, knowledge organization and learning systems, as well as social, economic and spiritual engagement (Gratani et al, 2014; Khupe, 2020; Pyke et al., 2018). In addition, indigenous water management cannot be considered separately from other external systems at play; it is deeply integrated into ecological, metaphysical, and community structures and processes (Gratani et al, 2014; Tsatsaros et al, 2018).

Settlers sometimes misunderstand indigenous knowledge systems and view them as mystical or unfounded, when in reality they are merely different. Although spirituality is often an important part of indigenous perceptions of water management, this fact does not make such approaches unreasonable (Wilson, 2019). An integral part of indigenous knowledge systems is based on learning and adapting across generations and responsive management of ecosystems (Bansal, 2022; Khupe, 2020). In simple terms, many indigenous cultures have a far more holistic view of water management than do settlers, which includes the recognition of the spiritual aspects of water but is also rooted in credible knowledge (Bansal, 2022; Wilson, 2019). Thus, while indigenous cultures may employ different processes in creating knowledge than those typical of the western scientific method, this does not mean they cannot be compatible with rational thinking and analysis.

Overall, it has been consistently observed that indigenous water knowledge and management enable indigenous peoples to manage natural resources sustainably, while also meeting their social and spiritual needs (Gratani et al, 2014; Tsatsaros et al, 2018). Moreover, they may allow for better adaptation to changing climates and environments (Tsatsaros et al, 2018). However, there is a risk that rather than supporting the transition to indigenous water sovereignty so that indigenous communities can practice their knowledge and management holistically, settlers may instead cherry-pick ecological teachings and practices from indigenous cultures without adequately considering the holistic methodology from which they originate (Gratani et al, 2014). This approach would be the equivalent of learning western science content without understanding the scientific theory or the principles behind it. If one learns disconnected facts and pieces of knowledge without understanding the methodology underlying them, the resultant management approach will be less capable of adapting to changing conditions, i.e., climate change. Consequently, indigenous water management should be seen and used as an integrated and comprehensive system, with the active participation of indigenous communities at every step of planning and implementation.

NGO involvement and community movements

In Canada, some organizations such as Water First are dedicated to supporting indigenous communities' water needs through communication, advocacy and project implementation (Water First, n.d). They also hire and train indigenous youth to give them the tools to contribute to the water and to projects (Water First, n.d). Water First works towards closing the water treatment gaps mentioned in the previous sections. Waterkeepers is a global alliance working toward preserving water bodies around the world through empowering the communities to protect their resources (Waterkeeper, n.d). Waterkeepers has 300 local groups across six continents and leads campaigns against agricultural pollution and carbon footprint (Waterkeeper, n.d). Waterkeepers has groups in Australia fighting against drought and fish killing in the Murray-Darling Basin, where groups have called for integrated water management that considers the ecosystem and water provision in the long term before withdrawing large amounts (Kelly et al., 2019). In Toronto, there is a Waterkeepers group dedicated to protecting Lake Ontario and the water it provides the province as well as ecosystems it houses (Swim Fish Drink, n.d). It began a project by Swim Drink Fish which is a Canadian charity organization working towards providing clean water to people across the country (Swim Fish Drink, n.d). Many other water non-profit organizations including Water Aid, Water for Good and Life from Water have emerged to provide clean water to communities across the world (Woloszyn, 2023). However, most NGOs with this mission go directly to the source and work on projects, rather than first having conversations on policies and water rights. A strong, direct link between NGOs and policies related to water rights must be established, although the impact of awareness and education on people within their communities could accomplish this (Hassan, 2020).

Toward effective IWRM processes and participatory governance

Beyond community movements, increasing the role and involvement of indigenous voices in formal water management could perhaps be part of a broader shift to an IWRM approach. Conceptually, IWRM is about solving problems of water management by balancing competing needs and priorities through stakeholder participation and devolution of decision-making authority (Swatuk & Qader, 2023). Integrated management could be multi-sectoral in nature, taking into account the social, economic, and environmental dimensions of water use. IWRM is enshrined in SDG target 6.5.1 and as of 2020, the UN's SDG 6 data portal reports "54%" as the degree of IWRM implementation worldwide (UN Water, n.d.). Australia and New Zealand report a "high" and "medium-high" degree of IWRM implementation from 2017 to 2020, respectively; and there is no data available for Canada (UN Water, n.d.). These statuses suggest that there has been substantial progress with room for improvement in Australia and New Zealand, while in Canada there is a troubling lack of reporting with respect to SDG 6.5.1.

IWRM efforts worldwide may share common goals, i.e., supporting the economic wellbeing and health of people in a sustainable way, through a basin-level approach that emphasizes good governance (Varis et al., 2006). However, an IWRM approach should ideally be flexible and adapted to the specific needs and circumstances of a community and the different water users within it. IWRM may be better characterized as a "sensibility" than as a specific set of practices (Swatuk & Qader, 2023). Promoting sustainable use of water for agriculture, improving the equitable distribution of water and sanitation services, and implementing measures of water efficiency could all be part of an IWRM approach that directly engages resources users at every stage of planning and implementation.

In recent years, there have been some notable attempts in Canada, Australia, and New Zealand to foster collaboration and co-creation between indigenous and other stakeholder groups in water management. These attempts feature partnerships between indigenous communities, local steward groups, water specialists, and government toward ensuring the long-term health of watersheds and river basins. The value of partnerships and community-

driven processes lies in addressing the gap between technical solutions to water management and the "social, economic, and geographic realities" that exist within different contexts of implementation (Black & McBean, 2017a, p. 57). In other words, engaging relevant stakeholder groups, including indigenous communities, could help in addressing the shortcomings in water management that might not be fully addressable through technological advancement or deployment alone. As discussed above, insufficient representation of indigenous voices and underutilization of indigenous knowledge are shortcomings relevant to the Canadian, Australian, and New Zealand contexts. Key to implementing "decolonizing methodologies" in water management is identifying approaches and methods that mobilize decision-making power in indigenous communities (Black & McBean, 2017a; Smith, 2012). The following section reviews a sampling of such attempts in the three countries.

New Zealand: Waikato and Waitaki River

In recent years, New Zealand has seen an increase in tribal and sub-tribally developed frameworks and assessment tools that incorporate Māori rights to ancestral water bodies and Māori cultural values or practices related to water (Stewart-Harawira, 2020). An early example is the national Cultural Health Index (CHI), which was co-developed between 2005 and 2016 and measures factors of cultural importance to Māori in freshwater environments (Statistics New Zealand, 2017). By incorporating customary food gathering status and cultural water quality into CHI scores, the tool renders Māori values for stream health measurable to water managers. Frameworks have also been developed for local community use. Two cases from the Waikato (in the North Island) and Waitaki River (in the South Island) in New Zealand offer insight on the successes and challenges of co-developing restoration strategies based on eco-cultural frameworks that convey values reflecting "iwi" (nation or tribe) and "hapu" (subtribe or clan) goals (Stewart-Harawira, 2020; Tipa et al., 2017). In these cases, environmental report cards link indicators of catchment health with Māori perspectives on environmental issues and cultural interests (Tipa et al., 2017). Researchers worked with Waikato communities to develop the 2016 Waikato Catchment pilot report card, which is divided into themes or "taura" (thread or ropes) representing elements of catchment health. The eight taura included "kai" (food, in this case species harvested from the river), ecological integrity, experience (related to cultural and social aspects of river interaction), water security, water quality, sites of significance, economics, and effort in restoration. For the Waitaki Repot Card, 45 indicators were developed addressing biophysical qualities and cultural health. Notably, increasing the engagement of Māori "whanua" (extended family group) in catchment management initiatives is included as a goal. Overall, a key feature of report cards co-created by and for the use of indigenous communities is the recognition that water management must extend beyond biophysical measures of ecological integrity to include goals for cultural health and reconnecting tribal members with the catchment (Tipa et al., 2017). According to Tipa et al., involvement of indigenous communities in developing the "where," "when," "who," and "how" of indicator assessment improves a report card's ability to accurately capture communities' preferences, site priorities, and seasonally dependent patterns of resource use.

The researchers also acknowledge some limitations of the report cards, which could be improved upon in future iterations. Challenges are mostly related to data gaps, e.g., limited information on whether resources gathered are safe to use, incorporation of qualitative data sets into a biophysical framework, and absence of data regarding the level of community support for ecosystem protection. Nonetheless, the report cards constitute an exercise in improving mutual understanding between existing frameworks for freshwater management and Māori knowledge systems (Tipa et al., 2017).

While the report cards showcase co-production of objectives for freshwater management, the New Zealand government has been planning a controversial restructuring of its national water supply and sanitation management. Since their announcement in 2021, the

proposed reforms have been criticized for their potential to widen the gap between Māori participation and government decision-making. The “Three Waters” programme was a response to a review of drinking water, wastewater and stormwater services – the so-called “three waters” – that followed a severe outbreak of waterborne illness (campylobacteriosis) in August 2016 (Graham, 2020). The review raised questions about the delivery and regulation of water services in the country, leading to the government proposing to shift management to several new “super-entities” by July 2024 (Manch 2021; Ellis, 2021). These super-entities were envisioned to alleviate the financial trade-offs facing councils between investing in water services or other services in their communities (Graham, 2020; Mahuta, 2021). They were also proposed to have both community and iwi representation (TVNZ, 2023). However, the plan would controversially remove ownership and decision-making over water infrastructure from local councils, which eventually led to the government scrapping the “Three Waters” name and delaying the implementation timeline by two years (TVNZ, 2023). As of April 2023, the government has agreed to re-evaluate a reform program at the regional level based on existing local authority boundaries.

The contentious politics of New Zealand’s water services reform highlights government’s difficulty in balancing its goal of an acceptable standard of service delivery nationwide with its obligations to enact reforms at a pace allowing for sufficient input from local councils and Māori. They may also indicate a need to strengthen trust between government and Māori tribes including the Wanganui River iwi: in 2021, a human representative (Te Pou Tupua) for the Whanganui River stressed that the community needed assurance from the government that reforms would not interfere with the existing Te Awa Tupua legislation (Ellis, 2021).

Australia: Murray-Darling Basin

In Australia, the Aboriginal Waterways Assessment (AWA) tool offers another example of a resource that can assist indigenous communities, scientists, and government in better assessing the condition of waterways and wetlands. It incorporates indigenous water planning objectives into management of the Murray-Darling Basin in southeastern Australia, and complements work done since 2010 as part of the National Cultural Flows Research Project (Mooney & Cullen, 2019; Woods et al., 2017). Like the CHI in New Zealand, the AWA was co-developed with indigenous communities to improve understanding of indigenous water knowledge in mainstream water planning across Australia (Mooney & Cullen, 2019). There is some evidence of success on this front, as the AWA has since been incorporated in a Victorian Government Water Plan (State of Victoria, 2016, as cited in Mooney & Cullen, 2019). In a report of lessons learned from the AWA, researchers found that in order for the assessment to work as intended, participants need ample time, training, and opportunities for discussion (Murray-Darling Basin Authority, n.d.). Modest supports in the form of scribes or visual aides containing information about local species and environmental conditions could improve the capacity of assessment teams.

In addition to containing the Murray-Darling Basin, the southeastern region of Australia supports the world’s largest water market by water volume and value (Nikolakis et al., 2013). The country is a global leader in the establishment of markets for water rights, wherein water users can trade rights on a permanent or temporary basis. Water trading was conceived as a policy tool to address water scarcity by encouraging efficient use through market-based supply and demand dynamics (Wheeler, 2022; Australia Department of Climate Change, Energy, the Environment and Water, 2022). However, water markets have been criticized for potentially creating market failures, such as the issue of legacy or gifted assets and inequitable distribution impacting indigenous communities (Wheeler, 2022). There are conflicting views on whether the separation of land and water licenses in this trade is beneficial: doing so enhances market “efficiency” and might even allow for more gender-equitable outcomes, as daughters have been

traditionally disadvantaged in farmland succession, but unbundling land from water is also antithetical to Indigenous holistic values (Wheeler, 2022; Nikolas et al., 2013).

In 2019, the Australian Competition and Consumer Commission (ACCC) conducted an inquiry into the Murray-Darling Baskin water markets in the wake of several reports of water theft and maladministration (Hamilton & Kells, 2020). The resulting report found a slew of serious problems related to market design, governance, and transparency (ACCC, 2020). In particular, the report notes that water brokers operate under little regulation and that asymmetrical information problems contribute to a situation where professional traders are best positioned to take advantage of trade opportunities. In other words, non-users of water have found openings in the Australian water rights system to pursue financial investment (Hamilton & Kells, 2020). Information asymmetries can make water users, including irrigators and indigenous groups, dependent on intermediaries for fundamental market information (ACCC, 2020). While this report alone does not provide enough evidence to definitively answer the question of whether a water rights market could function well in Australia, it highlights the need for water policy that addresses issues of equitable distribution (Wheeler, 2022). The idiosyncrasies and governance failures of Australia's water rights market suggest that consideration of indigenous concerns and values regarding water need to be integrated into the broader context of water policy; simply amending a tool like the AWA to a strategic plan is insufficient. Context is key.

British Columbia, Canada: Syilx Okanagan and Cowichan Watershed

In British Columbia (BC), Canada, indigenous groups have been historically underrepresented in provincial freshwater management frameworks, even though they are key stakeholders equipped with extensive local knowledge (Simms et al., 2016). Despite this, local indigenous populations have developed comprehensive action plans to manage water resources holistically and are in the process of implementing these plans. The Syilx people, whose traditional territory covers the Canada-US border in Washington state and British Columbia in the Okanagan Country region, are an example of an indigenous community with a freshwater strategy focusing on holistic best practices, education, and community involvement in water management. Syilx's water strategy, published in 2021, is based on the understanding that Syilx have inherent rights and responsibilities when it comes to water care (Syilx Nation, 2021). It covers headwater and valley bottom stewardship, as well as connected forest management, climate adaptation plans, and research initiatives.

Another example is that of the Cowichan Tribes on Vancouver Island. The Cowichan Watershed Board (CWB) is a local governance entity created in 2010 and represents a partnership between Cowichan Tribes First Nation and the Cowichan Valley Regional District (CWB, 2021). Historically, salmon have been important to Cowichan livelihoods and culture. As a result of climate change, watershed clear cutting, and commercial fishing activity, salmon stock was depleted by the early 1980s and continued to fall into the 21st century (Lake Berz, 2021). To address this crisis, a Cowichan Basin Water Management Plan was created in 2007 with 89 clear objectives and in 2010 the Board was created with "whole of watershed thinking" as a core principle (CWB, 2021). Over the past decade, the CWB's work has attracted and managed grants enabling local people to study the impact of low water flows on fish habitat, established approaches to peacefully negotiate low river flows during dry seasons, and developed consensus recommendations for water use planning processes. In its most recent annual report, CWB notes challenges related to the effects of climactic change (very long fall drought) and funding pressures from increasing operational costs (CWB, 2022). Relying on the same core funding since its establishment, CWB has thus far been able to maintain operations but is reaching "a tipping point" with respect to its ability to sustain a collaborative governance model (p. 10). Such an extensive, continuous collaboration entails considerable funding and work hours spent on field work, emails, and phone calls (CWB, 2021).

At a provincial level, the CWB has advocated for a Watershed Security Fund and sought to act as a model for what indigenous co-management of water could look like in B.C. (CWB, 2021). The B.C. government's proposed new Watershed Security Strategy and Fund signals an intention to improve the management and protection of provincial watersheds while furthering reconciliation efforts with indigenous peoples (Williams et al., 2023). In March 2023, the Province released an Intentions Paper that included, among other messages, future approaches to enhancing local watershed governance and plans to set up a fund to support initiatives for watershed health and climate resiliency (Williams et al., 2023; B.C. Ministry of Water, Land and Resource Stewardship, 2023). The Paper includes some promising language on prospects for collaboration between the Province and indigenous peoples in B.C., in particular with reference to the importance of co-developing recommendations and solutions. The establishment of a permanent fund could possibly enhance and provide greater financial stability to efforts like those undertaken by the Syilx people and the CWB. While the strategy is still in the collaboration stage with a projected launch in winter 2023, its calls for a $100 million-dollar investment in watershed health and partnership with First Nations constitutes a positive first step (Watson, 2023; B.C. Assembly of First Nations, 2023).

Key findings

Historically, colonialism played a significant role in suppressing indigenous culture and knowledge in all aspects including water management (Hartwig et al, 2022; Jackson, 2018). Reconciliation is necessary but must be implemented effectively to empower indigenous people within water governance and benefit from their knowledge (McGregor, 2018). Fair distribution of water rights across Australia, Canada and New Zealand allows First Nation communities to be engaged in preserving nature (Hartwig et al, 2022). Striking a balance between considering water as a commodity that could allow an economy to prosper, and the environmental damage that withdraw abuse can cause is critical in nature preservation. Indigenous water management possesses a holistic, balanced approach which could be better adapted into IWRM in the three countries (Bansal, 2022; Wilson, 2019).

A positive development in the approaches sampled above is the integration of local indigenous engagement and rights into broader water-management goal setting, e.g., increasing the involvement of indigenous in joint management, mapping of indigenous water values, and developing a cultural health index ensuring cultural materials are available for gathering (CWB, 2021; Michaels et al., 2022; Mooney & Cullen, 2019; Stewart-Harawira, 2020; Tipa et al., 2017; Woods et al., 2017). When monitoring catchment health through a representative set of sites, site selection should reflect the movements and use patterns of indigenous communities, not just scientists' research choices (Tipa et al., 2017). Common challenges include data gaps impeding effective tracking of indicators and the significant amount of time required to implement bottom-up participatory approaches (Black & McBean, 2017a; CWB, 2021; Tipa et al., 2017). In the CWB case, there is also the issue of sufficient resourcing to achieve objectives, as the effort required to set up and run collaborative bodies entails a large amount of work hours dedicated to coordination and field work.

Conclusion

Although there is a growing awareness towards indigenous rights and reconciliation, indigenous voices are not yet well understood nor adequately represented, especially in governmental bodies. Canada, Australia, and New Zealand are moving towards learning more about indigenous values and beliefs in relation to water. Water policies that lack withdraw limits from the Murray-Darling Basin although indigenous knowledge offers assessment tools that can provide sustainable limits, are an indication of Australia's government's prioritization of economic development over environmental protection (Bischoff-Mattson et al., 2018). In the

case of Canada, results on SDG 6.5.1 are not being reported, making it harder to track action towards establishing robust IWRM systems (UN Water, n.d.).
On the other hand, IWRM initiatives have received more funding and support in recent years which creates hope for the prospects of future co-creation and co-governance between indigenous communities and other stakeholders. Increasing resourcing toward such efforts in watershed health and climate resiliency is key, and the recently published B.C. Watershed Security Strategy and Fund Intentions Paper is a positive step toward this (B.C. Ministry of Water, Land and Resource Stewardship, 2023). The three countries explored in this case study would benefit from further involvement of indigenous voices and implementations of IWRM systems that assess water management from all perspectives before making decisions that will impact stakeholders for generations to come.

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