

SPECIAL ISSUE ARTICLE

Environmental and spatial planning with ngā Atua kaitiaki: A mātauranga Māori framework

Dean P. Walker¹  | James M. Ataria²  | Kenneth F. D. Hughey³ |
Patrick T. Park⁴ | John P. Katene⁴

¹Geospatial Research Institute, University of Canterbury, Christchurch, New Zealand

²Cawthron Institute, Nelson, New Zealand

³Department of Environmental Management, Lincoln University, Lincoln, New Zealand

⁴Te Ātiawa o te Waka-a-Maui, Waikawa, New Zealand

Correspondence

Dean P. Walker, Geospatial Research Institute, University of Canterbury, Private Bag 4800, Christchurch 8041, New Zealand.
Email: dean.walker@canterbury.ac.nz

Funding information

Foundation for Research, Science and Technology, Grant/Award Number: PROP-22734-TTP-LIN

Abstract

Internationally, Eurocentric hegemonies rooted in coloniality dominate the discourse on environmental wellbeing and sustainable development. Māori frameworks are being used and developed in Aotearoa New Zealand to support bicultural approaches to the management of natural resources and built environments. This paper reports on an Atua (Māori gods and spirits) framework that was found to be valuable as a cultural lens for the co-creation of a toolkit for assessing the wellbeing of indigenous forests. This article provides guidance on the development and application of kaupapa Māori frameworks, particularly Atua frameworks, in wider geographical contexts including urban design and spatial planning.

KEYWORDS

Atua framework, bicultural planning, culturally-based monitoring, kaupapa Māori, resource management, sustainable development

1 | INTRODUCTION

In Aotearoa New Zealand, Māori hold kaitiaki¹ rights, roles and responsibilities guaranteed under Te Tiriti o Waitangi 1840 (The Treaty). Despite greater recognition of Treaty rights over the last 50 years, coloniality persists. Government institutions, science and wider society generally fail to recognise Māori epistemologies or the benefits of Māori ways of knowing. The natural resource management and spatial planning traditions and aspirations of Māori generally remain unacknowledged and unrealised (Jolly & Thompson-Fawcett, 2021; Latimer, 2011; Matunga, 2000, 2013). This lack of recognition has contributed to the erosion of iwi² and hapū³ relationships with the environment, and to a decline in the extent of, quality and access to customary resources (Harmsworth & Awatere, 2013). Conservation policy and legislation lean heavily on Western conservation

ideals of the 19th and early 20th centuries with few opportunities for tangata whenua⁴ to practice their own environmental ethic (Ruru, Lyver, Scott, & Edmunds, 2017). Recent Treaty-led research collaborations between Māori communities and scientists are focused on redressing this disenfranchisement. The co-creation of tools for cultural monitoring and cultural impact assessments to improve the practice of kaitiakitanga⁵ is widespread (Nelson & Tipa, 2012). However, the theoretical foundations of culturally-based assessment tools and methods are underdeveloped (Jolly & Thompson-Fawcett, 2021). We argue that the development of bicultural monitoring and assessment tools rooted in Indigenous epistemologies, ontologies and praxis of place are empowering and powerful expressions of tino rangatiratanga⁶ for Māori.

In 2012, Te Ātiawa Manawhenua ki te Tau Ihu Trust,⁷ Ngāti Tama ki Te Waipounamu Trust and Te

Rūnanga o Ngāti Kuia Trust partnered with Lincoln University in a collaborative research project; *Toitū te Whenua, Matatū ana te Wao Nui a Tāne*⁸ (Walker, 2019). Based within the Motueka catchment in Te Tau Ihu (the northern area of the South Island of Aotearoa New Zealand), the research sought to address a lack of place-based and culturally-based tools for assessing and monitoring the wellbeing of the environment. One outcome of the research was the co-creation of a ketewhaihua⁹ toolkit for assessing the socio-ecological wellbeing of indigenous forests. The development of the ketewhaihua built upon existing Atua frameworks currently utilised by iwi groups across Te Tau Ihu for resource management and spatial planning purposes. This served to firmly underpin the toolkit in te ao Māori.¹⁰ Atua are spiritual entities who hold guardianship roles and responsibilities over specific environmental domains (Hiroa, 1949). Atua frameworks can be used for layering or ordering mātauranga Māori¹¹ according to these domains, so as to analyse environmental issues (Kennedy & Jefferies, 2009). The Atua framework developed in this project was used to undertake ‘consultation with the Atua’ and to support the identification and categorisation of indicators, and is the focus of this paper. The specific aim of the paper is to describe the development of the Atua framework, including its constituents and design elements, and its use as a cultural lens in the co-creation and application of a culturally-based tool for monitoring indigenous forests.

There have been recent calls to do geography differently, to unsettle and challenge the ontological foundations of the discipline, to focus on active doings in place, and to acknowledge the temporalities of indigenous ontologies (Barker & Pickerill, 2020). There are calls for decolonising geographies, but what this looks like in practice, beyond theory, is still unclear. Macfarlane and Macfarlane (2018) advocate a *He awa whiria* or braided river approach in collaborative research projects, which promotes the braiding or blending together of Māori and Western knowledge systems. With this in mind, we posed two research questions. First, ‘how can Indigenous and Western knowledge systems be successfully braided together for improved kaitiakitanga outcomes in resource management and spatial planning?’ and, second, ‘Can the theoretical foundations of Māori-led monitoring and impact assessments be strengthened through the use of te ao Māori frameworks?’ In providing answers to these questions, we first review sustainability frameworks that often underpin Western approaches to environmental monitoring and impact assessments. We then outline our methodological approach in the development of an alternative and appropriate kaupapa Māori framework to underpin the co-creation of a

culturally-based monitoring tool. We review contemporary Atua frameworks, their cosmological origins based on the whakapapa of all things, and their current applications in resource management and spatial planning. This leads on to a presentation of the Atua framework as developed and applied in this research, followed by the key findings, particularly in relation to the potential application of Atua frameworks within the broader spatial planning context.

2 | A REVIEW OF SUSTAINABILITY FRAMEWORKS WITH A FOCUS ON TE AO MĀORI EXAMPLES

Conceptual models and frameworks¹² are cognitive or sometimes pictorial illustrations of ideas and concepts. They can be understood as “tools to structure thinking and action about a problem. They provide a rationale, to justify decisions and explain findings” (Ilott, Gerrish, Laker, & Bray, 2013, p. 1). Frameworks can structure thinking and action and allow for a more holistic and interpretive understanding of complex systems and phenomena. They are often used in research to help increase understanding of or expand upon theory. They are particularly favoured in multidisciplinary research (Ilott et al., 2013).

Within Western approaches to natural resource management and spatial planning, the use of ‘sustainable development’ frameworks is prevalent. The concept of sustainable development was introduced by the World Commission on Environment and Development (1987, p. 8) as a “global objective” to meet “the needs of the present without compromising the ability of future generations to meet their own needs”. Barbier (1987, p. 104) is credited with first illustrating the ecological, economic and social dimensions of sustainable development as a Venn diagram, with the aim being to “maximise the goals across all these systems through an adaptive process of trade-offs”. These three dimensions are often referred as the three pillars of sustainability or the triple bottom line (Elkington, 2018; Purvis, Mao, & Robinson, 2019). In an attempt to strengthen the original sustainable development framework and to be more holistic, inclusive, plural and useful, it has been expanded by others over time to include cultural, institutional, financial, political and technical dimensions among others (Miller, 2005; Purvis et al., 2019). Nested versions of the sustainability framework, consisting of concentric interleaved circles, prioritise the dimensions, with the economy dependent on society and both dependent on the environment (Giddings, Hopwood, & O'Brien, 2002).

Sustainable development models have been challenged on multiple fronts. While initially the concept of sustainability was seen as marginally counter-hegemonic, it has been criticised on the basis of being both too vague to be useful, being co-opted by the mainstream to enable 'business as usual' and lacking operational frameworks rooted in theory (Purvis et al., 2019). International measures of citizen wellbeing have been, until recently, confined to the economic bottom line, generally relying on the gross domestic product (GDP) index. However, there has been a significant shift away from purely economic indicators to applying sustainability frameworks to multi-dimensional wellbeing indices at national, regional and local scales (Yates, 2019). This widening of the focus has been reflected in contemporary environmental monitoring approaches where a mix of cultural, social, ecological and economic indicators of wellbeing are being used for more holistic state of health assessments of complex systems.

The survival of Indigenous peoples around the world has been dependant on the ability of communities to monitor and respond to the health of their environments. Increasingly there are initiatives to develop contemporary forest monitoring tools, often in collaborative research projects with Western scientists (Adam & Kneeshaw, 2008; Karjala, Sherry, & Dewhurst, 2003; Natcher, 2001; Saint-Arnaud, Asselin, Dubé, Croteau, & Papatie, 2009; Sherry, Halseth, Fondahl, Karjala, & Leon, 2005). The practice of adapting sustainable development frameworks to Indigenous aspirations of wellbeing is a common approach in North America. First Nations peoples in Canada have adapted a Criteria and Indicators (C&I) approach developed by the Canadian Government to monitor crown-owned forests (Canadian Council of Forest Ministers, 2006) using their own sets of tribe-specific C&Is of local forest and community sustainability (Natcher, 2001; Natcher & Hickey, 2002; Saint-Arnaud et al., 2009). Some communities have challenged the use of forest monitoring approaches founded on sustainable development frameworks as instruments of coloniality. Instead, they consciously root their approaches in Indigenous ontologies. The Pikangikum First Nation at Whitefeather Forest in North-Western Ontario, for example, have co-created their own unique 'cultural landscape framework' for monitoring the wellbeing of their forests, based on their own worldviews, values and traditions. Their framework is representative of the tribe's worldview and was designed to monitor the health of their forests, to improve their ability to engage in forest certification programmes and to enhance cross-cultural

understanding across worldviews (Shearer, Peters, & Davidson-Hunt, 2009).

In Aotearoa New Zealand, there are increased opportunities for Māori to participate in environmental monitoring (Biodiversity Collaborative Group, 2018; Ministry for the Environment & Stats NZ, 2020; NZ Parliament, 2015). A range of culturally-based environmental monitoring tools, indicators and frameworks have been developed by Māori in conjunction with science partners to ground their practice of kaitiakitanga in te ao Māori and mātauranga Māori, with exemplars for wetlands (Harmsworth, 2002), freshwater (Awatere et al., 2017; Tipa & Teirney, 2003), lakes (Pauling & Arnold, 2008), estuaries (Walker, 2009) and forests (Lyver et al., 2017), as well as approaches that cut across domains (Morgan, 2008). Two key types of approaches have been identified which reflect the international examples touched on in the previous paragraph. Some utilise sustainable development frameworks in their construction while at the same time giving agency to Indigenous ways of knowing. Morgan (2008), for example, has developed the *Mauri-ometer*, a decision-making framework for undertaking impact assessments. In this tool the mauri¹³ of a range of indicators is assessed by tool users using a – 2 to +2 Likert scale across four pillars of sustainability: environmental, cultural, social, and economic wellbeing. Other groups have developed their own kaupapa Māori¹⁴ frameworks that are blended together with scientific methods in the development of tools (e.g., Harmsworth, Young, Walker, Clapcott, & James, 2011). While research opportunities for Māori to be involved in the co-creation of such tools have been forthcoming and policy initiatives, such as the Environmental Reporting Act (NZ Parliament, 2015), require reporting to be informed by a Māori perspective, opportunities for the application of these tools, particularly long-term monitoring and the integration of technological innovations, is lacking (Walker, 2019).

Jefferies and Kennedy (2009) identify three types of kaupapa Māori models currently used in the resource management space: cosmological (Atua-based) models, classification of time (Wā-based) models, and tikanga¹⁵ (values-based) models. Some groups overlap or hybridise models and frameworks. In this research project, the investigation was undertaken into one type, Atua frameworks, which was used to identify a range of culturally-based indicators and to co-create a cultural health assessment toolkit for indigenous forests. In the next section, we look at the methodology and methods used in this research project. In subsequent sections, we explore the roots of Atua frameworks in general, before describing the development of an existing Atua framework, which was then used to inform

the co-creation of a culturally-based tool for assessing the health of indigenous forests by kaitiaki Māori.

3 | RESEARCH METHODOLOGIES AND METHODS

This project was undertaken within the context of Aotearoa New Zealand and the continued effects of coloniality on Māori, so it was imperative that at its foundation the research was kaupapa Māori (Pihama, Southey, & Tiakiwai, 2015; Pohatu, 2005; Smith, 1990). The concept of kaupapa Māori in many ways defies classification, elucidating levels of understanding through philosophy, theory, methodology and praxis. Kaupapa Māori is a phenomenon embedded in the cultural being of Māori. It is rooted in ancient times but remains relevant to the contemporary (Mahuika, 2008; Pihama, 2001). When undertaking research with Indigenous communities their historical connections to place must be acknowledged. Research should be based on traditional Indigenous knowledge and be driven by the needs of 'the researched', as defined by themselves (Cram, 2011; Pihama, 2001; Smith, 2012). The research team's intentions were clear from the beginning. They were committed and supportive of the decolonising goals of the project, to behave and work in a way that empowered Māori voices and enabled positive and desirable outcomes for Māori communities.

Our research involved a multicultural and interdisciplinary team of researchers applying kaupapa Māori principles and aligned action research approaches. In this section, we outline the methodologies and methods that were used. Three iwi groups, Te Ātiawa Manawhenua ki te Tau Ihu Trust, Ngāti Tama ki Te Waipounamu Trust and Te Rūnanga o Ngāti Kuia Trust partnered with Lincoln University in the research project; *Toitū te Whenua, Matatū ana te Wao Nui a Tāne* (Walker, 2019). Four kaitiaki were mandated by the iwi groups to participate in the research,¹⁶ along with a PhD candidate, his supervisor and co-supervisor, who together formed the research team. Each member of the team brought a range of skillsets to the collective, including mātauranga Māori, lived experiences and scientific approaches to research. Particular kaitiaki had personal strengths in the areas of tikanga, kaitiakitanga, plant propagation and forest harvesting. The academic team complemented the kaitiaki team with strengths in te ao Māori, environmental management and project management. The PhD candidate was Pākehā, which for some would preclude his involvement in kaupapa Māori research (Barnes, 2014). However, he was acutely conscious of his ethnic positionality. Barker and Pickerill (2020, p. 643) describe research in the context of coloniality as ideally "a process

of interaction not extraction", and the PhD candidate had earned the trust of the three iwi groups through extended working and personal relationships over a 10-year period prior to the start of the project.

Relationships and reciprocal expectations were formalised between Lincoln University and the iwi partners through the Memoranda of Agreement (MoAs).¹⁷ Communication protocols were developed to clarify lines of communication and reporting. These were developed by the partners and set out the terms and conditions for those involved in the research and the responsibilities of the participants. The MoAs outlined measures for the protection of existing mātauranga and new intellectual property created between the parties. A mutual expectations agreement (MEA) was developed between the PhD candidate and his supervisors which highlighted their roles and responsibilities. Approval for the research was obtained from the Human Ethics Committee at Lincoln University to ensure the research was academically ethically sound.

Our research is theoretically informed by appropriate kaupapa Māori theory and is kaupapa Māori in practice. To further strengthen our collaborative research practice, a convergent methodology was sought to braid together Māori and Western knowledge systems, as advocated by Macfarlane and Macfarlane (2018). Action research has a natural synergy with, and can support and help implement a kaupapa Māori approach (Cram, 2011; Moller et al., 2009; O'Reilly, 2010), which satisfied the requirements of this research. Action research is counter-cultural, emancipatory and can provide pathways of self-determination (Dick, 1993). Action research and kaupapa Māori methodologies both challenge the positivistic construction of reality and offer overtly subjective ways forward. Both are strongly contextual and place-based, and emphasise a reality where the research journey (the process) is as important to the research as the destination (research outputs).

A case study approach was taken that involved the research team co-creating a prototype ketewhaihua forest monitoring toolkit. The kaitiaki team engaged in hui¹⁸ and rounds of fieldwork at six forest sites in the Motueka and Riwaka catchments over four seasons in 2013. The work proceeded through a spiral of action research steps comprised of planning (hui), action (forest visits), observation (data collection) and reflection (formalised in feedback forms). At the invitation of kaitiaki on the research team, whānau members and additional expert kaitiaki with speciality knowledge participated in selected hui and field visits. Forest holders¹⁹ also participated in the research at three forest sites, sharing knowledge about their forests, which was documented through semi-structured interviews aligned to the ketewhaihua. An

Atua framework familiar to the researchers was further built upon, delving deeper into the taxonomic concept of whakapapa so as to identify culturally-based indicators. Advice was taken from Harmsworth and Tipa (2006) who suggest that to be effective Māori environmental indicators need to be simple, robust, meaningful, and defensible, and able to be monitored at a reasonable cost. Culturally appropriate qualitative and quantitative metrics were identified to assess the mauri of each indicator. The indicators and data collection method were refined over the course of the action research steps to improve the performance of the developing toolkit. Post-fieldwork, the Atua framework was further developed as a schematic, to increase its effectiveness as a cultural lens and learning device. As such, the Atua framework formed both part of the methodology (in co-creating the tool) and part of the results of the research.

The next two sections briefly cover Atua frameworks. The first section introduces the concept of whakapapa, which informs all Atua framework designs, along with a few examples of their practical use in Aotearoa New Zealand today. The second section presents the Atua framework developed as an outcome of this research.

4 | WHAKAPAPA AND ATUA FRAMEWORKS

“In common with other oral societies, New Zealand Māori constructed mental maps by means of which they made sense of their phenomenological world. Their cognitive template, called whakapapa, consists of a genealogical framework upon which spiritual, spatial, temporal and biophysical information about a particular place is located” (Roberts, 2012, p. 741).

Whakapapa includes an intricate genealogical web of deities, humans, animal, bird and plant species, as well as inorganic ‘species’ such as minerals and rocks (Best, 1924; Clarke, 2007; Hiroa, 1949; Marsden & Henare, 1992; Roberts, 2012, 2013). Yates (2019, p. 6) describes whakapapa as also being “an ontological framework that attests to a multi-species lineage where earth, skies, rivers, and mountains, for example, have agency and importance as ancestral entities”. Contemporary Atua frameworks represent these ontologies beginning with the creation narrative where the primary parents, Papatūānuku earth mother and Ranginui sky father, produced six²⁰ sons: Tānemahuta, Tangaroa, Rongomātāne, Haumiatiketike, Tāwhirimātea, and Tūmataurangi (Hiroa, 1949). These six Atua, Hiroa (1949, p. 454) called “departmental gods”, “who were

important enough to receive divine authority over certain departments of life”. While the creation narrative is familiar to many iwi and hapū throughout the country there are geographical variations in the traditions, the nomenclature of Atua, and their roles and relationships (Best, 1924; Miller, 1952; Orbell, 1995; Roberts, 2013). Atua hold multiple guises according to context and place. Best (1924) documented 41 personifications of Tāne, with each persona representing a different role and set of responsibilities. The six departmental Atua (in other traditions more or less than six) begat a multitude of progeny, each responsible for species, groups of species or phenomena. Best (1924) referred to the multitudinous progeny of the six Atua as ‘tribal gods’, because they are place-based, usually recognised by a single tribe or group of tribes rather than being universally known. They are variously referred to as taniwha, kāwai tūpuna and poutiriao.²¹

The complexity and depth of whakapapa as a taxonomic system has been illustrated and discussed by various commentators including Hiroa (1949), Miller (1952) and Roberts (2012). Each relays a traditional narrative(s) which is then illustrated following schematic conventions found in phylogenetic or evolutionary trees. Each whakapapa and narrative begins with a departmental Atua producing lines of descendants responsible for specific living and non-living entities, or phenomena. For example, a creation narrative relayed by Hiroa (1949) tells the story of the separation of Ranginui and Papatūānuku. Tāwhirimātea, who was against the separation, made war in the form of a storm against his brothers. Ikatere and Tūtewehiwehi, offspring of Punga²² and grandchildren of Tangaroa, disputed as to where they should seek safety from the wrath of Tāwhirimātea. Ikatere fled to the sea where he and his family became ancestors of certain fish. Tūtewehiwehi fled inland and he and his progeny became ancestors of reptiles. Hiroa (1949, p. 440) reflects, “Here we have an evolutionary theory of the development of fish and reptiles from a common ancestor”. Miller (1952) presents an annotated list of Māori nomenclature of insects with nearly 400 entries and presents five abbreviated versions of the whakapapa of insects sourced from the literature and correspondence. Roberts (2012) relays three abbreviated whakapapa of kumara, of fishes and reptiles, and of lizards and taniwha. Traditional narratives, storytelling and arts are important storerooms and transmitters of Indigenous knowledge (Hunt, 2014). Modes such as whakatauki,²³ mōteatea²⁴ and pūrākau²⁵ are used to encode and transmit mātauranga Māori and to embody deeper environmental ethics including that of utu,²⁶ aroha²⁷ and karakia.²⁸ Atua were integral to the practice of kaitiakitanga in the past and continue to be consulted

by kaitiaki in their practice of kaitiakitanga today. The acknowledgement of Atua by kaitiaki before utilising resources or temporarily restricting their use (the latter termed *rāhui*) is an example of a customary practice continued by kaitiaki for the purpose of managing people-environment interactions.

The Hauraki Māori Trust Board (2004) developed an Atua framework around Ranginui, Papatūānuku, Tāne Mahuta, Tangaroa, and Rongomātāne to form a collective vision and structure for their environmental management plan *Whaiā te Mahere Taiao a Hauraki*. Tiakina te Taiao, a resource management entity comprised of six iwi trusts based in Nelson, have utilised Atua frameworks to support the development of a local iwi management plan (Passl, 2004), cultural impact assessments (Passl, Elkington, Hill, Horne, & Stafford, 2011; Sheridan, Stafford, Hovell, & Board of Tiakina te Taiao, 2010) and culturally-based approaches to environmental monitoring (Harmsworth et al., 2011; Walker, 2009, 2019). In a recent collaborative project between five iwi groups, six councils and the Department of Conservation, the iwi involved developed an Atua framework *Te Aotūroa* to support their biodiversity *Kotahitanga mō te Taiao Strategy* (West Coast Regional Council et al., 2019).

The Atua framework as finally developed in this research project—including the Atua entities that make up the framework, its design elements, current uses, and limitations—is presented in the next section. The framework developed provides a holistic systems overview with potential uses across a range of resource management and spatial planning initiatives, which is discussed in the final section.

5 | AN ATUA FRAMEWORK INFORMED BY THE RESEARCH FINDINGS

In this section, we provide a brief background to the development of an Atua framework during the research project *Toitū te Whenua, Matatū ana te Wao Nui a Tāne*. We then (a) outline the departmental Atua in the framework and their areas of authority, (b) outline the design elements of the framework, (c) illustrate the application of the framework, and (d) highlight some limitations of the framework.

Contemporary Atua frameworks have been used by iwi groups in Te Tau Ihu for kaitiakitanga purposes since at least the early 2000s, following the publication of the *Nga Taonga Tuku Iho ki Whakatū*²⁹ Management Plan (Passl, 2004). Two kaitiaki in the research team were familiar with the use of Atua frameworks in the context of cultural impact assessments and culturally-based freshwater monitoring. Cultural health assessments were

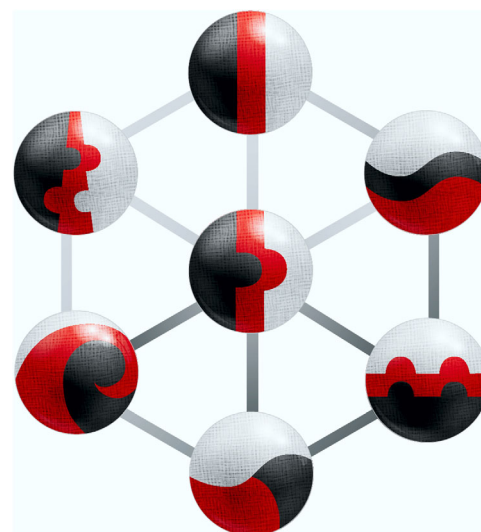


FIGURE 1 Atua framework: Tāne (centre), Tūmatauenga (12 o'clock), Rongomātāne (2 o'clock), Haumiatiketike (4 o'clock), Rūaumoko (6 o'clock), Tangaroa (8 o'clock), Tāwhirimātea (10 o'clock)

carried out by kaitiaki prior to, during and after the construction of the Ruby Bay Bypass near Motueka using culturally-based tools underpinned by a framework involving six Atua (Sheridan, Stafford, & Hovell, 2010). In our research, a draft schema was used by the kaitiaki team to explore the holistic understanding of whakapapa and help identify a set of *tohu* indicators. Two kaitiaki had not used Atua frameworks previously, although they were familiar with the Atua, their whakapapa and the traditional creation narratives. Throughout the research journey, the Atua framework was progressively developed to improve its effectiveness as a cultural lens. *Mātauranga* held by the research team, expert kaitiaki and *whānau* was a primary source of knowledge, along with *mātauranga* Māori within the public domain (Best, 1978; Hiroa, 1949; Irwin, 1984; Orbell, 1998; Roberts, 2012). Post-fieldwork, the schema was further developed to increase its utility as a learning tool, as illustrated in Figure 1.

Each of the seven spherical symbols within the framework represents an Atua. Tāne³⁰ is at the centre, as the research was undertaken within his forest domain. Tāne is the Atua of birds and forests, and he is also the fertility force. Tūmatauenga³¹ is the Atua of people and war. Political and social issues are included in his portfolio. Rongomātāne³² is the Atua of agriculture and peace. Haumiatiketike³³ is the Atua of fern root and wild foods. Rūaumoko³⁴ is the unborn Atua of earthquakes, volcanoes and other geological phenomena. Tangaroa³⁵ is the Atua of the oceans and waterways. Tāwhirimātea³⁶ is the Atua of the winds, clouds and storms.

The Atua framework as a schema was purposefully designed to emphasise the concepts of harmony, the balance of natural forces and kotahitanga.³⁷ The schema draws upon cultural symbols, colours and design elements present within te ao Māori. It allows for interpretation, and is not restricted by learning styles, ways of knowing or the written word. The hexagonal arrangement of the framework provides a quality of strength manifest in beehives, basalt columns and other building blocks of nature. The triangles (*niho taniwha*³⁸) that link the seven Atua in sets of three emphasise their whakapapa connections. Niho taniwha is a symbol of strength and resilience. It has a series of contextual meanings, including the historian, the chief, hospitality and the family houses of a tribe (Department of Maori Studies, 1986, p. 42). It is a reminder of the interrelationships between the three kaitiaki entities—the Atua, the iwi and the mandated individuals—working together to uphold their kaitiaki rights, roles and responsibilities. The colours black, white and red ochre are widely used around Aotearoa New Zealand in traditional arts including whakairo,³⁹ kōwhaiwhai⁴⁰ and tukutuku.⁴¹ They also form the colour palate of the Tino Rangatiratanga flag which has become a symbol of Māori resistance and affirmation of sovereignty. The three colours have multiple meanings in Māori culture. Te Kawariki (1999) explain the colours of the flag, with black representing Te Korekore, the realm of Potential Being; white representing Te Ao Marama, the realm of Being and Light; and red representing Te Whei Ao, the realm of Coming into Being.

The Atua framework was used by the kaitiaki team as a learning device in the construction of the prototype ketewhaihua. Team members who were familiar with the application of Atua frameworks for kaitiakitanga purposes used it to help explain its use to those who were not familiar with it in this context. The framework was used by the team to discuss the wider concept of whakapapa as a taxonomical system for the classification of species, groups of species and phenomena. Atua and poutiriao, their whakapapa, roles and responsibilities were discussed. Poutiriao were populated into the framework, located according to their whakapapa, and aligned to a tohu indicator, keywords or phrases and a relevant whakatauki. For example, Parauri was identified as a wife of Tāne and the poutiriao of nectar-feeding birds such as tūi⁴² and korimako.⁴³ Keywords included song, nectar and harvest level. This tohu was paired with the whakatauki “He korokoro tūi” (the throat of a tūi) which is used to describe the chatting of a tūi or singing and speech making.

Holistic assessments of the wellbeing of the six forests in the Motueka and Riwaka catchments were undertaken using the ketewhaihua to consult each Atua and

poutiriao in turn. This consultation was undertaken through a set of indicators of mauri to assess the overall hauora⁴⁴ of the forests. Their wellbeing was recorded using appropriate qualitative and quantitative metrics. Short mōteatea was the culturally preferred mechanism for kaitiaki to record the state health of the poutiriao. As an example, a kaitiaki distilled the state of wellbeing of Parauri at one forest site as “Tūi singing in the background, song full of honey” and assigned the tohu a score of 1 on a – 2 to +2 Likert scale. Tuning in is important when assessing the wellbeing of a place. Using the schema as a guide helps one focus and tune in. It carries cultural cues into the field. Tuning into the task, the kaitiaki team found the framework useful in the forests, to connect with culture and nature, and to undertake monitoring of wellbeing in an Indigenous way.

In a recent collaborative research project, *Map-based tools for Community and Rūnanga-led sustainable town planning*, two geospatial place-based tools were co-created with Māori groups, Ngāi Tūāhuriri and Ngāti Whakaue to better enable community-led spatial planning (Dionisio & Walker, 2019, 2020). The Atua framework was applied in both case studies to help root the tools in te ao Māori. Both tools have functions for whānau⁴⁵ members to securely upload and hold cultural narratives and geospatial layers. Each narrative uploaded is categorised by one or more Atua and narrative types (e.g., traditional, historical, and lived experience). Both tools allow users to search for cultural narratives by Atua and by narrative type.

There are limitations to the framework. Although spherical symbols were used to convey a sense of dimension, the framework is constrained to two dimensions by the flat page. While the Atua framework helps demonstrate the inter-relatedness of the spiritual entities and the fluidity of their overlapping roles and responsibilities, the space available on the page makes it difficult to locate all poutiriao and fully convey the complexity of whakapapa. A digital version would allow for a better spatial representation of the whakapapa of Atua and poutiriao. Another challenge was that the Atua framework was purposefully developed as a generic framework following commonly published Atua and poutiriao characters. This was performed to be recognisable to wider whānau around the country rather than consciously populating it with place-based but potentially obscure characters. At the same time, the framework was designed to be flexible and adaptable for other ontologies and geographies, so that other tribal groups can populate it according to their own traditions. A third caution is that the framework is not meant to replace the role of kaumātua⁴⁶ or of the marae.⁴⁷ The framework was designed to carry cultural cues of the marae into the field, acknowledge the Atua and generate kōrero about the wellbeing of their progeny.

The Atua framework was developed as a schematic to enhance its ability to act both as a cultural lens and as a learning device. While kaupapa Māori frameworks are beginning to be utilised for the practice of kaitiakitanga we argue that their full potential has yet to be realised. Our research allowed for more in depth exploration of an Atua framework and its application in the creation of a place-based tool.

6 | CONCLUSION: THE POTENTIAL APPLICATION OF ATUA FRAMEWORKS

Our planet is in a traumatic state. In seeking solutions, hegemonic ontologies typically divide the world into ecological, economic and social systems. Despite attempts at holism through the incorporation of other dimensions into sustainable development frameworks, such as culture, politics and technology, we argue that Western approaches are not leading to sustainable outcomes. Relying on technological innovations to get us out of our stricken state is proving problematic, as the current pandemic, which has exposed how vulnerable we are to our dependence on the 'global village', demonstrates. Indigenous ontologies, including place-based ways of knowing and doing offer alternative approaches. These are rooted in epistemologies nurtured over hundreds and sometimes thousands of years of interrelationships between people and place. They promote holistic, integrated, interdisciplinary approaches, ideal to the management of natural and cultural landscapes.

Here in Aotearoa New Zealand, we have an example of an Indigenous ontology, a construction of the universe populated with supernatural deities and heroic deeds. These Atua hold roles and responsibilities within an elaborate whakapapa of interrelationships. Māori communities are blending together Māori and Western knowledge systems, building contemporary Atua frameworks to underpin their spatial planning tools and ground their practice of kaitiakitanga in te ao Māori. Are these approaches transferable from the rivers and forests to cities, from the natural to built environments? We contest that Atua frameworks have the potential to be an overarching point of reference within multiple spatial planning and resource management contexts. Atua frameworks can be adapted and populated according to the specific place-based traditions and narratives of iwi and hapū, regardless of their geographies. They have the potential to assist Māori-led design of settlements and to empower local communities, whether in urban, peri-urban or rural contexts. We posit the view that the incorporation of Indigenous frameworks into spatial planning

can help create a collective vision for place. Māori-led initiatives can be co-designed with communities through the Atua framework, consulting each Atua in turn. The framework can be targeted to maximise and monitor the wellbeing of each Atua, rather than the competing forces of the prevalent Western sustainable development frameworks. We believe that such Indigenous-centric approaches to spatial planning and resource management initiatives have great potential in turning around the deteriorating state of our planet.

ACKNOWLEDGEMENTS

We acknowledge the support and trust of our iwi partners in this research: Te Ātiawa o Te Waka-a-Māui Trust, Ngāti Tama ki Te Waipounamu Trust and Te Rūnanga o Ngāti Kuia Trust. Ngā mihi maioha to kaitiaki and their whānau from Motueka who contributed to the development and testing at forest locations of the Atua framework presented in this paper: Ray Anderson, Jason Maui Duff, Daren Tamaiti Horne, Hori Kahukura, Ngarangi Marsh, Melz E. McColgan and Ngawaina Joy Shorrocks. Thank you to my colleagues Willy Cameron and Rita Dionisio for discussions and proofreading of the manuscript. Thank you also to the Foundation for Research Science and Technology Research which provided funding in the early stages of this project in the form of a Te Tipu Pūtaiao Fellowship.

ORCID

Dean P. Walker  <https://orcid.org/0000-0003-0061-2763>

James M. Ataria  <https://orcid.org/0000-0001-5953-0485>

ENDNOTES

¹ Kaitiaki ≈ guardian.

² Iwi ≈ tribe.

³ Hapū ≈ sub-tribe.

⁴ Tangata whenua ≈ local Māori who hold authority over their place.

⁵ Kaitiakitanga ≈ Guardianship. The concept is generally understood in the context of natural resource management but increasingly it is recognised as also including guardianship of the built environment (i.e., spatial planning).

⁶ Tino rangatiratanga ≈ Māori sovereignty.

⁷ Now Te Ātiawa o Te Waka-a-Māui Trust.

⁸ Toitū te Whenua, Matatū ana te Wao Nui a Tāne ≈ The permanence of the land, the enduring forests.

⁹ Ketewhaihua ≈ Fit-for-purpose toolkit.

¹⁰ Te ao Māori ≈ Māori world view.

¹¹ Mātauranga ≈ Māori knowledge.

¹² The terms "frameworks" and "models" are often used interchangeably in the literature. For the purposes of this article, the term framework is favoured.

- ¹³ Mauri ≈ life force.
- ¹⁴ Kaupapa Māori ≈ Māori approaches and principles.
- ¹⁵ Tikanga ≈ customs.
- ¹⁶ The iwi members of the research team were Patrick Takarangi Park (Te Ātiawa), John Pere Katene (Te Ātiawa), Ray Anderson (Ngāti Kuia) and Jason Maui Duff (Ngāti Tama). Sadly Mr. Park passed away in 2016 but with the consent of his whanau he is included as a co-author to reflect his contribution to the paper.
- ¹⁷ Although Ngāti Tama ki Te Waipounamu Trust were instrumental in the development of the MoAs, they decided not to sign one themselves. Their reason was that, while trust had been established between themselves and the PhD candidate, they did not want to sign a three-way document that included Lincoln University with whom trust had yet to be established. Despite this, they continued to support the project throughout, including mandating a kaitiaki to the research team and supporting funding applications.
- ¹⁸ Hui ≈ meetings.
- ¹⁹ Forest holders are those people who hold rights over forests, including management rights, harvest rights and freehold (fee simple) rights.
- ²⁰ The number and name of the sons varies between tribal traditions.
- ²¹ For the purpose of this article we refer to tribal gods using the term poutiriao.
- ²² Punga is the ancestor of ugly things, which in various traditions include insects, lizards, sharks and rays.
- ²³ Whakataukī ≈ proverbial sayings.
- ²⁴ Mōteatea ≈ poetry.
- ²⁵ Pūrākau ≈ stories.
- ²⁶ Utu ≈ reciprocity.
- ²⁷ Aroha ≈ care and respect.
- ²⁸ Karakia ≈ Prayer, incantations.
- ²⁹ Whakatū ≈ Nelson area.
- ³⁰ Also known as Tāne-mahuta and Tāne-nui-a-Rangi.
- ³¹ Also known as Tū and Tūkāriri.
- ³² Also known as Rongo, Rongo-hīrea and Rongo-marae-roa-a-Rangi.
- ³³ Also known as Haumietiketike, Haumia, Haumia-tikitiki and Haumia-roa.
- ³⁴ Also known as Rūaimoko.
- ³⁵ Also known as Takaroa.
- ³⁶ Also known as Tāwhiri, Tāwhiri-rangi and Tāwhiri-mate-a-Rangi.
- ³⁷ Kotahitanga ≈ Unity, collective action, holism.
- ³⁸ Niho taniwha ≈ Saw-edged or triangular pattern. Literally the “tooth of the supernatural being”.
- ³⁹ Whakairo ≈ carvings.
- ⁴⁰ Kōwhaiwhai ≈ rafter patterns.
- ⁴¹ Tukutuku ≈ lattice work.
- ⁴² Tūi = *Prosthemadera novaeseelandiae*.
- ⁴³ Korimako = *Anthornis melanura*.

- ⁴⁴ Hauora ≈ cultural and environmental wellbeing.
- ⁴⁵ Whānau ≈ wider family.
- ⁴⁶ Kaumātua ≈ elders.
- ⁴⁷ Marae ≈ A marae is the courtyard in front of the main meeting house of a tribal group, but the word is also used to refer to the complex of buildings around the marae.

REFERENCES

- Adam, M. C., & Kneeshaw, D. (2008). Local level criteria and indicator frameworks: A tool used to assess aboriginal forest ecosystem values. *Forest Ecology and Management*, 255(7), 2024–2037. <https://doi.org/10.1016/j.foreco.2007.12.051>
- Awatere, S., Robb, M., Taura, Y., Reihana, K., Harmsworth, G. R., Te Maru, J., & Watene-Rawiri, E. (2017). *Wai Ora Wai Māori—a kaupapa Māori assessment tool*. Hamilton, New Zealand: Manaaki Whenua Landcare Research.
- Barbier, E. B. (1987). The concept of sustainable economic development. *Environmental Conservation*, 14(2), 101–110.
- Barker, A. J., & Pickerill, J. (2020). Doings with the land and sea: Decolonising geographies, indigeneity, and enacting place-agency. *Progress in Human Geography*, 44(4), 640–662. <https://doi.org/10.1177/0309132519839863>
- Barnes, A. (2014). *What can Pākehā learn from engaging in kaupapa Māori educational research?*. Wellington, New Zealand: New Zealand Council for Educational Research, Te Wāhanga.
- Best, E. (1924). *Maori religion and mythology (part 1)* (Vol. 10). Wellington, New Zealand: Dominion Museum.
- Best, E. (1978). *Some aspects of Māori myth and religion*. Wellington, New Zealand: E.C. Keating, Government Printer.
- Biodiversity Collaborative Group. (2018). *Report of the Biodiversity Collaborative Group*. Wellington, New Zealand: Biodiversity (Land and Freshwater) Stakeholder Trust.
- Canadian Council of Forest Ministers. (2006). *Criteria and Indicators of Sustainable Forest Management in Canada: National status 2005*. Ottawa, Canada: Natural Resources Canada, Canadian Forest Service.
- Clarke, A. (2007). *The great sacred Forest of Tane: Te Wao Tapu Nui a Tane*. Auckland: Reed.
- Cram, F. (2011). *Whānau Ora and Action Research*. Retrieved from http://whanauoraresearch.co.nz/files/formidable/Cram_WOActionResearch2011.pdf
- Department of Maori Studies. (1986). *Tukutuku patterns in the wharenui*. Wellington, New Zealand: Te Whare Wananga o Wīkitoria.
- Dick, B. (1993). In *You want to do an action research thesis? How to conduct and report action research*. Chapel Hill, Queensland: Interchange. Retrieved from <http://www.aral.com.au/resources/arthesis.html>
- Dionisio, M. R., & Walker, D. P. (2019). *Map-based tools for community and rūnanga-led sustainable town planning: Annual report 2019*. Wellington, New Zealand: MBIE.
- Dionisio, M. R., & Walker, D. P. (2020). *Map-based tools for community and rūnanga-led sustainable town planning: Annual report 2020*. Wellington, New Zealand: MBIE.
- Elkington, J. (2018). 25 years ago I coined the phrase “triple bottom line.” Here’s why it’s time to rethink it. *Harvard Business Review*. Retrieved from <https://hbr.org/2018/06/25-years-ago-i-coined-the-phrase-triple-bottom-line-heres-why-im-giving-up-on-it>

- Giddings, B., Hopwood, B., & O'Brien, G. (2002). Environment, economy and society: Fitting them together into sustainable development. *Sustainable Development*, 10(4), 187–196. <https://doi.org/10.1002/sd.199>
- Harmsworth, G. R. (2002). *Coordinated monitoring of New Zealand wetlands, phase 2, goal 2: Māori environmental performance indicators for wetland condition and trends*. Palmerston North, New Zealand: Manaaki Whenua Press.
- Harmsworth, G. R., & Awatere, S. (2013). Indigenous Māori knowledge and perspectives of ecosystems. In J. Dymond (Ed.), *Ecosystem services in New Zealand: Conditions and trends* (pp. 274–286). Lincoln, New Zealand: Manaaki Whenua Press.
- Harmsworth, G. R., & Tipa, G. (2006). *Māori environmental monitoring in New Zealand: Progress, concepts, and future directions*. Retrieved from http://icm.landcareresearch.co.nz/knowledgebase/publications/public/2006_Maorienvmonitoring_harmsworth_tipa.pdf
- Harmsworth, G. R., Young, R. G., Walker, D. P., Clapcott, J. E., & James, T. (2011). Linkages between cultural and scientific indicators of river and stream health. *New Zealand Journal of Marine and Freshwater Research*, 45(3), 423–436.
- Hauraki Māori Trust Board. (2004). *Whaiā te Mahere Taiao a Hauraki; Hauraki iwi environmental plan*. Paeroa, New Zealand: Ministry for the Environment, Department of Conservation, and Environment Waikato.
- Hiroa, T. R. (1949). *The coming of the Māori*. Christchurch, New Zealand: Whitcombe and Tombs.
- Hunt, S. (2014). Ontologies of indigeneity: the politics of embodying a concept. *Cultural Geographies*, 21(1), 27–32.
- Ilott, I., Gerrish, K., Laker, S., & Bray, K. (2013). *Naming and framing the problem: using theories, models and conceptual frameworks*. Retrieved from <https://www.e-repository.clahrc-yh.nihr.ac.uk/wp-content/uploads/2015/02/Bridging-the-gap-between-knowledge-and-practice-v1.pdf>
- Irwin, J. (1984). *An introduction to Māori religion: Its character before European contact and its survival in contemporary Māori*. Adelaide, South Australia: Australian Association for the Study of Religion.
- Jefferies, R., & Kennedy, N. (2009). *Māori outcome evaluation: A Kaupapa Māori outcomes and indicators framework and methodology*. Planning Under Co-operative Mandates Māori Report 1. Hamilton, New Zealand: University of Waikato & KCSM Solutions.
- Jolly, D., & Thompson-Fawcett, M. (2021). Enhancing indigenous impact assessment: Lessons from indigenous planning theory. *Environmental Impact Assessment Review*, 87, 106541. <https://doi.org/10.1016/j.eiar.2020.106541>
- Karjala, M., Sherry, E., & Dewhurst, S. (2003). *The Aboriginal Forest planning process: A guidebook for identifying community-level criteria and indicators*. Prince George, Canada: University of Northern British Columbia.
- Kawariki, T. (1999). *20 years of Protest Action: 1979–1999*. Kaitiāia, New Zealand: Te Kawariki.
- Kennedy, N., & Jefferies, R. (2009). *Kaupapa Māori Framework and Literature Review of Key Principles*. Retrieved from http://www.waikato.ac.nz/igci/pucm/mr/mr4_lrkp.pdf
- Latimer, T. P. (2011). *Māori involvement in natural resource management in Aotearoa New Zealand: Do statutory processes create benefits? (Masters)*. Palmerston North, New Zealand: Massey University. Retrieved from <http://hdl.handle.net/10179/3038>
- Lyver, P. O. B., Timoti, P., Jones, C. J., Richardson, S. J., Tahī, B. L., & Greenhalgh, S. (2017). An indigenous community-based monitoring system for assessing forest health in New Zealand. *Biodiversity and Conservation*, 26(13), 3183–3212. <https://doi.org/10.1007/s10531-016-1142-6>
- Macfarlane, A., & Macfarlane, S. (2018). *Toi Tū te Mātauranga: A National Science Challenge Approach for culturally-responsive research*. Christchurch, New Zealand: University of Canterbury.
- Mahuika, R. (2008). Kaupapa Māori theory is critical and anti-colonial. *MAI Review*, 3, 4.
- Marsden, M., & Henare, T. A. (1992). *Kaitiakitanga: A definitive Introduction to the holistic world view of the Māori*. Wellington, New Zealand: Ministry for the Environment.
- Matunga, H. (2000). Decolonising planning: The Treaty of Waitangi, the environment and a dual planning tradition. In P. A. Memon & H. C. Perkins (Eds.), *Environmental planning and management in New Zealand* (pp. 36–47). Palmerston North: Dunmore Press.
- Matunga, H. (2013). Theorizing indigenous planning. In R. Walker, T. E. D. Jojola, & D. Natcher (Eds.), *Reclaiming indigenous planning* (pp. 3–32). Montreal, Canada: McGill-Queen's University Press.
- Miller, D. (1952). The insect people of the Māori. *Journal of the Polynesian Society*, 61(1–2), 1–61.
- Miller, D. (2005). *Western and Māori Values for Sustainable Development*. Retrieved from <http://www.firstfound.org/david%20miller.htm>
- Ministry for the Environment & Statistics NZ. (2020). *New Zealand's Environmental Reporting Series: Our Freshwater*. Retrieved from <http://www.mfe.govt.nz>
- Moller, H., Lyver, P. O. B., Bragg, C., Newman, J., Clucas, R., Fletcher, D., ... Rakiura Titi Islands Administering Body. (2009). Guidelines for cross-cultural participatory action research partnerships: A case study of a customary seabird harvest in New Zealand. *New Zealand Journal of Zoology*, 36, 211–241.
- Morgan, T. K. K. B. (2008). *Mauri Model Decision Making Framework Research Summary*. Retrieved from http://old.boprc.govt.nz/Consents/Appendix_11.pdf
- Natcher, D. C. (2001). Arriving at appropriate criteria and indicators for sustainable forest management: A First Nations Perspective. In *Paper presented at the Tenth Biennial Conference of the International Institute of Fisheries Economics and Trade, July 10–14*. Corvallis, Oregon: International Institute of Fisheries Economics and Trade.
- Natcher, D. C., & Hickey, C. G. (2002). Putting the community back into community-based resource management: A criteria and indicators approach to sustainability. *Human Organisation*, 61(4), 350–364.
- Nelson, K. D., & Tipa, G.T. (2012). *Cultural indicators, monitoring frameworks and assessment tools*. Report for Aqualinc Wheel of Water research programme. 63pp.
- NZ Parliament. (2015). *Environmental Reporting Act*. Retrieved from <http://www.legislation.govt.nz/act/public/2015/0087/latest/DLM5941105.html>
- Orbell, M. (1995). *The Illustrated Encyclopedia of Māori Myth and Legend*. Christchurch, New Zealand: Canterbury University Press.

- Orbell, M. (1998). *A Concise Encyclopedia of Māori Myth and Legend*. Christchurch, New Zealand: Canterbury University Press.
- O'Reilly, D. (2010). Participative action research: Consensus cardsort—Whānau future narrative. *MAI Review*, 3, 10.
- Passl, U. (2004). *Nga Taonga Tuku Iho ki Whakatu Management Plan*. Nelson, New Zealand: Nelson Iwi Resource Management Komiti & Nelson City Council.
- Passl, U., Elkington, M., Hill, C., Horne, D., & Stafford, K. (2011). *A cultural impact assessment: Managing waterways in the Tasman District*. Nelson, New Zealand: Tiakina te Taiao.
- Pauling, C., & Arnold, G. (2008). Cultural Health of the Lake. In K. F. D. Hughey & K. J. W. Taylor (Eds.), *Te Waihora/Lake Ellesmere: State of the Lake and Future Management* (pp. 77–84). Christchurch, New Zealand: EOS Ecology.
- Pihama, L. (2001). *Tihei Mauri Ora: Honouring Our Voices. Mana Wahine as a Kaupapa Maori Theoretical Framework*. The University of Auckland, New Zealand, Unpublished PhD. Retrieved from <http://www.kaupapamaori.com/theory/5/>
- Pihama, L., Southey, K., & Tiakiwai, S.-J. (Eds.). (2015). *Kaupapa Rangahau: A Reader*. Hamilton, Aotearoa/New Zealand: Te Kotahi Research Institute.
- Pohatu, T. W. (2005). *Ata: Growing respectful relationships*. Retrieved from <http://www.kaupapamaori.com/assets//ata.pdf>
- Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: In search of conceptual origins. *Sustainability Science*, 14(3), 681–695. <https://doi.org/10.1007/s11625-018-0627-5>
- Roberts, M. (2012). Mind maps of the Māori. *GeoJournal*, 77(6), 741–751. <https://doi.org/10.1007/s10708-010-9383-5>
- Roberts, M. (2013). Ways of seeing: Whakapapa. *Sites*, 10(1), 93–120.
- Ruru, J., Lyver, P., Scott, N., & Edmunds, D. (2017). Reversing the decline in New Zealand's biodiversity: empowering Māori within reformed conservation law. *Policy Quarterly*, 13(2), 65–71.
- Saint-Arnaud, M., Asselin, H., Dubé, C., Croteau, Y., & Papatie, C. (2009). Chapter six: Developing criteria and indicators for aboriginal forestry, mutual learning through collaborative research. In M. G. Stevenson & D. C. Natcher (Eds.), *Changing the culture of forestry in Canada: Building effective institutions for Aboriginal engagement in sustainable forest management* (pp. 85–106). Edmonton: CCI Press.
- Shearer, J., Peters, P., & Davidson-Hunt, I. J. (2009). Chapter five: Co-producing a Whitefeather Forest cultural landscape monitoring framework. In M. G. Stevenson & D. C. Natcher (Eds.), *Changing the culture of forestry in Canada: Building effective institutions for Aboriginal engagement in sustainable forest management* (pp. 63–84). Edmonton: CCI Press.
- Sheridan, A., Stafford, K., Hovell, J., & Board of Tiakina te Taiao. (2010). *A cultural impact assessment for the proposed Ruby Bay bypass*. Nelson, New Zealand: Tiakina te Taiao.
- Sherry, E., Halseth, R., Fondahl, G., Karjala, M., & Leon, B. (2005). Local-level criteria and indicators: An Aboriginal perspective on sustainable forest management. *Forestry: An International Journal of Forest Research*, 78(5), 513–539. <https://doi.org/10.1093/forestry/cpi048>
- Smith, G. H. (1990). *Research issues related to Māori education. Paper presented at the NZARE special interest conference*. Palmerston North, New Zealand: Massey University.
- Smith, L. T. (2012). *Decolonizing methodologies: Research and indigenous peoples* (Second ed.). London: Zed Books.
- Tipa, G., & Teirney, L. (2003). *A cultural health index for streams and waterways: Indicators for recognising and expressing Māori values*. New Zealand: Ministry for the Environment. Wellington.
- Walker, D. P. (2009). *Iwi Estuarine Indicators for Nelson*. Retrieved from <http://www.envirolink.govt.nz/PageFiles/425/628-nlcc31.pdf>
- Walker, D. P. (2019). *Toitū te whenua, Matatū ana te Wao Nui a Tāne: A cultural health monitoring and assessment technique for New Zealand indigenous forests*. Lincoln, New Zealand: Lincoln University.
- West Coast Regional Council, Ngāti Apa ki te Rā Tō, Nelson City Council, Kaikoura District Council, Marlborough District Council, Ngāti Kuia, Buller District Council. (2019). *Kotahitanga mō te Taiao Strategy*. Retrieved from <https://www.doc.govt.nz/contentassets/cf2bf2f877544dc29594442365ca797c/kotahitanga-mo-te-taiao-strategy.pdf>
- World Commission on Environment and Development. (1987). *Our Common Future*. Oxford: Oxford University Press.
- Yates, A. (2019). *Whanake mai te mauri ora: Think piece – an expanded wellbeing framework and urban science data tool for integrated wellbeing governance* [Research Report]. BRANZ-NSC11-BBHTC. Retrieved from <http://buildingbetter.nz/resources/publications.html>

How to cite this article: Walker, D. P., Ataria, J. M., Hughey, K. F. D., Park, P. T., & Katene, J. P. (2021). Environmental and spatial planning with ngā Atua kaitiaki: A mātauranga Māori framework. *New Zealand Geographer*, 77(2), 90–100. <https://doi.org/10.1111/nzg.12300>