Harmsworth, G., S. Awatere, and M. Robb. 2016. Indigenous Māori values and perspectives to inform freshwater management in Aotearoa-New Zealand. *Ecology and Society* 21(4):9. http://dx.doi.org/10.5751/ES-08804-210409

Research, part of a Special Feature on Sustainably Managing Freshwater Resources

Indigenous Māori values and perspectives to inform freshwater management in Aotearoa-New Zealand

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ABSTRACT. In response to widespread water quality and quantity issues, the New Zealand Government has recently embarked on a number of comprehensive freshwater management reforms, developing a raft of national discussion and policy documents such as "Freshwater Reform 2013 and Beyond" and a National Policy Statement for freshwater management (NPS-FM 2014). Recent resource management reforms and amendments (RMA 2014), based on previous overarching resource management legislation (RMA 1991), set out a new approach and pathway to manage freshwater nationwide. Internationally, there is an increasing trend to engage with indigenous communities for research and collaboration, including indigenous groups as active participants in resource management decision making. What is driving this change toward more engagement and collaboration with indigenous communities is different for each country, and we document the progress and innovation made in this area in New Zealand. The indigenous rights of Māori in New Zealand are stated in the 1840 Treaty of Waitangi and in many forms of New Zealand's legislation. Local and central governments are eager to include local indigenous Māori groups (iwi/hapū) in freshwater management planning processes through meaningful engagement and collaboration. Key to the success of collaborative planning processes for Māori are enduring relationships between local government and Māori, along with adequate resourcing for all partners contributing to the collaborative process. A large number of shared governance and management models for natural resource management have emerged in New Zealand over the past 20 years, and some recent examples are reviewed. We provide some discussion to improve understanding and use of the terms used in these management models such as cogovernance, comanagement, and coplanning, and describe some of the more important frameworks and tools being developed with Māori groups (e.g., iwi/hapū), to strengthen Māori capacity in freshwater management and to support good collaborative process and planning.

Key Words: *cogovernance; collaboration; comanagement; coplanning; cultural monitoring; cultural values; indigenous Māori; Māori knowledge; mātauranga Māori; resource management*

INTRODUCTION

Freshwater is one of New Zealand's most precious resources, which has come under increasing pressure in the last 20 years (Land and Water Forum 2010, 2012*a, b,* Davies-Colley 2013, Parliamentary Commissioner for the Environment 2015). Concerns about the state of and trends in water quality and water quantity in New Zealand have been long-standing, but are now being seriously addressed by government, industry groups, Māori, and environmental managers in central and local government (Office of the Minister for the Environment 2009, Land and Water Forum 2010, 2012*a, b*, 2015).

This paper, a synthesis of more than 20 years of research, collates a large amount of material from a large number of projects (~> 15 studies) in which the authors have been involved. We highlight recent issues in freshwater management and comment on how Māori involvement and inclusion in decision making is developing through time.

The paper provides a summary of recent issues of and debates on freshwater management and legislative and policy reform in New Zealand as part of work funded under a government science-funded program entitled Values, Monitoring and Outcomes. It describes indigenous Māori involvement in freshwater decision making, first providing a basic description of Māori values and knowledge systems together with an outline of the relevant legislative and policy landscape in which New Zealand society operates. It then provides some of the Māori-led frameworks and tools that help inform collaborative processes and planning, identifying key tools and Māori frameworks that are essential for building indigenous Māori capacity and therefore helping increase indigenous participation and collaborative discourse in freshwater management. These tools are integral for characterizing and articulating indigenous values, perspectives, and interests and thereby informing decision making processes.

Finally, this paper explores some of the emerging collaborative models that have developed under the Treaty of Waitangi and various legislative reforms and through which we seek to improve the understanding and use of terms such as collaborative governance, comanagement, and coplanning. A glossary of Māori, constitutional, and policy terms is given in Appendix 1. An understanding of key Māori words provides an essential insight into indigenous Māori knowledge and Māori involvement in collaborative process and decision making.

BACKGROUND AND CONTEXT

Indigenous Māori society

Traditionally, indigenous Māori lived in local tribal areas where ancestry (*whakapapa*) and beliefs (te ao Māori, values) linked Māori to their natural and spiritual environment and customary practices were reinforced through inte-generational knowledge and application. Colonization by the British from the mid-1800s had major impacts on the Māori population, especially Māori health, culture, language, social status, and loss of land, water, and natural resources (Durie 1998, King 2003). Despite these major changes, the basic tenets of traditional Māori society still remain strong and influence the way Māori construct tribal status and authority, manage their lands and resources, and relate to

[1]Tribal: Te Arawa, Ngāti Tūwharetoa, Ngāti Raukawa, [2]Landcare Research, [3]Tribal: Ngāti Porou, [4]Tribal: Ngāti Awa, Ngāti Ranginui

other agencies and government. The way traditional indigenous rights and membership are enacted in current legislation continues to provide robust debate and models of democratic and collaborative practice (Te Aho 2010, Ruru 2012).

Legislative frameworks

Māori rights, roles, and responsibilities are enshrined in the 1840 Treaty of Waitangi, upheld by the principles of the Treaty (see glossary at end of paper), and subsequently stated under many of New Zealand's legislative frameworks such as the Resource Management Act (RMA) 1991 (Durette 2010, Ruru 2009*a, b*, 2011*a*). The Waitangi Tribunal has articulated a number of resource-specific principles, including those that state that the spiritual and cultural significance of a freshwater resource can only be determined by tângata whenua and their traditional rights (Te Wai Māori, 2008, Ruru 2009*c*, NIWA 2010, Te Aho 2010, Waitangi Tribunal 2011, Ruru 2012). The RMA 1991 directs regional councils, who are responsible for managing natural resources in New Zealand, to recognise and provide for the relationship of Māori and their culture and traditions with waters as a matter of national importance. The Local Government Act 2002 provides for democratic and effective local government that recognizes the diversity of New Zealand communities.

Current freshwater legislation

The most influential policy for the management of freshwater resources in recent years is the National Policy Statement for Freshwater Management (NPS-FM) 2014 (New Zealand Government 2014), which provides direction to local government on matters of national significance in reference to the RMA. Setting enforceable quality and quantity limits is a key purpose, so that regional councils and communities can more consistently and transparently plan for freshwater objectives.

The NPS-FM identifies 13 national values and uses for fresh water. Two of these national compulsory values apply to all water bodies: ecosystem health and human health for recreation. National bottom lines are set for the compulsory values and minimum acceptable states for the other national values. Reference in the NPS-FM is given to Māori values through an overarching framework called *Te Mana O Te Wai*, a concept that recognizes that fresh water is a natural resource the health of which is integral to the social, cultural, economic, and environmental well-being of communities.

The NPS-FM 2014 refers to the Treaty of Waitangi as the underlying foundation of the Crown/iwi/hapū relationship in regard to the management of freshwater resources (New Zealand Government 2014). This includes the need for collaborative planning, effective provisions for Māori involvement in freshwater planning and decision making, and the implementation of a national objectives framework. Using the treaty and subsequent legislative frameworks, processes, and policy statements, Māori seek increased status for decision making about natural resources, such as water, and therefore for actively participating in collaborative processes and the cogovernance of natural resources (Memon and Kirk 2012, Te Aho 2010, Ruru 2009*a, b, c, d*, 2011*a, b*, 2012, Waitangi Tribunal 2011).

Since the late 1990s, Treaty of Waitangi settlements (e.g., Waitangi Tribunal 2010, 2011) have played a critical role in providing the legislative foundation for a range of cogovernance and comanagement institutional arrangements to manage freshwater resources and for the implementation of rehabilitation strategies and actions to meet Māori and community aspirations across rivers, wetlands, lakes, and catchments (e.g., Waikato River, Whanganui, Te Waihora, Te Arawa Lakes).

Profound national and local concerns and debates about resource management in New Zealand have been catalysts for exploring new styles of collaboration and governance. Desired outcomes and stated goals for improved freshwater management in New Zealand have often been reinforced through geographically explicit (e.g., river, lake, catchment) treaty settlement agreements, with specific sections and schedules asserting indigenous rights. These treaty responsibilities obligate the Crown and local government to have regard for indigenous relationships and rights, thus providing a sound legal and policy basis to increase Māori involvement in local governance, planning, and management decisions, and to recognize Māori values, uses, and interests, which requires a more inclusive and collaborative approach to freshwater management, especially at the local regional and catchment levels.

Internationally, there is an increasing trend to engage with indigenous communities in collaborative research where indigenous groups are active participants in resource management decision making (Dove 2006, McGregor 2014). What is driving this change toward more engagement and collaboration is different for each country, but many agencies and researchers are recognizing the importance and value of local and diverse perspectives and knowledge in both research and decision making (Houde 2007, Adams et al. 2014, Carothers et al. 2014, McGregor 2014, Velasquez Runk 2014) and the judicial and ethical frameworks that give effect to collaboration (Ruru 2009*a, d*, Nikolakis and Grafton 2014).

Evolving from these relationships and collaborations, are an increasing number of cogovernance and comanagement examples (Carlsson and Berkes 2005, Berkes 2009, Durette and Barcham 2009, Duff et al. 2010, Te Aho 2010, von der Porten and de Loë 2013*a, b*, Dodson 2014, Auditor General New Zealand 2016); methods for monitoring governance outcomes (Cundill and Fabricius 2010); and how to include indigenous groups in planning and policy (Duff et al. 2010, Tan and Jackson 2013, von der Porten and De Loë 2014).

A large number of shared governance and management models have therefore emerged in New Zealand over the past 20 years (Durette and Barcham 2009, Waikato River Authority 2011, Muru-Lanning 2012, Harmsworth et al. 2015, Robb et al. 2015). To help improve understanding, we examine some of these management models and discuss current terms being commonly used, such as governance (Ruru 2009*a*, Te Aho 2010, Fenemor et al. 2011), cogovernance (Muru-Lanning 2012, O'Brien 2012), comanagement (Carlsson and Berkes 2005, Berkes 2009, Memon and Kirk 2012), and coplanning (Duff et al. 2010, Awatere et al. 2012). Our recent research has found that the success of collaborative planning processes relies on enduring relationships between local government (regional councils) and Māori, along with adequate resourcing for all partners contributing to the collaborative process (Robb et al. 2015, Sinner and Harmsworth

2015). It is also a very long-term process based on solid relationships and trust, which needs a long-term horizon to truly measure benefits and outcomes (e.g., >~10-50 years). Many tools have been developed to help strengthen Māori capacity in freshwater management and to support effective collaborative process and planning. Some of the more important frameworks and tools being used by Māori groups (e.g., iwi/hapū) are described in this paper.

Māori freshwater values

Te Ao Māori (Māori world view) and mātauranga Māori (Māori knowledge systems) refer to a wide range of cultural concepts, values, knowledge systems, frameworks, ethics, and principles founded on traditional knowledge, philosophy, religion, and beliefs, giving rise to customary practice and a distinct set of indigenous cultural, physical, spiritual, and metaphysical values (Marsden 1988, Barlow 1993, Mead 2003, Awatere and Harmsworth 2014). The modern Māori world view, based on a mix of traditional, historic, and modern elements, can be used to articulate modern perspectives, issues, local interests, values, and resources (e.g., customary resources, mahinga kai). For example, in a modern context mātauranga Māori (e.g., traditional, holistic, local, and contemporary knowledge) has been used to construct modern Māori issues, perspectives, and realities (Durie 1998), aspirations and vision (Waikato River Authority 2011, TALT 2015), and tools and frameworks (Awatere and Harmsworth 2014, Robb et al. 2015), to develop Māori classifications of water and wetlands (Douglas 1984, Harmsworth 2002) and to construct tribal cultural histories as basis for understanding contemporary freshwater management (Tipa 2013).

The decline in water quality and quantity in many parts of New Zealand, as well as its state of mauri (life force, energy), is a significant issue for Māori (Te Wai Māori 2008, Harmsworth et al. 2014). This decline is typically represented in local tribal areas by widespread degradation of customary resources, including extensive habitat area reduction, low flows in rivers and streams, reduction in flora and fauna populations, and poor condition of ecosystems and resources (e.g., mahinga kai, taonga species, habitats).

Mātauranga Māori to inform collaborative processes

Mātauranga Māori is being increasingly used to inform collaborative processes to help manage freshwater ecosystems as councils, iwi/hapū groups, and communities engage collaboratively in decision making, planning, and managing natural resources (Awatere and Harmsworth 2012, Sinner and Harmsworth 2015). Tribal and generic Māori knowledge systems are used to determine the values to be managed and protected, and these can then be used in collaborative processes for comanagement and coplanning to achieve strategies and actions to support Māori values.

FRAMEWORKS AND TOOLS TO INFORM COLLABORATIVE PROCESS AND PLANNING

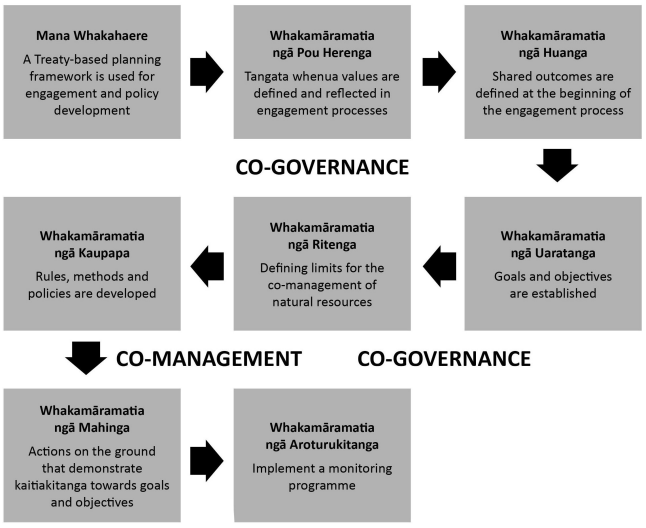
With the increased role of Māori in managing natural resources and the various legislative reforms focused on improving the management of freshwater resources, a number of guidelines and protocols have emerged to facilitate effective Māori engagement in these processes. Guidelines and protocols outlining appropriate processes for Crown−council (regional and district)−Māori (iwi/hapū) engagement in New Zealand (e.g., Harmsworth 2005, Awatere et al. 2012, Sinner and Harmsworth 2015) have been developed, and these support good collaborative process and planning, as encouraged through the NPS-FM and proposed RMA reforms. A number of examples from across New Zealand (e.g., Harmsworth 2005, Robb et al. 2015) also provide important lessons and reflections for iwi/hapū engagement and Māori collaboration with the Crown and councils.

Kaupapa Māori-based (Māori centered, Māori knowledge based) frameworks and tools that have emerged to help different parts of a community articulate and demonstrate the value they place on a freshwater resource can be used individually, or in combination, to generate effective and meaningful Māori-Crown dialogue to support partnerships, cogovernance, and comanagement (e.g., Robb et al. 2015, Waikato Tainui 2015*a, b*). These all help achieve desired freshwater outcomes.

Māori frameworks

Tikanga-based frameworks: Tikanga are custom- and protocol-based actions that drive "correct" (tika) behavior. In this context, tikanga refers to processes for engagement. The building of meaningful relationships between the Crown and iwi/hapū is the foundation for any collaboration between treaty partners. These relationships should be maintained and strengthened over time and should exist beyond a single project. Tikanga-based frameworks (Awatere and Harmsworth 2014) are developed early with iwi/hapū (i.e., when forming the initial relationship) to guide collaborative processes, customary protocols, behavior, and responsibilities. Using a tikanga approach and process, a collaboration framework for working with Māori was developed by Robb et al. (2015) and Harmsworth et al. (2013), which is shown in Figure 1.

Fig. 1. An eight-step tikanga process to achieve desired freshwater planning and management outcomes for Māori (Robb et al. 2015).



Values-based frameworks: These type of frameworks identify, organize, and describe key Māori values as a basis for guiding and determining freshwater management (e.g., Ngâ Matapono Ki Te Wai (TRONT 2013), Te Mana o te Wai (New Zealand Government 2014), Te Arawa Cultural Values Framework (TALT 2015), and Wai Ora Wai Māori (Awatere et al. 2015). Value-based frameworks can be used to set freshwater limits and standards connected to Māori values.

Cultural opportunities mapping and assessment: These are tools that provide a framework for incorporating cultural perspectives, values, and interests into freshwater management, contemporary resource management, and intergenerational planning (Tipa 2010, Tipa and Nelson 2012, Tipa and Severne 2010).

Māori tools

Iwi and hapū management plans: A large number of iwi/hapū management plans have been developed by various iwi/hapū since the 1990s (Durie 1998, Awatere et al. 2012), most in response to the RMA 1991 requirements to articulate Māori values for planning and policy. Many of these plans are now in the third generation and continue to evolve over time. They are an important source of information for articulating Māori issues, values, objectives, aspirations, and priorities within a given area, supported by local mātauranga Māori. These documents are important sources of information for collaborative processes and freshwater planning and hold iwi/hapū-specific and site-specific knowledge.

Geographic information systems (GISs): Used extensively in New Zealand since the mid-1990s. GIS information has often been collected in conjunction with iwi/hapū management plans and to support treaty claims and has become an important Māori tool used by many tribes and Māori organizations. In this context Māori knowledge has often been used to identify, record, classify, and map Māori values, significant sites, or special interest areas at accurate scales. GIS mapping improves the understanding and expression of locational Māori values in planning. Spatial and temporal mapping and assessment, and indigenous approaches to using GIS are well documented (e.g., Harmsworth 1997, 1998, TRONT 2003, 2007, Robb et al. 2015) and can be used to support aspects of collaborative freshwater management, such as modeling and scenario planning, and to identify priority areas for management and restoration.

Cultural monitoring: Sophisticated indigenous cultural monitoring and assessment methods and tools, developed in different parts of New Zealand, utilize mātauranga Māori and Western science to monitor progress toward goals and objectives, and changes in environmental health. These approaches have been developed in different parts of New Zealand and are continually adapted for local use (e.g., Harmsworth 2002, TRONT 2003, Townsend et al. 2004, Harmsworth and Tipa 2006, Tipa and Tierney 2006*a, b*, Jollands and Harmsworth 2007, Harmsworth et al. 2011, 2013, 2015, Harmsworth and Awatere 2013, Awatere and Harmsworth 2014, Robb et al. 2015). Cultural monitoring data are being used to varying degrees to inform and improve local and regional collaborative processes and enhance understanding of environmental health from a Māori perspective.

Cultural monitoring can be used to support Māori articulation of "values" for decision making and provide iwi/hapū with ways to assess and manage freshwater, and monitor environmental-cultural changes in ways that are relevant to them (Harmsworth and Awatere 2011, Robb et al. 2015). Cultural monitoring tools can be used to contribute to, or inform, some formalized assessment (qualitative or quantitative) to show change or trends at varying spatial and temporal scales (Harmsworth et al. 2014). An extensive range of Māori-led cultural monitoring approaches, methods, and tools have been developed, trialled, tested, and used throughout Aotearoa-New Zealand, for example (Table 1).

An example of how Māori-led cultural monitoring can be used to support decisions within a collaborative process is outlined in the framework shown in Table 2. This shows the relationship between tangata whenua values, objectives, and monitoring tools, and provides some examples of the freshwater variables that can be managed through interventions to meet iwi/hapū objectives, goals, and long-term aspirations and outcomes, e.g., healthy waterways, restoration of the mauri of the river.

EMERGING MODELS: COGOVERNANCE, COPLANNING, AND COMANAGEMENT IN PRACTICE

A large number of shared governance and management models have emerged in New Zealand over the past 20 years (Ruru 2009*a*, Te Aho 2010, Dodson 2014, Harmsworth et al. 2015, Robb et al. 2015, Auditor General New Zealand 2016), many based on the treaty, reinforcing and bringing to life the legal status of cogovernance agreements. Under each model, governance structures, legal status, membership, agreements, and the collaborative process tend to vary markedly from council to council, and from region to region (Table 3, Fig. 2). Some of the best examples are where the Treaty of Waitangi claims and settlements have formed the basis of many statutory comanagement regimes shown in freshwater catchments, such as the Te Arawa Lakes, Te Waihora (Lake Ellesmere), and the Waikato and Waipa rivers.

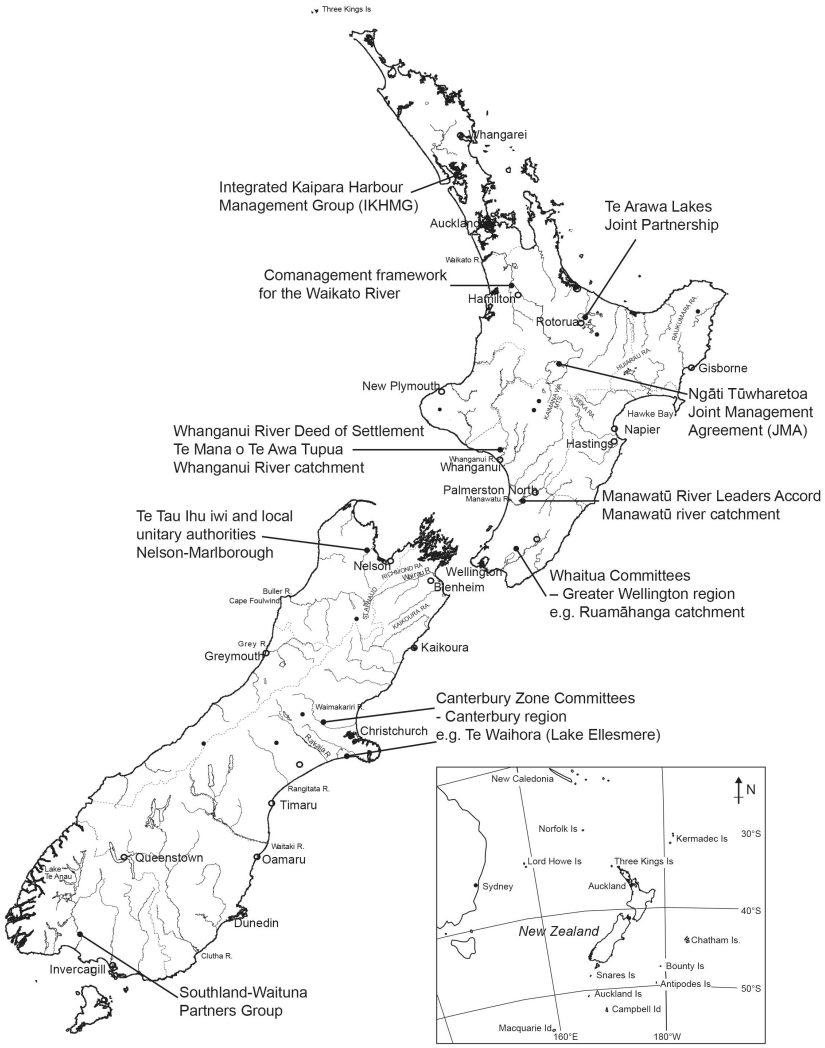
Local government, iwi/hapū groups, and communities are increasingly engaging in collaborative processes for decision-making, planning, and managing natural resources, and Māori more routinely play a critical role in the comanagement of freshwater (Table 3, Fig. 2). Freshwater, catchment, and resource management agreements typically intend to achieve mutually agreed outcomes, first, between iwi/hapū Māori and the Crown and delegated authorities (e.g. national government, regional councils, local authorities), and second, with other communities and stakeholders.

DISCUSSION

Internationally New Zealand stands out in terms of having one signed overarching treaty between the Crown, now represented by the New Zealand Government, and indigenous Māori groups (iwi/hapū) that crosses jurisdictions, agencies, and communities to recognize and acknowledge indigenous rights. These iwi/hapū groups are now represented in many modern forms and generally mandated by the community or constituency they represent (e.g., iwi authority, rūnanga).

Current legislation and policy are designed to embrace and respect the treaty and its principles. This has strengthened the rights of inclusion of indigenous peoples in decision-making processes and natural resource management across New Zealand. In more

Fig. 2. Location of selected Māori cogovernance and comanagement models in New Zealand.



recent years it has given rise to collaborative processes for resource decision making, and a number of cogovernance and comanagement arrangements and models. However, the terms cogovernance, coplanning, and comanagement are often used interchangeably and are not well defined, which increases confusion about the role of Māori and the expectations of different Māori groups alongside the responsibilities and representation of local government (e.g., councils) within this collaborative process. The following explanations and definitions were developed in 2015 from an indigenous Māori perspective (Harmsworth et al. 2015, Robb et al. 2015) to provide clarity and inform discussion:

- Cogovernance: Formal arrangement to share decision making. In terms of iwi/hapū and the Crown, this should be based on the Treaty of Waitangi. Through principles and collaborative guidelines, the treaty provides the basis for meaningful ongoing relationships. Cogovernance agreements between iwi/hapū and the Crown are essential early on in a collaborative process.
- Coplanning: Planning together under cogovernance agreements. Coplanning is a shared process where iwi/hapū/tangata whenua interests and values, and the use and understanding of mātauranga Māori, are incorporated into local or regional planning, including the development of policies, goals, and objectives in council, regional and district plans, and/or urban design.
- Comanagement: Actions and responsibilities implemented jointly by the parties. Comanagement involves deciding how a desired goal, objective, or outcome is best achieved (e.g., catchment, wetland, and farm plans, consents, riparian planting, river clean-ups, restoration, etc.). Iwi/hapū groups work together with partner agencies.

Table 1. Key Māori-led cultural monitoring approaches in Aotearoa-New Zealand

Name of approach	Specific examples	Selected references
Taonga (e.g., flora and fauna) species sampling, monitoring reporting, harvesting	Kōura (freshwater crayfish)	Kusabs et al. (2015*a, b*)
	Tuna (eel)	Williams et al. (2014)
	Freshwater mussels	Rainforth (2008)
	Kanakana/pihirau-lamprey	Te Ao Marama Incorporated and Waikawa Whânau (2010)
	Native fish species such as *Galaxiids* spp., e.g., inanga, kôkopu, koaro	Kitson et al. (2012) Morris et al. (2013)
	Plants such as kuta, raupô, harakeke, etc.	Kapa and Clarkson (2009)
Cultural habitats	Mahinga kai, cultural harvest sites	Maxwell and Penetito (2007); Stewart et al. (2014)
Contaminants	Risk, customary resources	NIWA (2016); Stewart et al. (2014)
Report cards	2016 Pilot Waikato River report card: methods and technical summary Framework and methods guided by river iwi	Williamson et al. (2016)
The Cultural Health Index (CHI) for rivers and streams	CHI method and application: has been used extensively by iwi/hapū groups to inform decisions, and provide knowledge to support collaborative processes (https://www.mfe.govt.nz/sites/default/files/chi-for-streams-and-waterways-feb06-full-colour.pdf)	Tipa (1999); Tipa and Tierney (2003, 2006*a, b*); Townsend et al. (2004); Pauling et al. (2007); Nelson and Tipa (2012); Tipa and Nelson (2012); Tipa and Associates (2013)
	Adaptations have been made for freshwater and estuarine environments	Young et al. (2002); Townsend et al. (2004); Taranaki District Council (2007); Hughey and Taylor (2009); Walker (2009); Harmsworth et al. (2011)
Baselines	Cultural health assessment	Pauling et al. (2005)
Cultural flow	Cultural flow preference studies	Tipa (2009, 2012); Tipa and Severne (2010); Tipa and Nelson (2012); Tipa and Associates (2013); Rainforth (2014)
Historic data and information	Mapping of Māori values, historic places, cultural resources, etc.	Harmsworth (1997, 1998); Tipa (2013)
Significance assessment method	Significance assessment method for determining Māori values/tangata whenua river values	Tipa (2010)
Tribal/regional state of environment reporting: State of Takiwâ	A "toolbox" for iwi environmental monitoring and reporting: Te Waipounamu/South Island, developed by the iwi Ngai Tahu	Mattingley and Pauling (2005); Pauling et al. (2007); TRONT (2003, 2007); Pauling (2010)
Wetlands	National monitoring approaches and indicators of wetlands Wetland habitats along the Waikato west coast, e.g., Toreparu wetland assessment approach	Harmsworth (2002) Robb (2014)
Mauri assessments	The Mauri model and "mauri o meter" (http://www.mauriometer.com/)	Morgan (2006, 2007*a, b*, 2015); Morgan et al. (2013)
	Mauri of Waterways Kete and Framework	Jefferies and Kennedy (2009)
	The Mauri compass	Ruru (2014, 2015)
Science and cultural indicators	Linking cultural and science indicators	Harmsworth et al. (2011)
Kaitiaki tools (guardianship tools)	Kaitiaki tools: an Internet-based iwi resource management planning tool (https://www.niwa.co.nz/freshwater/management-tools/water-quality-tools/kaitiaki-tools)	NIWA (2016)
Ngā Waihotanga Iho (estuarine assessment tools)	Ngā Waihotanga Iho: Iwi Estuarine Monitoring Toolkit	Rickard and Swales (2009*a, b*)

The emergence of these new collaborative relationships between the Crown (or delegated Crown agencies such as a regional council) and iwi/hapū are not without their challenges. These may highlight the issue of power sharing in newly formed arrangements between Māori and government and requirements for improved clarity of the role of the Treaty of Waitangi in local government, and uncertainty about rights, representation, and membership of iwi/hapū in the collaborative process. For example, there are few examples of effective coplanning in New Zealand between councils and iwi/hapū (Awatere et al. 2012). Ideally, coplanning should occur before comanagement, but the paucity of coplanning probably reflects the power and capacity imbalance between councils with authority, dedicated resources, and legislative function, and Maori groups who lack resources, capacity, and a specific participatory role. This places another stress on effective participation in the collaborative planning process.

Table 2. Cultural monitoring to assess freshwater limits to maintain/enhance cultural values.

Values	Objectives	Performance measures/tools	Management variables (examples)
Kaitiakitanga Mauri Mahinga kai	Set limits to restore the mauri of freshwater, cultural resources, mahinga kai areas (define standards/limits/bottom lines to support life-supporting capacity/ecological integrity for taonga spp. and habitats)	Monitoring such as Cultural Health Index and mauri assessment; identify change/trends in the state or mauri Abundance/condition of cultural resources, taonga spp., mahinga kai	Minimum flows Nutrient management/reduction Water clarity and sediment loads Habitat extent and condition Groundwater-surface water Connectivity Pathogens (e.g., *E. coli*) levels Stock exclusion Catchment management-land use

Table 3. Indigenous Māori involvement in collaborative processes and freshwater management in New Zealand.

Existing model and location	Structure and agreement	Examples of collaborative process
Integrated Kaipara Harbour Management Group (IKHMG) Kaipara harbour	Agreement between iwi, Kaipara community, Crown agencies, local government, industry, and nongovernmental organizations	Comanagement and some coplanning: established in 2005 to promote integrated harbor management, kaitiakitanga, and interagency coordination
Comanagement framework for the Waikato River Waikato River	Joint management agreements (JMAs) based on Waikato-Tainui Raupatu Claims Settlement Act 2010. Waikato River Authority (WRA) established 2010 as cogovernance entity. Agreement between the Crown and five river iwi	Cogovernance, comanagement (JMAs), and some coplanning: to implement Te Ture Whaimana o Te Awa o Waikato Vision and Strategy for the Waikato River
Te Arawa Lakes Joint Partnership Rotorua Lakes region	Based on 2004 Deed of Settlement Te Arawa and the Crown, joint partnership between Te Arawa Lakes Trust, Bay of Plenty Regional Council, and the Rotorua District Council to comanage the Rotorua Lakes	Cogovernance and comanagement, shared decision making
Ngāti Tūwharetoa Joint Management Agreement Taupô district	JMA (2008) between Taupô District Council and Tūwharetoa Māori Trust Board	Cogovernance and comanagement: resource consents and private plan hearings
Whanganui River Deed of Settlement Te Mana o Te Awa Tupua Whanganui River catchment	Ruruku Whakatupua, the Whanganui River Deed of Settlement 2014: Agreement between Whanganui iwi and the Crown	New legal framework, cogovernance and comanagement, Statutory decision making and collaborative process
Manawatu River Leaders Accord Manawatu river catchment	Agreement/signed 2010 accord between regional council, local council, community, and iwi: joint action to improve state of river	Cogovernance Focus, vision, goals defined
Whaitua committees - Greater Wellington region e.g., Ruamâhanga catchment	Overarching Greater Wellington Regional Council (GWRC) Te Upoko Taiao committee and catchment/regional Whaitua committees established—joint GWRC, iwi, and community	Māori representation on all committees; collaborative freshwater processes, partnerships, good engagement practice for freshwater management
Te Tau Ihu iwi and local unitary authorities Nelson-Marlborough	Claims Settlement Bill, Memorandum of Understanding, iwi interests, agreement between iwi and three local government authorities to manage freshwater	Shared decision making via pan-iwi rivers and under Deed of Settlement: Freshwater Advisory Committee established
Canterbury Zone committees Canterbury region e.g., Te Waihora (Lake Ellesmere)	Managed by Environment Canterbury, Regional Management committee established, 2009 Canterbury Water Management Strategy, water zone management committees	Integrative collaborative planning approach, implementation plans for each zone, decision making to implement and meet targets
Southland-Waituna Partners Group	Established 2013 comprising multiple agencies with a statutory responsibility for management (government, local, district, iwi).	Shared decision making under a terms of reference (TOR) binds the agencies and records the relationship of parties ("the Partners"); how they will work together to improve the environmental health of Waituna Lagoon and catchment

CONCLUSIONS

The integration of indigenous knowledge into freshwater management science, policy, and practice is being considered in numerous jurisdictions around the world. New Zealand provides an exemplar of engagement in this space that has led to the adoption of indigenous concepts within a national policy framework. Freshwater management strongly reflects indigenous rights exemplified under the 1840 Treaty of Waitangi, which provides the essential foundation for forming meaningful relationships and partnerships between government and the local district tribes: iwi/hapū. The New Zealand experience also illustrates the challenges of integrating different value sets and knowledge traditions as part of the governance and management regime. Cogovernance, coplanning, and comanagement are important terms within freshwater management and require clarification and understanding for ongoing use and application.

Treaty principles (e.g., relationships, partnership, consensus, trust, respect) can guide good collaborative process and decision making from start to finish (Harmsworth et al. 2013, Sinner and Harmsworth 2015, Robb et al. 2015). When working with indigenous groups, collaboration is shown to be most successful when the indigenous groups are involved from the outset in setting the terms of reference and determining membership, and when there is understanding, respect, and acknowledgement of different perspectives, values, issues, and knowledge systems throughout the collaborative process, with adequate resourcing that builds capacity on both sides, i.e., government and Māori).

Key to the success of collaborative processes are enduring relationships between local government and tangata whenua, along with adequate resourcing for all partners. As shown in this research, collaborative processes can be supported by a variety of kaupapa Māori-based frameworks and assessment tools (Awatere and Harmsworth 2014, Harmsworth et al. 2015, Robb et al. 2015) to promote greater understanding and appreciation of Māori knowledge and values. These can be used at various stages along the collaborative, planning, or decision-making pathway. The success of a collaborative approach needs to be measured or evaluated over a longer time frame (i.e. >~3 yrs) using key indicators, to meet goals, objectives, and desired outcomes.

Māori-led guidelines, protocols, frameworks, and tools provide deeper understanding of Māori values, perspectives, and knowledge systems (mātauranga Māori), which can build bicultural capacity for iwi/hapū, and for central and local government, to improve collaborative processes to reach desired outcomes. Although the context for this paper is New Zealand, it has broader implications for indigenous people in resource management decision making elsewhere in that it demonstrates how indigenous frameworks and tools can be used to underpin and provide a basis for more inclusive decision-making processes.

Responses to this article can be read online at:
http://www.ecologyandsociety.org/issues/responses.php/8804

Acknowledgments:

This work was funded by the Ministry of Business, Innovation, and Employment (MBIE) in the programme Values, Monitoring and Outcomes (VMO) under contract C09X1003. We thank Andrew Fenemor (Landcare Research), Suzie Greenhalgh (Landcare Research), Lena Henry (planning, Auckland University), and two anonymous reviewers for valuable comments made on this paper, and Anne Austin (Landcare Research) for editing the manuscript.

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Appendix 1. Glossary of terms.

Local government – includes territorial local authorities, unitary authorities, and regional councils that carry out functions and administration regionally for the New Zealand Government.

Regional Councils – local government bodies responsible to carry out Crown or Government legislation particularly centred on resource management, local planning and policy.

The Crown – The Crown in New Zealand represents the constitutional system of government, the executive that governs, forming a Westminster-style parliamentary democracy where legislative or judicial branches of the New Zealand Government write and pass national legislation and policy.

The Treaty of Waitangi (TTOW/Te Tiriti o Waitangi) – A written agreement (in Māori and English) signed in 1840 between the British Crown (now the New Zealand Government) and iwi/hapū tribal groups in New Zealand. TTOW established a partnership for British sovereignty and recognition of indigenous rights and governance. There are 4 main articles in TTOW: 1) sovereignty, kawanatanga, British authority to govern; 2) The Crown guarantees "full, exclusive and undisturbed possession of indigenous peoples lands and estates, forests, fisheries and other properties" and indigenous Māori have tino rangatiratanga (tribal authority) over all taonga; 3) the Queen gives protection to "all the ordinary people living in New Zealand"; 4) the Māori text includes rights to practice religious freedom and customary lore.

Waitangi Tribunal – Established in 1975, the Waitangi Tribunal is charged with making recommendations on Treaty claims to Government (The Crown), that seek redress and settlement by Māori relating to historic actions, grievances, and omissions by the Crown that breach the 1840 Treaty.

Principles of the Treaty of Waitangi – 5 main principles based on the Treaty are described:

1.	Principle of Government (Kawanatanga principle): The British Government to govern for the common good (article 1 sovereignty, and 'interests' 2).
2.	Principle of self-management (rangatiratanga principle): iwi rights to manage resources, taonga, iwi affairs, etc. articles 2 & 3 of the Treaty of Waitangi.
3.	Equality: all NZers equal under NZ laws article, reduces disparities in society.
4.	Principle of reasonable cooperation: government and iwi are obliged to accord each other cooperation on major issues of concern (good faith).
5.	Principle of redress: the government was responsible for providing effective processes for the resolution of grievances in the expectation that reconciliation could occur.

Ngā Kupu Māori – Māori words

Hapū – local sub-tribes that make up larger iwi groupings, at local or district geographic level

Harakeke – flax, important customary plant and fibre for weaving (*Phormium tenax*)

Inanga – juveniles of native fish, 5 *galaxiid* species, commonly called whitebait (*Galaxias maculatus*)

Iwi – a Māori tribe, often in a geographic area, at regional or district level

Kaitiaki – person or agent giving benefit to the resource, environmental guardian

Kaitiakitanga – environmental guardianship, embodies a range of complex Māori environmental concepts

Kanakana/piharau – Lamprey fish (*Geotria australis*)

Kaupapa – Framework, philosophy, purpose, scope, topic, sets cultural framework for discussion

Kōkopu – native *galixiid* species (banded kōkopu – *Galaxias fasciatus*; shortjaw kōkopu – *Galaxias postvectis*, and giant kōkopu – *Galaxias argenteus*)

Koaro – native fish (*Galaxias brevipinnis*)

Koura – freshwater crayfish (*Paranephrops planifrons, Paranephrops zealandicus)*

Kuta – important customary plant for weaving (*Eleocharis sphacelata*)

Mātauranga Māori – Māori knowledge, Māori knowledge system, belief system, wisdom

Mahinga kai – places where customary resources (e.g., plants, fish, food) are harvested or collected

Mauri – life force, internal spirit or wairua, energy of system, links the physical to the spiritual world

Ngā Mātāpono – our values

Raupō - important customary plant for weaving (*Typha orientalis*)

Rūnanga – tribal/governing council, Māori assembly, iwi authority

Takiwā – tribal region/area or province

Tangata whenua – local people, people of the land, people inextricably linked to their natural resources

Taonga – treasured/precious resources such as the language, customs, flora and fauna species, iconic species, indigenous or customary species

Te Ao Māori – Māori world, Māori world view

Wairua – spiritual dimension

Whānau – family, extended family; groups make up hapū and iwi

Whakapapa – ancestral lineage, hierarchical assemblage of descendants, inter-connections

Wai – water, freshwater ecosystems

Whenua – land, placenta