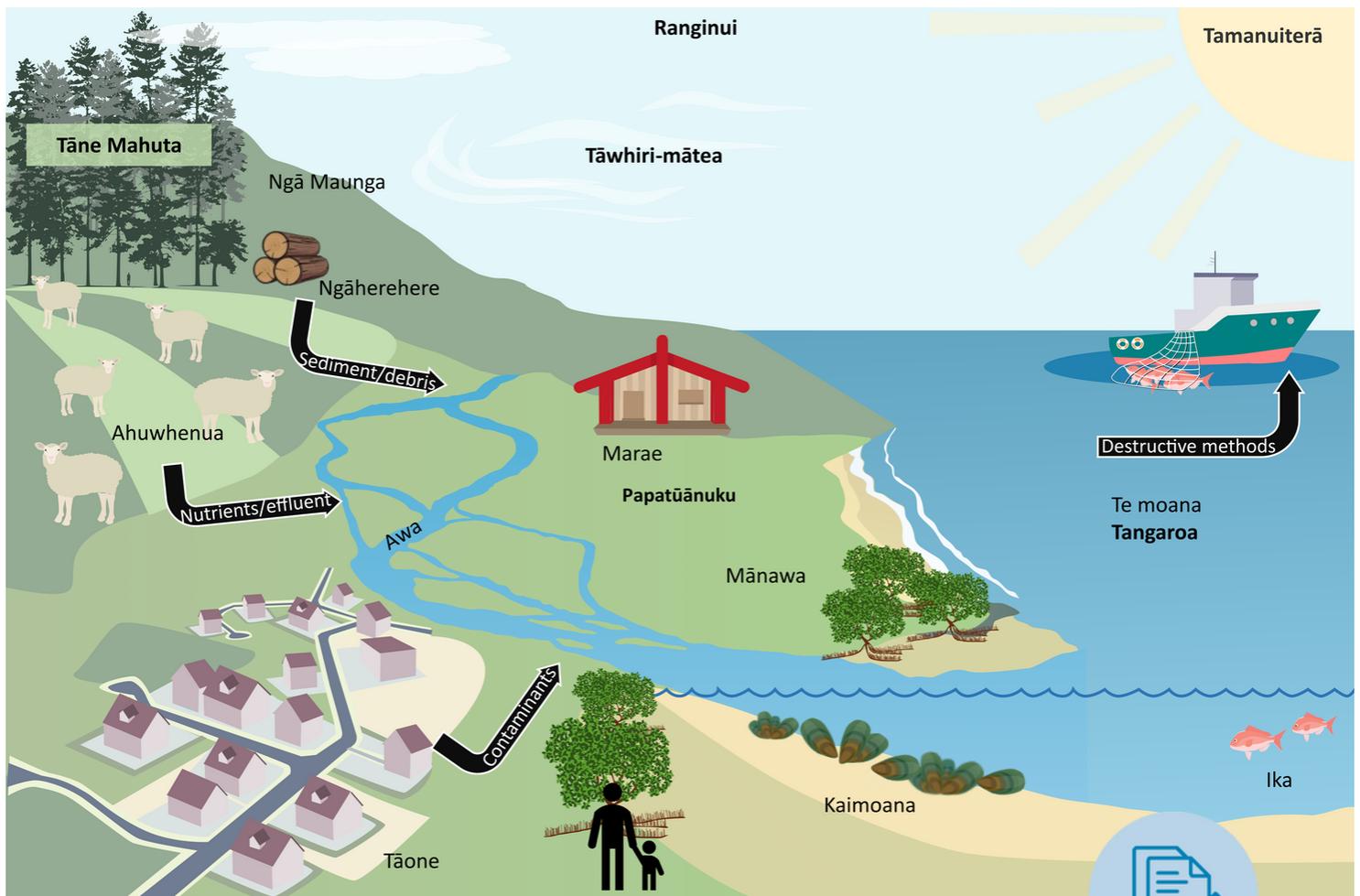


Hapū and iwi perceptions of cumulative effects: towards supporting kaitiakitanga

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Report

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For more information on this project visit: <https://www.sustainableseaschallenge.co.nz/our-research/spatially-explicit-cumulative-effects-tools/>

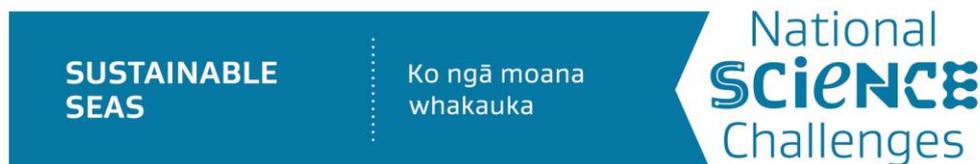
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About the Sustainable Seas National Science Challenge

Our vision is for Aotearoa New Zealand to have healthy marine ecosystems that provide value for all New Zealanders. We have 60+ research projects that bring together around 250 scientists, social scientists, economists, and experts in mātauranga Māori and policy from across Aotearoa New Zealand. We are one of 11 National Science Challenges, funded by the Ministry of Business, Innovation & Employment.



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Executive summary

Research on the cumulative effects of multiple stressors on ecosystems is a growing field of study, and takes into account many ecological concerns about our natural environment and the values we associate with it. However, little research has been undertaken to understand Māori experiences and perceptions of cumulative effects. The Sustainable Seas National Science Challenge (the Challenge) seeks to apply both science and mātauranga Māori to enable innovative governance and jurisdiction models at different scales, and to meet the ongoing needs and aspirations of Māori and communities. The purpose of this report is to help the Challenge support existing iwi and hapū kaitiakitanga by understanding cumulative effects from a Māori perspective. This report presents some of the barriers faced by iwi and hapū across Aotearoa with regards to management of cumulative effects in freshwater, estuarine and marine environments, and potential solutions to overcome these barriers.

This literature review is only to be used as a guide to understand the general perceptions, issues, and priorities of iwi and hapū regarding cumulative effects of multiple stressors. It is crucial that that unique needs and priorities of individual whānau, hapū and iwi are discussed 'kanohi ki te kanohi'.

As a case study, iwi and hapū management plans (IEMPs) from Heretaunga (Hawke's Bay region) and lodged with Hawke's Bay Regional Council were used in the collation and analysis of this report. In addition, a selection of case studies derived from iwi- and hapū-driven research, strategies and reports across Aotearoa and Te Wai Pounamu are examined to understand potential barriers and solutions to enabling Māori-driven environmental management.

The issues identified in Heretaunga IEMPs included land use and land management strategies, and compartmentalisation of the natural environment. These in turn can result in poor water quality from erosion, excess nutrient inputs, point-source discharges, and contaminants in unfiltered runoff. To manage these issues, iwi and hapū were particularly interested in remediation actions deriving multiple benefits. Iwi and hapū sought to mitigate the cumulative effects of various land use and management strategies by improving land management best practice, including through riparian planting, habitat restoration, and integrating holistic management across the whole ecosystem.

It was clear from IEMPs that cumulative effects are managed holistically in te ao Māori. However, contemporary management systems in Aotearoa have created significant barriers to the expression of tikanga Māori management approaches for cumulative effects. Compartmentalisation of centralised resource management and governance systems does not recognise the flow-on effects of activities across catchments. Co-governance arrangements for natural resources are one way to ensure Māori values are respected through collaborative decision making, however even these may not fully realise tikanga Māori approaches. As more hapū and iwi are undertaking the treaty settlement process, more statutory bodies could be established with greater power to integrate the holistic and integrated co-governance of their taonga and places of cultural significance from a tikanga Māori perspective, allowing for cumulative effects to be better managed.

1 Introduction

We have collated accessible information on the cumulative effects of multiple stressors on marine and cultural values, as expressed by iwi and hapū around Aotearoa New Zealand. The key purpose is to communicate iwi and hapū accounts of multiple stressors and their cumulative impacts on cultural values and resources, especially regarding **kaitiakitanga** (active spiritual and physical guardianship) towards designing meaningful decision-support tools based on **tikanga** Māori. We draw on existing concerns and interests regarding cumulative effects and stressors shared by selected **iwi** (tribe) and **hapū** (sub-tribe) from Heretaunga (Hawke's Bay region) as a case study. A further selection of other case studies from across Aotearoa and Te Wai Pounamu are then examined to understand potential barriers and solutions to enabling tikanga Māori within existing management tools and approaches.

This report is not an attempt to collate and publicise the extensive body of mātauranga Māori that is retained and has been actively practised over centuries by **whānau** (extended family group), hapū and iwi across the **motu** (land, island, country). It is designed to gain a better understanding of cumulative effects within a Heretaunga whānau cultural context, towards designing meaningful decision-support tools based on tikanga Māori. We encourage readers to source the cited references for a more in-depth understanding of Māori cosmology, principles, and concepts and the tribal and **rohe** (territory, region) histories touched on in this report.

This report contains place names and other nouns that are relevant and are spelled according to how they are utilised in te reo Māori. Te reo Māori and English words that may require definitions throughout this report are boldened the first time they are used. If a definition is not provided directly after, these terms will be defined in the glossary section (Appendix 1).

1.1 Context

Research on cumulative effects of multiple stressors on ecosystems is a growing field of study (e.g., Jackson et al. 2015; Puccinelli 2012; Ellis et al. 2017) and this approach takes into account many ecological concerns about our natural environment and the associated values that we associate with it. Cumulative effects research recognises that while one stressor may have negligible impacts on the environment and its resources, multiple stressors may have cumulative impacts of varying magnitudes (Thrush et al. 2014, Hewitt et al. 2016, Thrush et al. 2017). This is of particular importance for ecosystem-based management (EBM), as understanding cumulative effects is essential for managing them in a more holistic, inclusive way.

One of the challenges with EBM is the difficulty of incorporating cumulative effects into existing decision-making practices. Current contemporary marine management practices typically focus on single stressors, or single sectors, single habitats, or single species. However, the interactions between multiple stressors and where and when a stressor footprint occurs are important considerations when determining effects on ecosystems. Project 1.2 of the Sustainable Seas National Science Challenge (the Challenge) aims to build the capacity of existing marine spatial management tools to include the assessment of cumulative effects.

To date, little research has been undertaken to understand te ao Māori experiences and perceptions of cumulative effects. This report details a desktop exploration on te ao Māori experiences and perceptions of cumulative effects to fill this gap.

1.2 Māori perceptions

Ko au te awa, ko te awa ko au - I am the river, the river is me

- A well-known **whakataukī** (proverb) used by Whanganui iwi and hapū.

Many Indigenous Peoples recognise the environment as an extension of themselves, which is often expressed through song, stories, and customs (Durie 2004). The relationship between indigenous peoples and the environment has allowed the development of dynamic intergenerational knowledge and practices over time (Wehi et al. 2019). Iwi and hapū maintain their relationship with the environment through the practice of active spiritual and physical guardianship, also known as kaitiakitanga (Walker et al. 2019). When **mātauranga** Māori is disregarded in approaches to environmental research, management and policy, potential disruption to the **mana** and wellbeing of iwi and hapū can occur (Walker et al. 2019).

It is the position of the Challenge that EBM depends on the effective application of science and mātauranga Māori to enable innovative Te Tiriti-based governance and jurisdiction models at different scales, and to meet the ongoing needs and aspirations of Māori and communities. However, to date there has not been an investigation to identify and understand Māori perceptions of cumulative effects of multiple stressors in a New Zealand context.

1.3 Purpose

The purpose of this report is to help the Challenge understand cumulative effects from hapū and iwi perspectives, towards supporting their potential kaitiakitanga approaches to EBM. This report presents some of the barriers faced by iwi and hapū with regards to cumulative effects in freshwater, estuarine and marine environments, and potential solutions to overcome these barriers. The objectives of this report are to:

- Identify hapū and iwi values and language around cumulative effects management and impacts (Section 3.1 and 3.2),
- Identify the key cumulative effects issues commonly raised in Heretaunga iwi and hapū planning (Section 3.3)
- Identify key remedial actions and restoration activities to cumulative effects sought by Heretaunga hapū and iwi to address these issues (section 3.4).
- Present case studies from across Aotearoa and Te Wai Pounamu that identify barriers and potential solutions to the expression of tikanga Māori in current resource management systems (sections 3.5).

A glossary of te reo Māori used throughout this report is provided in Appendix 1.

2 Methods

Conducting **wānanga** (meetings, workshops) with hapū and iwi is an ideal method for collecting information, and a key Māori principle is **kanohi ki te kanohi** (face to face interactions). However, due to scope and focus of this research within a broader project on developing cumulative effects models and tools, the methods were necessarily adapted to be desktop-based.

The information contained in this report was compiled through a review of iwi and hapū environmental management plans (IEMPs) and other publicly accessible information. Generally, IEMPs are documents developed by hapū or iwi that identify environmental **kaupapa** (topic, policy, purpose, matter for discussion) of significance and details around how they expect to engage in environmental planning and decision-making processes. These IEMPs can vary in style, content, spatial and temporal specificity – and can include outcomes sought, concerns, issues, objectives, methods and/or policies in relation to various environmental kaupapa. The IEMPs are often holistic documents that not only include environmental issues but encompass broader cultural, economic, social and political issues (Nelson and Tipa 2012; Saunders 2017).

Due to the multitude of IEMPs available across New Zealand, for the purpose of this study, hapū and iwi management plans within Heretaunga (i.e., Hawke’s Bay regional Council boundary, Figure 1) were chosen as a case study. In total, seven IEMPs were sourced from the Hawke’s Bay Regional Council (HBRC) website (Hawke’s Bay Regional Council 2023). A list of the hapū and iwi IEMPs that have been lodged with HBRC is provided in Table 1.

In addition to IEMPs from Heretaunga, case studies from iwi and hapū research, strategies and reports across Aotearoa and Te Wai Pounamu were drawn upon to gain a wider view. Through this other literature we have provided examples of the perceptions and impacts of cumulative effects on Māori cultural values, uses and practices, and management strategies and arrangements as expressed by various whānau, hapū and iwi around Aotearoa New Zealand.

For clarity, we did not engage with any iwi or hapū to contribute to or endorse this review. It is not the intention of this review to conflict with, replace or supersede the distinct perspective of iwi and hapū and any respective outputs, actions, or initiatives they use to inform their decision-making processes.



Figure 11: Hawke’s Bay Regional Council Boundary. (Source: localcouncils.govt.nz).

Table 11: IEMPs that informed this literature review.

Name of IEMP	Date	Hapū, iwi or rūnanga represented	Author/s	Website link
Ngāti Hori Freshwater Resources Management Plan – “Operation Patiki”	2012	Ngāti Hori	Margaret McGuire	https://www.hbrc.govt.nz/assets/Document-Library/Plans/Iwi-Hapu-Management-plans/20130131-Ngati-Hori-Freshwater-Resources-Management-Plan-scanned-image.pdf
Mana Ake Ngā Hapū o Heretaunga- An expression of Kaitiakitanga	2015	Te taiwhenua o Heretaunga		https://www.hbrc.govt.nz/assets/Document-Library/Plans/Iwi-Hapu-Management-plans/20150520-Management-Plan-Mana-Ake-Nga-Hapu-o-Heretaunga-2015-published-by-Te-Taiwhenua-o-Heretaunga.pdf
Kahungunu ki Uta Kahungunu ki Tai Marine and Freshwater Fisheries Strategic Plan	2008	Ngāti Kahungunu Iwi Incorporated	Jim Hutcheson, Harry Mikaere, and Ngahiwi Tomoana	https://www.hbrc.govt.nz/assets/Document-Library/Plans/Iwi-Hapu-Management-plans/20130213-Kahungunu-ki-Uta-Kahungunu-ki-Tai-Marine-and-Freshwater-Strategic-Plan.pdf
Kaitiaki o te Rakato – Environment Resource Management Plan	No date	Ngā kaitiaki o te rakato marae mahia mai tawhiti: Ngāi Tama, Ngāi Te Rakato, Ngāi Tarewa, Ngāi Tu, Ngāti Hikairoa		https://www.hbrc.govt.nz/assets/Document-Library/Plans/Iwi-Hapu-Management-plans/Kaitiaki-o-Te-Rakato.pdf
Nga Hua o Te Taiao o Rakaipaaka - Te Iwi o Rakaipaaka Hapu Environment and Resource Management Plan	2000	Te Iwi o Rakaipaaka		https://www.hbrc.govt.nz/assets/Document-Library/Plans/Iwi-Hapu-Management-plans/Management-Plan-Te-iwi-o-rakaipaaka-hapu.pdf
Management Plan Tūtaekurī Awa Management and Enhancement Plan	2015	Ngā hapū o Tūtaekurī: Ngāti Paarau, Ngāti Hinepare, Ngāti Māhu, Ngāi Tāwhao	Hinewai Hiwaikirangi, Te Kaha Hiwaikirangi, and Cameron Ormsby and Ngā Hapū o Tūtaekurī	https://www.hbrc.govt.nz/assets/Document-Library/Plans/Iwi-Hapu-Management-plans/Management-Plan-Tutaekuri-Awa-Management-and-Enhancement-Plan-2015.pdf
Ngāti Kahungunu Kaitiaki Mō Taonga Tuku Iho	1992	Ngāti Kahungunu		https://www.hbrc.govt.nz/assets/Document-Library/Plans/Iwi-Hapu-Management-plans/NKI-Taonga-Tuku-Iho-1992.pdf

2.1 Data collation and analysis

IEMP search criteria

An initial list of key words, values and themes formed the basis of an initial search for accessible literature. These key themes included: **mauri, ki uta ki tai**, kaitiakitanga, **taonga, wairua**, holistic, integrated, cumulative, **mahinga kai**, and holistic. The IEMP data were collated and analysed for themes that were commonly used across IEMPs. The next tier of data collection involved searching the IEMPs for any narratives that were directly related to the project scope, e.g., cumulative effects, environmental impacts of cumulative effects, and actions or policies to manage cumulative effects. These narratives were then collated into tables.

2.2 Limitations of the approach

Our approach recognises that not all hapū and iwi who may be affected by cumulative effects may know about this issue or have publicly available, up-to-date IEMPs.

Further, Treaty settlement processes are still underway which will continue to increase the number of groups who are recognised by the Crown to have rights and interests in the land, awa and coasts included in this review. This is important to acknowledge as there is not “one Māori world view”. Perceptions will vary between marae, whānau, hapū and iwi which have been developed over time through their interactions with their marine environment. While many similarities exist between different IEMPs, assumptions should not be made that all values and perceptions will be the same across the affected parties.

The IEMPs accessed were published over a range of timeframes. The timeframes in which the plans were published affects the data collated from them. For example, many plans have not been updated since they were first published and so do not include information regarding environmental issues that have manifested in more recent times (i.e., Cyclone Gabrielle).

3 Literature Review

3.1 Te ao Māori values

Before we can understand how iwi and hapū Māori may perceive cumulative effects, we must first understand cultural values and aspects of the environment from **te ao Māori** (a Māori worldview). Worldviews are the lens in which we live life and make decisions. They are our understanding of how life came to be, and can orient us towards knowledge systems, cultures, points of view, what matters to us and how we should behave (Heperi, 2018). There are common principles and values that establish and reinforce whānau, hapū, **rūnanga** (council, iwi authority), and iwi identity and their responsibilities and rights to manage and use water. First, te ao Māori requires an intergenerational focus, where resources must be protected and enhanced for past, present, and future generations (Morrison et al. 2023).

Whakapapa (genealogies, interconnectedness) is central to te ao Māori. Whakapapa encapsulates and emphasises the familial connection of tangata whenua with the environment (Tomlins-Jahnke & Forster, 2015). **Tangata whenua** trace their origins back to their ancestral homelands, which in nature is specific (tribally) and also extensive (spatio-temporally) including celestial, terrestrial, freshwater, marine, and island nations across the ocean (e.g., Hawaiki Nui, Hawaiki Roa, Hawaiki Pāmamao). Therefore, **he taiao tatou** (Mākiha 2020) – we are intimately part of our ecosystems.

There are iwi variations to the creation narrative in terms of the genealogical source. According to narratives in the Heretaunga IEMPs, whakapapa recognises the genealogical descent of all living things from **Ranginui** (Sky father) and **Papatūānuku** (Earth mother) to their children who became the **Atua** (deities) of the various domains (e.g., earth, sky, sea, forests) and created the plants and animals within (Ngāti Kahungunu 1992; Te Taiwhenua o Heretaunga 2015; Heperi 2018). They are the original **kaitiaki** (guardians) and their **mana** (prestige, authority, status) to exercise this role is handed down through whakapapa. Oceans, estuaries, rivers, streams, and lakes are intimately bound to tangata whenua through whakapapa and are a fundamental tenet of personal and tribal identity.

Whānau, hapū and iwi see themselves as an integral part of the natural world because all people and life forms descend from a common source through whakapapa. Te ao Māori seeks to understand the whole environment or ecosystem and the connection through whakapapa between humans, ecosystems and all its flora and fauna. Through this perspective, te ao Māori is holistic and integrated (Ngā Hapū o Tūtaekurī, 2015). The Māori role as tangata whenua is to manage their relationship with the physical world. Man was given **taonga tuku iho** (gifts from the atua) of mana, **wairua** (spiritual essence), tikanga (customs, laws, protocols) and **reo** (language) to exercise this kaitiakitanga (Ngāti Kahungunu 1992). Tikanga were practical rules to sustain the wellbeing of people and included concepts such as **tapu**, **rāhui** and **noa**. Everything was balanced between regulated and unregulated states, where tapu was sacred, rāhui was restricted and noa was relaxed or unrestricted access (Harmsworth and Awatere, 2013).

By understanding he taiao tātou (we are the environment), te ao Māori considers the wellbeing of the people to be directly related to the natural environment, and vice versa. Therefore, it is the shaping of culture with/within these landscapes, and vice versa, that continues to inform the environmental ethos of Māori, including tikanga. For example, the relationship with our environment as part of our whakapapa is fundamental in our ethos, as shared by the late Moana Jackson:

*In simple terms, tikanga is a values system about what 'ought to be' that helped us sustain relationships, and **whakatika** or restore them when they were damaged. It is a relational law based on an ethic of*

restoration that seeks balance in all relationships, including the primal relationship of love for and with Papatūānuku. Because she is the Mother, we did not live under the law but rather lived with it, just as we lived with her' (Jackson, Moana 2020).

Kaitiakitanga describes the ethic of active stewardship over the natural environment for the benefit of future generations. This value focuses on protecting and enhancing the quality of life and **mauri** (life essence) of taonga (gifts, significant treasures). In Ngāi Tahu (South Island iwi) there are two elements to kaitiakitanga: a metaphysical element in which atua are manifest to support the current generation, and a practical element in which tangata whenua actively support the atua to protect the environment and its resources in place (Williams, 2012).

To sustain their mana, kaitiaki are bound to do everything they can to preserve and restore the mauri of their environment. Mauri, an internal energy, or life force derived from whakapapa, is an essential essence sustaining all forms of life. Thus, it provides life, vitality, and energy to all living things and is the binding force that links the physical to the spiritual worlds. It denotes a health and spirit that permeates all living and non-living things and damage or contamination to the environment is therefore damage to or loss of mauri (Awatere & Harmsworth 2014).

Once the mauri has been extinguished, the result is extinction because the natural restorative and regenerative powers are lost (Ngāti Kahungunu, 1992).

Shifts in the mauri of any part of the environment, for example through use, would cause shifts in the mauri of immediately related components (Awatere & Harmsworth, 2014).

Mauri or life essence of natural species are under threat through pollution, loss and degradation of habitat, unsustainable exploitation (Ngāti Kahungunu 1992).

In te ao Māori there are recognised transcendental values such as **whanaungatanga** (relationship, kinship, sense of family connection) and **manaakitanga** (hospitality, kindness, generosity, support), which reflect directly to the way in which whānau, hapū and iwi manage, interact with and perceive their environments (Harmsworth & Awatere, 2013). One way to express manaakitanga within the natural environment is to ensure it flourishes, so we can provide hospitality to manuhiri/kaumatua/whanau. Having the ability to manaaki visitors by supplying kai sourced from one's area means that the activities of fishing and gathering other foods create and maintain community ties and reinforce identity. Conversely, the inability to manaaki guests and sustain whanaungatanga may reflect poor kaitiakitanga practices and can lead to cultural loss (Tipa et al. 2010a & b).

Mātauranga Māori provides the basis for the Māori worldview and is a perspective which connects inter-generational knowledge and the environments where it is derived (Paul-Burke et al. 2020). It is specific to tangata whenua in their rohe and is defined by Hikuroa as the pursuit and application of knowledge and understanding of te taiao, following a systematic methodology based on evidence, incorporating culture and values (Hikuroa 2017). Mātauranga is developed and transmitted through practices of food management, harvesting and preparation (Tipa et al 2010b). One needed knowledge of what to look for, and where it was located to access **mahinga kai** (traditional resources, resource gathering sites) (Phillips et al. 2016). An intimate knowledge and wise guardianship of resources was also needed to ensure sustainability of resources and iwi survival (Russell 2004). Mātauranga Māori derived from these activities was therefore integral to a range of established sustainable management practices that governed the use and protection of natural resources (Kerr & Grace 2017).

The principle of **ki uta ki tai** is one such example of a management practice derived from mātauranga Māori. It represents the connectivity of all environmental elements and the reciprocal relationship between people and their environments (Te Rūnanga o Ngāi Tahu 2003, Tipa et al.

2016). It is a catchment-based approach to the management of water which recognises the movement of water through the landscape and the numerous interactions it has on its journey. Iwi, hapū and whānau understand that due to this connectivity, they must manage resources and their environment holistically, ‘from mountains to sea’.

Mahinga kai generally refer to whānau and hapū food-gathering sites, providing sustenance and the ability for Māori to collect and maintain their connection to and sustainable use of a place or resource, which in turn underpins positive conceptualisations of identity, health, and wellbeing (King et al. 2009; Panelli & Tipa 2009). While Māori resource management may have many goals, one clear goal is always to protect, restore and enhance the mauri of mahinga kai as they are the culmination of many of the aforementioned values and principles. Mahinga kai feed the people, so must be protected. They are also linked to identity and the transmission of mātauranga (Tipa et al., 2010b).

3.2 Terminology

Understanding the way Māori refer to cumulative effects and ecosystem health, the language they are using, and the associated cultural values, uses and practices (e.g., **tohu, maramataka, manaakitanga, kaitiakitanga, rāhui**) is an essential starting point when working alongside Māori communities (e.g., Wilson et al. 2007). Cumulative effects may not be explicitly mentioned within IEMPs and other Māori literature, however they are inherent to the way Māori manage their resources.

Māori will often refer to the mauri of an ecosystem or place, and the need to be mauri-enhancing, (e.g., Ngā hapū o Tūtaekurī 2015; Ngāti Kahungunu 1992; Te Taiwhenua o Heretaunga 2015; Hopkins 2018). When iwi, hapū and whānau talk about mauri they are referring to the holistic health of the ecosystem, considering the inputs from a physical, and spiritual perspective. There is an understanding that the mauri can be enhanced or degraded by many factors, and an ecosystem with degraded mauri may therefore require holistic, integrated solutions to recover (Harmsworth & Awatere, 2013).

Additionally, ki uta ki tai denotes an understanding that ecosystems are a result of the inputs across the catchment, and therefore the poor health of an ecosystem results from the cumulative effects of multiple stressors (Davies et al. 2019). Mahinga kai are often the receiving environments for multiple stressors that have passed through the catchment environment, and therefore encounter the cumulative effects of these stressors. This makes cumulative effects particularly relevant to Māori, as a key part of their identity is threatened by them.

3.3 IEMPs – Heretaunga iwi and hapū perspectives

This section represents the review of IEMPs from Heretaunga, aka the Hawkes Bay region to better understand iwi and hapū knowledge and perceptions of direct, indirect, and cumulative impacts of multiple stressors on mahinga kai and associated cultural values, uses, and practices (Table 2). The associated actions and priorities suggested by Heretaunga iwi and hapū to address these issues were also compiled (Table 3) to produce a better understanding of their approaches to kaitiakitanga and managing the pressures from cumulative effects.

The IEMP of Ngāti Hori, called “Operation Patiki” (2012) focusses primarily on policies to enhance the Karamu stream and all its resources. The plan is based around four priorities: achieving sufficient water flow, improving water quality, protections and restoring traditional riparian vegetation, and protecting and restoring fish and fish habitat.

Te iwi o Rakaipaaka’s IEMP called “Ngā hua o te taiao o Rakaipaaka” (2000) aims to actively participate in exercising their Rakaipaakatanga and kaitiakitanga over the taonga and environment

and natural resources of Rakaipaaka. The plan focusses more on ways they can be actively involved in decision making.

Ngā kaitiaki o Te Rakato marae's IEMP called "Tangata whenua o ngā taonga katoa environmental resource management plan" (no date) aims to provide whānau with an appropriate form for discussions and debate on all issues relevant to interests and resources in their tribal boundaries, form a basis for negotiation with groups who must consult with them, and provide a foundation upon which to build a pathway that will lead to the prosperity and sustainable management of natural resources, among other aims. The plan expresses a desire for more holistic planning.

Rūnanganui o Ngāti Kahungunu's IEMP: "Kaitiakitanga mō ngā taonga tuku iho" (1992) aims to introduce councils to their ethic of sustainable resource management, lists their issues and suggests outcomes and methods of implementation according to their values of turangawaewae, mauri, mana, tapu and tino rangatiratanga. Their **marine and freshwater fisheries strategic plan "Kahungunu ki uta, Kahungunu ki tai" (2012)** sets out a framework whereby hapū will be supported to manage their customary fisheries in the freshwater and along the coast.

Within the IEMP of Ngā Hapū o Tūtaekurī, the primary objective focusses on enhancing the mauri of their main waterway, the Tūtaekurī awa (Ngā Hapū o Tūtaekurī, 2015). This was defined across four 'life essences' (e.g., Papatūānuku/land, Tāne Mahuta/biodiversity and living things, Tangaroa/waters, and Tāwhirimātea/air/climate/weather systems) that flow through it, recognising that while the ecosystem may have different domains, they are all still interconnected through mauri.

The IEMP of Te Taiwhenua o Heretaunga, called Mana Ake (2015), has an overall objective to enhance te ao Māori, protect and sustainably utilise natural taonga, uphold the mana of whānau, marae and hapū, and have tikanga and kawa inform decisions on issues affecting them. The plan also addresses their issues across six different domains.

3.3.1 Issues / impacts of cumulative effects on mahinga kai and associated cultural values and practices

According to Heretaunga iwi and hapū, no single issue identified in Table 2 is necessarily going to cause large changes in the state of the environment/mahinga kai. Together, the cumulation of all of these issues can impact the mauri of their environment, including the waterways. In combination these issues can be devastating to cultural resources and therefore identity.

For example, the IEMPs of Ngā Hapū o Tūtaekurī and Te Taiwhenua o Heretaunga distinguished between environmental domains, while acknowledging these are connected. These plans therefore recognise that the mauri of the environment is not degraded or enhanced by one stressor, action, or domain, but by everything that encounters it. They also acknowledge that people are part of the environment and their ability to make decisions about their rohe is important to their identity.

Cumulative effects issues: land-to-sea impacts

Iwi and hapū in Heretaunga (Table 1) express that activities on land are interconnected and impact on freshwater, estuarine and coastal ecosystems. Land use and land management practices, and their associated impacts on mahinga kai and water quality and clarity are the key causes of cumulative effects addressed in these IEMPs. For example:

*"We know through monitoring, testing, scientific reporting, and from living on the Tūtaekurī awa that **the mauri of the awa has degraded by the impact of land development in the catchment.**" (Ngā Hapū o Tūtaekurī 2015).*

“Mindless [exploitation] of native forests has destroyed habitats, disrupted the food chain and caused water pollution through erosion and nutrient run-off, all of which undermine the mauri of the affected species” (Rūnanganui o Ngāti Kahungunu 1992).

*“When all is said and done, it is **often a combination of a range of bad management practices inland which has a cumulative effect** on the ever-diminishing quality of our waters as they progress towards the sea” (Rūnanganui o Ngāti Kahungunu 1992).*

*“Many **Heretaunga maunga have been subjected to denuding of native bush, heavy farming practices leading to erosion, subdivision, roading, infrastructure, other public works...** to the point that these landscapes are severely degraded and the cultural values of specific maunga are compromised” (Te Taiwhenua o Heretaunga 2015).*

*“Insufficient attention appears to have been given to **environmental issues affecting inland waterways and coastal waters**, including pollution, habitat destruction or modification, water abstraction, damming/diversion... has resulted in degraded inland waterways... delicate estuarine systems and coastal waters affected by pollution, run-off and sedimentation.” (Ngāti Kahungunu Iwi Inc. 2008).*

*“There are **many contributing factors to increasingly poor water quality** in the Karamu Stream... There are a range of different land uses in the area... The cumulative discharge of such chemicals when combined with elevated amounts of sediment and nutrients can result in an overall degradation of fisheries and aquatic values.” (Ngāti Hori 2012).*

Cumulative effects issue: land use and land management practices impact all living things

The issue of land use and land management practices is all-encompassing, covering all physical impacts expressed by iwi and hapū (Table 2). It covers the clearance of native forest and bush, the extraction of gravel, the uptake of forestry and agricultural land use, and more, all of which increase erodibility and decrease the filtering capacity of soil/vegetation prior to entering waterways. This therefore degrades water quality and mauri, which has flow-on impacts on mahinga kai, resulting in fewer sites suitable for kai gathering.

Table 22 Examples of key issues and their direct and indirect impacts on estuarine and coastal values as expressed by Heretaunga iwi and hapū.

Key issues	Summary description	Examples of iwi/hapū that have described these issue and their impacts
Land use and management practices	Land use (e.g., forestry, farming, urban development) and associated land management practices (e.g., vegetation clearance, drained wetlands, wastewater/industrial inputs) have subsequent impacts including sedimentation and nutrient runoff. These are linked to cultural/spiritual impacts on mahinga kai, wāhi tapu and sites of significance. Impacts of these activities and unsustainable fishing practices are specifically linked to declines in kaimoana.	Rūnanganui o Ngāti Kahungunu (1992), Ngāti Kahungunu Iwi Inc. (2008), Te Taiwhenua o Heretaunga (2015), (Ngāti Hori (2012), Ngā hapū o Tutaekurī (2015)
Tikanga Māori approaches not realised in management	Resources or areas of significance to Māori are still managed largely by regional councils or central government, and tikanga Māori approaches are either not recognised or not respected. Inclusion of Māori in decision making is often lacking or through consultation with short timeframes. Central government or regional councils often get the final say, and limited Māori representation in decision-making bodies results in power imbalances.	Rūnanganui o Ngāti Kahungunu (1992), Ngāti Kahungunu Iwi Inc. (2008), Te Taiwhenua o Heretaunga (2015), (Ngāti Hori (2012), Ngā hapū o Tutaekurī (2015), Te Iwi o Rakaipaaka (2000), Ngā kaitiaki o te Rakato Marae Mahia mai Tawhiti (no date)
Compartmentalisation of the natural environment	Managing the different realms of the environment (e.g., land, freshwater, coastal/marine) separately has resulted in poor cultural health of the environment. For example, enforcement of area-based fishery closures (s186A & s186B rāhui) prevents exploitation of mahinga kai species but does not prevent cumulative land-based impacts (e.g., sedimentation, eutrophication), from diminishing the mauri of these species. It is also noted that these measures restrict fishing activities and place-based interaction, rather than actively enhancing or restoring.	Rūnanganui o Ngāti Kahungunu (1992), Te Taiwhenua o Heretaunga (2015),
Unsustainable exploitation	Removal of natural and physical resources (e.g., commercial and recreational fishing practices, forestry, water and gravel extraction) result in loss and degradation of natural habitats. For example, removal of native forests has resulted in loss of habitats for native manu and insects, and caused water pollution through erosion and nutrient runoff, which has flow-on impacts of freshwater and estuarine habitats and species. Water and gravel extraction in Karamu stream has resulted in lower river flows, removal of	Rūnanganui o Ngāti Kahungunu (1992), Ngāti Kahungunu Iwi Inc. (2008), Te Taiwhenua o Heretaunga (2015), Te Iwi o Rakaipaaka (2000), Ngāti Hori (2012), Ngā hapū o Tutaekurī (2015)

important stream habitat diversity, and increased concentration of nutrients and pollutants.

Water quality/clarity	Degradation of water quality and clarity, and therefore mauri, through pollution (e.g., via point-source effluent discharge, and non-point source nutrient runoff and sediment) was a key concern for many iwi and hapū for the freshwater and coastal environments including the cultural and spiritual connections they have to their waterways, wetlands, lakes, as well as impacts on recreation and cultural harvesting.	Rūnanganui o Ngāti Kahungunu (1992), Te Taiwhenua o Heretaunga (2015), Te Iwi o Rakaipaaka (2000), Ngāti Hori (2012), Ngā hapū o Tutaekurī (2015)
Erosion and sedimentation	Sedimentation is recognised to reduce water clarity, clog the gills of filter feeders (for example cockles, pipi, scallops), reduce the foraging abilities of finfish (e.g., juvenile snapper), impacting reefs, seaweeds, kina, nursery grounds and decreasing food available to benthic species. Specific locations are mentioned that are changing from sandy to muddy, impacting kaimoana and the ability of whānau to interact with these locations	Rūnanganui o Ngāti Kahungunu (1992), Te Taiwhenua o Heretaunga (2015), Te Iwi o Rakaipaaka (2000), Ngā hapū o Tutaekurī (2015)
Point source discharges	Point source discharges (e.g., sewage, wastewater, stormwater) are issues that impact mauri, mahinga kai, and biodiversity, as well as the ability of whānau to safely interact with these locations. Sewage from non-functioning pumping stations and old pipelines are identified as impacting kaimoana. Iwi and hapū are averse to taking food from polluted waters, especially water bodies receiving treated and untreated sewage.	Rūnanganui o Ngāti Kahungunu (1992), Te Taiwhenua o Heretaunga (2015), Ngāti Hori (2012)
Nutrients	Water quality issues such as excessive nutrients, toxic algal blooms and eutrophication, impact kaimoana, their habitats and the ability of whānau to interact safely with these locations.	Rūnanganui o Ngāti Kahungunu (1992), Te Taiwhenua o Heretaunga (2015), Te Iwi o Rakaipaaka (2000), Ngāti Hori (2012)
Heavy metals and other contaminants	Sediments and stormwater entering the environment is known to carry contaminants (e.g., heavy metals, hydrocarbons and pesticides) that degrade fisheries and aquatic values and may accumulate in the environment and up the food chain. This could impact human health and customary practices.	Ngāti Hori (2012), Ngā hapū o Tutaekurī (2015)

3.3.2 Actions and policies to manage cumulative effects

IEMPs are often focussed on policies or solutions to improve upon the issues/concerns that iwi and hapū have about their environment. These policies tend to be holistic, ecosystem-based approaches to protect and enhance the environment across multiple domains. No single type of policy or action identified in Table 3 is likely to prevent the negative results of cumulative effects on their own. However, some of these actions are likely to be restorative to ecosystems across many domains and can work towards preventing multiple stressors.

This review identified native and riparian planting as the key restoration action which addresses multiple stressors sought by iwi and hapū at various scales (i.e., catchment, land block, riparian scale) (Table 3). It is recognised that native riparian planting initiatives will enhance the mauri of awa and other water bodies (Ngā Hapū o Tūtaekurī, 2015). This is reflected in Ngā Hapū o Tūtaekurī's IMP, with riparian planting suggested across all domains in conjunction with other monitoring, environmental limit setting, exclusion, and restorative strategies, because it can have the following benefits:

- Shading/decreased water temperatures,
- Decreasing sediment and nutrient inputs,
- Creating low and uniform periphyton biomass,
- Ensuring that periphyton is dominated by diatoms and not phormidium,
- Creating high retention of coarse particulate organic matter,
- Creating high habitat diversity,
- Enabling high utilisation by invertebrates of heterotrophic biofilms and detritus,
- Having higher numbers of mayflies, stoneflies and caddisflies and shredders, coupled with lower numbers of snails, chironomids, and oligochaetes (Rutherford et al. 1997; Ngā Hapū o Tūtaekurī 2015).

Holistic, multi-ecosystem approach needed

Specific land management best practice actions like sediment trapping (Table 3) often address single stressors. While they are useful, they are required in combination to be effective at addressing cumulative effects.

Area-based restrictions like rāhui or marine protected areas, and active restoration of habitats like wetlands, shallow lakes and mahinga kai are effective expressions of kaitiakitanga too. However, these need to be done in conjunction with upstream restorative (native and riparian planting) and restrictive (fencing/exclusion of livestock) activities to ensure that the restoration of these habitats is not undermined.

Thus, holistic, integrated management of ecosystems is required and called for by iwi and hapū:

*“Mauri is considered to be the essence or life force that provides life to all living things. Water also has mauri. The linkages between all living things within the ecosystem are based on the whakapapa or genealogies of creation. This establishes the basis for the **holistic** view of the environment and our ecosystem held by the tangata whenua.” (Ngā Hapū o Tūtaekurī 2015).*

*“Our guiding principles... te ao Māori – Māori world-view based on ‘**holistic** interaction.’ It recognises the interconnectedness and interrelatedness of all things, that is, an action affects all other aspects of self and our wider existence.” (Te Iwi o Rakaipaaka 2000).*

*“**Holistic** planning: Tipuna Māori managed the environment as a totality. Activities designed for one area were coordinated with those of another area. In terms of planning, the coastal domain was not separated from the land ward. All areas- land, sea, rivers, lakes and waters of all descriptions were designated for particular purposes. The overriding principle of traditional plans and management was the sense of seeing the natural world in its entirety.” (Ngā Kaitiaki o Te Rakato Marae Mahia Mai Tawhiti, no date).*

*“In order to keep healthy that which is important hapū tikanga (best practice) is **holistic**, incorporating Māori aspects of health; wairuatanga; whakapapa; taonga; kaitiakitanga; and mātauranga. Healthy whenua and wai is of great importance to hapū because they are irrevocably linked to healthy life ultimately for whānau, hapū and marae.” (Te Taiwhenua o Heretaunga 2015).*

*“The [Resource Management] Act [1991] talks only of “natural and physical” resources which reflects a mentality for compartmentalisation. We as Māori prefer to look at all of our resources (taonga katoa) **holistically**.” (Rūnanganui o Ngāti Kahungunu 1992).*

Table 33 Examples of key actions sought by Heretaunga iwi and hapū to address multiple stressors.

Actions/Policies	Summary	Iwi/Hapū
Riparian planting (native) and maintenance	Native riparian planting can have the following benefits to awa, wetlands, and coastal environments: shading (e.g., lower water temperatures), bank stabilisation, decreased nutrient/sediment inputs (e.g., filtering), lower algal biomass, increased habitat diversity, enhanced native/sensitive biodiversity.	Ngā Hapū o Tūtaekurī (2015), Ngāti Hori (2012), Rūnanganui o Ngāti Kahungunu (1992)
Land use and mitigation and best practice	Iwi and hapū have expressed many mitigation and land management practices including but not limited to matching land use capacity to land use capability (e.g., sustainable stocking rates), sediment trapping and control methods, felling of trees away from waterbodies, catchment monitoring programmes, fencing and riparian planting around sites of significance and freshwater.	Ngā Hapū o Tūtaekurī (2015), Ngāti Hori (2012), Ngāti Kahungunu Iwi Inc. (2008)
Exclusions and seasonal closures	Iwi and hapū have expressed the need to close particular areas to mauri degrading activities, or to protect particular resources. For example, the exclusion of livestock from all waterways permanently through fencing, and exclusion of vehicles from river gravels during bird nesting season to protect native manu and prevent sedimentation, faecal contamination. Rāhui, Mātaitai are also proposed as ways to manage ecosystems/resources as and when needed.	Ngā Hapū o Tūtaekurī (2015), Ngāti Hori (2012), Rūnanganui o Ngāti Kahungunu (1992), Ngāti Kahungunu Iwi Inc. (2008),
Enhancement, restoration, and rehabilitation of habitats	Habitats such as wetlands, shallow lakes, mahinga kai are actively restored/rehabilitated to enhance their ecosystem services (e.g., provision of kai, filtering contaminants, provision of habitats for native manu/insects).	Ngā Hapū o Tūtaekurī (2015), Ngāti Kahungunu Iwi Inc. (2008)
Setting and monitoring environmental targets/limits	Improving understanding of the health of different ecosystems, incorporating measures of mauri, and setting targets which ensure restoration and enhancement of the mauri.	Ngā Hapū o Tūtaekurī (2015), Rūnanganui o Ngāti Kahungunu (1992), Ngāti Kahungunu Iwi Inc. (2008), Te Taiwhenua o Heretaunga (2015), Te Iwi o Rakaipaaka (2000)
Integrating management of the whole ecosystem	A more holistic management scheme that takes into account the principles of ki uta ki tai and connections across the different domains (e.g., land, freshwater, marine and air).	Rūnanganui o Ngāti Kahungunu (1992), Ngāti Kahungunu Iwi Inc. (2008), Ngā Kaitiaki o Te Rakato Marae Mahia Mai Tawhiti (no date)

Active management /Māori community involvement	Having formalised partnerships in co-management or co-governance of environmental resources to ensure Māori approaches and issues are acknowledged and communities are more connected to their environment.	Ngā Hapū o Tūtaekurī, Rūnanganui o Ngāti Kahungunu (1992), Ngāti Kahungunu Iwi Inc. (2008), Te Taiwhenua o Heretaunga (2015), Te Iwi o Rakaipaaka (2000)
Environmental levying and offsetting	A 'user pays' principle for land uses that degrade the mauri of the ecosystem. Financial contributions from levies can be used for restorative/mauri-enhancing activities (e.g., fencing, riparian planting).	Ngā Hapū o Tūtaekurī (2015), Rūnanganui o Ngāti Kahungunu (1992)
Improved consenting	Improve consent conditions to ensure efficiency of extracted resource use and to better account for Māori values. This would apply to, for example, gravel takes, water takes, forestry and pastoral land use/management, industrial use and discharges.	Ngā Hapū o Tūtaekurī (2015), Te Taiwhenua o Heretaunga (2015)

3.4 Other case studies across Aotearoa and Te Waipounamu

The cumulative effects of a variety of land-based activities on mauri, water quality, kaimoana, mahinga kai, biodiversity, and manaakitanga are understood and being experienced across the motu. The following case studies provide examples of iwi and hapū values, perceptions of stressors, management approaches, and potential barriers to effective management of cumulative effects.

3.4.1 *Waitaha hapū values of estuarine shellfisheries*

Across four Waitaha estuaries (aka Canterbury), Kainamu-Murchie et al. (2018) interviewed fishers, recreational fishers and ‘beach-goers’ who affiliated as Ngāi Tahu and non-Ngāi Tahu (i.e., Māori, Pākehā, other ethnicities) to better understand their experiences of the condition of their estuaries and shellfisheries overtime. The study showed that perceptions around sediment, water quality and contaminants were used by fishers as indicators that informed their use of four estuaries – Rakahuri-Saltwater Creek Estuary, the Avon-Heathcote Ihutai Estuary, Rāpaki Bay, and Koukourarata.

Interviewed participants perceived stressors aligned with those identified globally. The most perceived stressors/drivers of environmental change were catchment land use/management, sediment, water quality, water flow, pollution and contaminants, and earthquake related changes. Experienced fishers, including Ngāi Tahu, changed or ceased their mahinga kai practices when environmental conditions were degraded, as indicated by declining abundances in mahinga kai and the presence of anthropogenic and/or natural hazards (e.g., earthquake impacts) (Kainamu-Murchie 2017). As a result, in some locations, favoured species, such as tuaki/cockles, were no longer harvested due to perceived decreased abundances, gathering restrictions (rāhui), and/or poor environmental conditions (e.g., food-safety risks) (Kainamu-Murchie et al. 2018).

Sediment, water quality and land use are all cumulative effects issues, as they come from multiple land uses and stressors and accumulate to cause greater environmental impacts than a single stressor (Davies et al. 2018). Of relevance to this review, this case study indicates that Ngāi Tahu fishers expressed a strong understanding of multiple stressors impacting the estuaries studied, however the emphasis appeared to be more on the consequences of these cumulative stressors (e.g., the restricted use, abundance and quality of mahinga kai and favoured species).

Often the drivers of improved resource management are the experiences and observations of declining taonga. Declines in the marine environment/estuaries are especially indicative of the cumulative effects of multiple stressor inputs, and if management does not improve, could lead to tipping points and localised extinctions of those resources (Davies et al. 2018). The following case study links perceptions like those in this study to improved management in a nearby catchment.

3.4.2 *Te Whakaraupō/Lyttelton Harbour ki uta ki tai management framework*

Te Hapū o Ngāti Wheke is a hapū of Ngāi Tahu. In conjunction with Canterbury Regional Council, Lyttelton Port Company and Christchurch City Council, Ngāti Wheke and Te Rūnanga o Ngāi Tahu have driven the development of Whaka-Ora: Whakaraupō/Lyttelton Harbour Catchment Management Plan (2018). The plan is a ki uta ki tai framework with the goal of restoring ecological and cultural health of the harbour as mahinga kai. The ethic of ki uta ki tai within the plan acknowledges the biophysical connectivity and reciprocal relationship between people and the environment (Te Rūnanga o Ngāi Tahu 2003; Tipa et al. 2016).

Within the plan are lists of actions relating to improvements for four key focus areas: erosion and sedimentation, pollution, indigenous terrestrial biodiversity and indigenous marine biodiversity. Actions include re-vegetation and habitat enhancement around streams, piloting erosion and sediment control to identify effective long-term solutions at multiple sources, removing stormwater discharges and upgrading storm/wastewater systems, stock exclusions, land-based water treatment,

and community planting initiatives. These actions are linked back to six ecological bands across the entire catchment: rocky outcrops and forests, hills and lowlands, wetlands and saltmarsh, foreshore, harbour and streams.

This plan is an example of how Ngāi Tahu hapū and Te Rūnanga o Ngāi Tahu have worked alongside local government to improve and integrate co-management and drive the enhancement of their mahinga kai. Utilising ki uta ki tai, they are addressing the cumulative effects of multiple stressors across the catchment with the understanding that to manage their taonga (e.g., mahinga kai) they need to manage all the inputs and their effects. Actions like planting initiatives and sediment control at multiple sources are key activities that encompass multiple stressors.

3.4.3 East Otago Taiāpure – Kaitiakitanga in action, ongoing barriers, and potential solutions

The East Otago Taiāpure is an example of contemporary fisheries management and rangatiratanga by Kāti Huirapa Rūnaka ki Puketeraki (a papatipu rūnanga of Ngāi Tahu). In 1992 Kāti Huirapa ki Puketeraki applied for the taiāpure (a customary management tool for local fisheries) due to concerns about the environmental degradation and depletion of their taonga species under central management. In 1999, the East Otago Taiāpure was gazetted, followed by the East Otago Taiāpure management committee being established in 2001, and the first fishing regulation within the taiāpure enacted in 2007 (Bennett-Jones et al. 2022). In 2014, a mātaimitai reserve application for the Waikouaiti estuary within the taiāpure was also made, to further manage fisheries resources, citing concerns about the degradation of waterways (Kāti Huirapa Rūnaka ki Puketeraki, 2014). This was accepted in 2016 to enable further kaitiakitanga of taonga by Kāti Huirapa.

The East Otago Taiāpure management plan (2008) includes a section on the health of the environment, with a vision to protect the local fisheries habitats from adverse impacts of multiple human activities so resources are fit for human consumption (East Otago Taiāpure Management Committee, 2008).

“It is fundamental to the success of the Taiāpure that all fisheries resources are fit for human consumption. Kaitiakitanga is essentially aimed at the protection of the mauri of a resource or area. Mauri is a value that can be represented by qualities of health, abundance, vitality, the unpolluted and the presence of indigenous flora and fauna. The protection of mauri is enhanced through the gathering of food and so this management plan has been written to emphasise the importance of this activity.”

“The use of fisheries resources ensures the mātauranga of how to protect the mauri of these resources is passed on from one generation to the next.”

Ki uta ki tai and cumulative effects-specific issues mentioned in the plan include multiple sources of effluent and nutrient discharges, poor riparian management, and water abstraction from rivers, which impact negatively on the mauri of the ecosystem and ability for humans to consume the fishery resources. To manage these issues, the committee pledged to work with Otago Regional Council to encourage the prohibition of discharges from land and from poor land management into the taiāpure, including encouraging planting or protection of riparian areas and enforcement of current consent conditions, and address water abstraction from waterways that feed into the taiāpure.

Barriers to customary cumulative effects management

Iwi, hapū, whānau and rūnanga are still forced to operate within Aotearoa New Zealand’s broader legal system, which has been created through a pakeha lens. Kāti Huirapa attempted to enact a further regulation to manage pāua in the taiāpure by restricting pāua gathering to wading-only.

However, this proposed regulation was opposed by the Ministry for Primary Industries¹ (Bennett-Jones et al. 2022). While this was a species-specific regulation, it exposed barriers to kaitiakitanga due to the current legal system which may impact cumulative effects management, even within customary mechanisms that have been created to enable kaitiakitanga.

Of relevance to the review, large barriers to cumulative effects management in this case study included an inability to introduce true customary mechanisms, and a lack of holistic management approaches. Current fishery legislation has provided a legal mechanism to enforce rāhui (i.e., section 186A and 186B temporary closures) (Gnanalingam & Hepburn, 2015). However, this has misappropriated the term rāhui, and limited the mechanism to fishery-specific limits (e.g., minimum sizes, temporary closures, bag limits). It does not enable Māori customs which may protect and enhance the mauri of the whole area to be utilised and does not consider mātauranga or the biological ability of particular fishery stocks to recover in their own time (Bennett-Jones et al. 2022). Changes to such legal mechanisms to allow more flexibility and consideration for te ao Māori would improve kaitiakitanga (Gnanalingam et al. 2015).

This highlights the further issue of un-holistic, fragmented management in the current legal system. Current fishery legislation can provide for limited customary management, but this does not allow for management of the whole catchment. It only enables management of the fisheries resources (i.e., mahinga kai) within a coastal/estuarine area. For example, in the case of a s186A closure, while a shellfishery may be closed temporarily to prevent the take of shellfish, it does not address ki uta ki tai principles and the cumulative effects of multiple stressors (Bennett-Jones et al., 2022). This has resulted in re-application of closures every two years due to a lack of land-based management of stressors which prevent species recovery, and unrealistic timeframes in which to see a meaningful change in populations (Gnanalingam & Hepburn, 2015).

Solutions

In the case of the East Otago Taiāpure, Kāti Huirapa Rūnaka and the East Otago Taiāpure Committee (led by Kāti Huirapa, local residents and fisher representatives) have partnered with different organisations, especially University of Otago, to ensure that there has been monitoring and restoration of broader catchment health. For example, the Committee has undertaken consultation the Port Company in Otago to protect inshore habitats from offshore disposal of dredged sediments (Hepburn et al., 2019). The taiāpure committee and Kāti Huirapa have led the He Pātaka Waiora project in partnership with University of Otago to monitor and enhance river and estuarine health upstream of the taiāpure (Van Halderen et al. 2016). While these partnerships have been beneficial, more holistic, integrated management across government agencies would better enable kaitiakitanga.

3.4.4 Waikato IEMPs – iwi and hapū perspectives on sediment issues and actions to remediate

Huirama (2021) completed a review of IEMPs from the Waikato region to better understand iwi and hapū knowledge of sediment-related issues and impacts, and the responses and actions suggested to address these issues (Figure 2). Like the Heretaunga IEMPs reviewed above, the Waitaha interviews, and Te Whakaraupō, land use and associated management practices were seen by iwi and hapū as a key driver of erosion and sedimentation, having cumulative negative impacts on mahinga kai and water quality. These plans also expressed the interconnectedness of the environment, often linking activities on land to impacts on freshwater, estuarine and coastal ecosystems.

¹ Today known as Fisheries New Zealand (FNZ)

The review noted that it was evident that the impacts of erosion and sediment are cumulative and impact a wide range of values for hapū and iwi, including kai, harvesting, medicine, recreational, amenity and mahinga kai health. This stems from a holistic view of the environment, and the interconnectedness between the environment and people. For example, many of the IEMPs have documented the experience of increased sediment in estuaries impacting mahinga kai, which has led to a loss of mātauranga Māori of that site, especially where closures or temporary closures have been needed that then prevent place-based interaction.

Furthermore, hapū and iwi within Waikato were particularly interested in remediation actions delivering multiple benefits (Huirama, 2021). Riparian planting and constructed wetlands were seen as tools to decrease stream bank erosion, filter nutrients, provide opportunities for whānau to participate in restoration activities, protect sites of significance, and establish hapū and iwi owned nurseries. They therefore address multiple stressors to effectively prevent cumulative effects and enhance the mauri of the area.

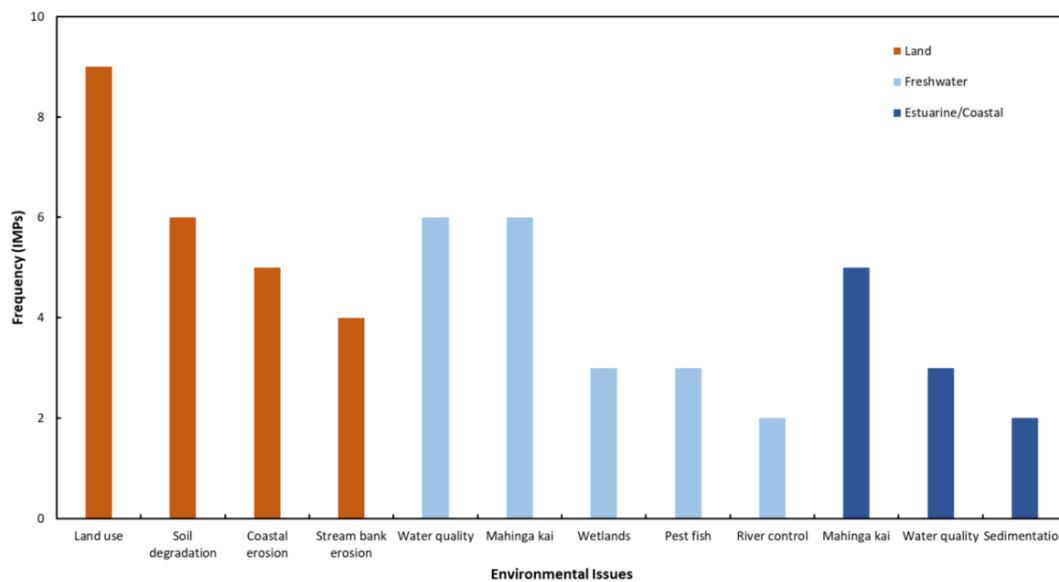


Figure 2: Erosion and sediment issues identified by hapū and iwi in the Waikato Region for land, freshwater, and estuarine/coastal domains. (Source: Huirama 2021).

3.4.5 The Waikato River Authority – an integrated restoration strategy

The Waikato River Authority was established in 2010 as the custodian of the Vision and Strategy for the Waikato River (2008), and as the body responsible for overseeing the implementation of the clean-up of the river. The board consists of five representatives from Waikato iwi and hapū, and five Crown appointees. The Vision and Strategy responds to the degradation of the river, catchment, and their natural processes through the cumulative effects of human activities, physical intervention, land use and subsurface hydrological changes. These have compromised Waikato awa iwi ability to exercise mana whakahaere or conduct tikanga and kawa, and community aspirations and relationships with the river have been degraded. The strategy is written with the understanding that restoration of the mauri of the river will be a long-term commitment. It covers the entire length of the Waikato River from Huka Falls to Te Puuaha o Waikato and the length of the Waipa River to its junction with the Waikato River, and applies to activities in all catchments affecting the Waikato River (Figure 3).

and fisheries agencies, to achieve an integrated, holistic, and co-ordinated approach to the implementation of the vision and strategy and the management of the Waikato River”

As part of the Waikato River co-management agreements, each iwi that make up the region (Waikato-Tainui, Ngāti Tūwharetoa, Ngāti Raukawa, Te Arawa and Ngāti Maniapoto) is required to develop customary fisheries plans. For example, tuna fisheries in the lower Waikato River catchment are now co-managed by Waikato-Tainui and the Crown, under the Waikato-Tainui (Waikato River) Fisheries Regulations 2011. The regulations allow Waikato-Tainui to propose bylaws to the Ministry for Primary Industries that may restrict or prohibit commercial, recreation and customary fishing. To date six bylaws pertaining to tuna (freshwater eels) in the Waikato-Tainui Fisheries Area have been implemented (Waikato Raupatu River Trust, 2014).

These bylaws mean that tuna receive sanctions from fishing during periods of migration, especially large mature female tuna who hold the important role of venturing great distances to spawn young tuna in warmer climates, who then later return to the waterways of Aotearoa and Te Waipounamu. The WRA funded the co-development of the Tuna Restoration Strategy which compliments these bylaws and has since funded many other river restoration projects. Many other whānau, hapū and iwi also have proactive programs to support their environmental taonga, although do not have the authority of bylaws, yet.

As more iwi and hapū undertake the process of treaty settlement, more statutory bodies could be established with greater power to integrate the holistic and integrated co-governance of their taonga and places of cultural significance.

4 Discussion

It was clear from IEMPs that cumulative effects are managed holistically in te ao Māori, as is evident by the cultural values and principles of mauri and ki uta ki tai. In this review, common and recurring cumulative effects issues as expressed by iwi and hapū included land use and land management strategies, and compartmentalisation of the natural environment, which in turn can cause poor water quality from erosion, nutrient inputs, point-source discharges, and contaminants in unfiltered runoff (Table 2). Poor water quality from a combination of these inputs is recognised to degrade the mauri of the environment, and impacts cultural identity and values (e.g., mahinga kai, harvesting, rongōā, place-based interaction, manaakitanga, mātauranga).

Environmental degradation and consequent cumulative impacts on mahinga kai species and cultural practices is a significant issue for iwi and hapū across Aotearoa New Zealand (Morrison et al. 2023). Kai gathering in particular provides a sense of identity and serves as a vehicle for the transmission of values and knowledge (Tipa et al. 2010a). Traditionally, attention was given to recognising, interpreting, and responding to tohu and the cumulative effects, causes and events associated with the natural world and its resources (Paul-Burke et al. 2020). This knowledge and experience accumulated as mātauranga and was used as a basis of iwi and hapū resource management practices.

Iwi and hapū understanding of cumulative effects is therefore anchored on their cultural practices. Cumulative effects impact upon the ability to sustainably harvest, swim in, and otherwise interact with waterways. These have flow-on cultural impacts such as loss of mātauranga and cultural identity – therefore, at stake with the loss of kai gathering is not only cultural survival, but potentially the physical and mental well-being of whānau (Tipa et al. 2010a). This creates a need to effectively manage those effects to ensure cultural practices continue. For example, if the kaimoana within mahinga kai is depleted or unsuitable for human consumption due to pollution, this decreases

their ability to feed themselves and to manaaki manuhiri and whānau, which in turn diminishes their mana. Sustainably managing resources and the cumulative effects that impact them, is mana enhancing and will ensure continuation of mātauranga.

A key theme within Heretaunga IEMPs was a need to manage the environment and its resources holistically, with many methods being integrated. A high priority for many iwi and hapū was riparian planting which both restores stream banks and habitats (e.g., for native manu and īnanga) and protects the waterways (e.g., from high temperatures, erosional sedimentation, runoff and leaching of nutrients and other contaminants), (Table 3; Huirama 2021). Restoration of other habitats like wetlands and shellfish beds was also mentioned. These types of activities are both restorative and provide opportunities for iwi, hapū, and whānau to connect with their natural environment, which can promote reinvigoration of mātauranga.

Barriers and pathways toward kaitiakitanga

Kaitiakitanga is grounded upon management of cultural resources to ensure sustainability of the environment and all its resources for future generations (Williams, 2012). It is in and of itself a holistic approach, utilising ki uta ki tai principles to protect and enhance the mauri the environment from the cumulative effects of multiple stressors (Durie et al. 2018). To ensure expression of the ki uta ki tai principle, integration of management systems across the whole catchment (land, freshwater, coastal and air) is needed (e.g., Te Hapū o Ngāti Wheke et al., 2018).

Contemporary management systems in Aotearoa New Zealand have created significant barriers to the expression of tikanga Māori approaches regarding cumulative effects. The Heretaunga IEMPs for example, expressed consistently that current compartmentalisation of centralised resource management and governance systems is a significant barrier, as it does not recognise the flow-on effects of activities across the catchment (Table 2). They express that respect for and empowerment of iwi, hapū and whānau to enact holistic, local management (kaitiakitanga) from a te ao Māori perspective that is led by kaitiaki would better protect and enhance resources and mana for iwi and hapū (Table 3; Paul-Burke et al. 2020).

The East Otago Taiāpure Management Committee experienced similar issues with compartmentalised central management processes, which meant that while they had powers to manage the taiāpure, they still had little power over the surrounding catchment land uses and management practices (Bennett-Jones et al. 2022). The committee was able to overcome such compartmentalisation by partnering with other groups to ensure that there has been monitoring and restoration of broader catchment health. However, this can be taxing on the committee, iwi and hapū resources as they stretch between many different initiatives. Additionally, the committee's legal mandate does not extend beyond the coastal area of the taiāpure, and the law does not encompass true tikanga Māori approaches to management.

Co-governance arrangements for natural resources are one way to ensure Māori values are respected and appropriately enabled. The Whaka-Ora collaboration agreement for Whakaraupō and the Waikato River Authority are both examples of co-governing bodies over particular cultural resources/taonga. Through these co-governance arrangements there have been movements toward integration of management with specific oversight on an area and its catchments, ki uta ki tai (Te Hapū o Ngāti Wheke et al. 2018; Waikato River Authority, 2008). The WRA has utilised its enabling legislation (i.e., Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010, Ngaati Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Act 2010, and Ngaa Wai o Maniapoto (Waipa River) Act 2012) to ensure integrated management and ecosystem-based responses can

occur. Arrangements like this enable more effective treaty partnership as Māori methods and values are considered.

As more iwi and hapū are undertaking the treaty settlement process, more statutory bodies like this could be established with greater power to integrate the holistic co-governance of their taonga and places of cultural significance. By enabling tikanga Māori, cumulative effects will be better managed. By incorporating tikanga Māori in decision support tools like those being developed by the Challenge, local cumulative effects can be better managed as management options will be centred within Māori environmental strategies.

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Appendix 1: Kupu hou/glossary of Māori terms

Atua	Ancestry with continuing influence, god, deity – although often translated as ‘god’ and now also used for the Christian God, this is a misconception of the real meaning. They are regarded as ancestors with influence over particular domains and related to man.
Awa	River
Hapū	Kinship group, clan, tribe, sub-tribe, extended family – often refers to a subtribal/extended family kinship group, that consists of extended family who descend from a common ancestor.
Iwi	Extended kinship group, tribe, nation, people, nationality – often refers to a large group of people descended from a common ancestor and associated with a district territory.
Kaimoana	Kaimoana may simply represent coastal fisheries and/or shellfisheries; however, iwi, hapū, and whānau consider a much wider range of species when they use this language. For example, kaimoana, mahinga kai, and mahinga mātaītai are synonymous terms used by iwi, hapū, and whānau.
Kaitiaki/tangata tiaki	The contemporary definition is utilised in this research in regard to fisheries: the custodian, guardian, keeper, steward of customary fisheries designated by tangata whenua.
Kaitiakitanga	The intergenerational exercise of customary custodianship, in a manner that incorporates spiritual matters, by those who hold mana whenua/moana status for a particular area or resource.
Kanohi ki te kanohi	Face to face, in person, in the flesh. Best way to communicate with whānau, particularly relevant when meeting for the first time
Ki uta ki tai	It is an environmental philosophy that acknowledges the connectivity ‘from inland/mountain to sea’ and the reciprocal relationship between people and environment.
Kaupapa	Topic, policy, matter for discussion, plan, purpose, scheme, proposal, agenda, subject, programme, theme, issue, initiative.
Kupu	Word.
Mahinga kai	Referring to the species that have traditionally been used as food, tools, medicine, or other resources, including the act of harvesting/practice/use of those resources and the places they are gathered.
Mana	Prestige, authority, status.
Mana whenua/mana moana	Refers to the local tribe/sub-tribal group who hold mana and have ‘demonstrated authority’ over land or territory in a particular area, authority which is derived through whakapapa links to that area.

Manaaki/Manaakitanga	The practice of showing respect, generosity, and care for others, caring for people, places, and other living and non-living things.
Manu	Bird
Manuhiri	Visitor, guest.
Marae	Courtyard - the open area in front of the whareniui, where formal greetings and discussions take place. Often also used to include the complex of buildings around the marae.
Maramataka	Māori lunar calendar – a planting and fishing monthly almanac.
Mātauranga Māori	Is a holistic perspective encompassing all aspects of Māori knowledge and seeks to understand the relationships between all component parts and their interconnections to gain an understanding of the whole system. It is based on its own principles, frameworks, classification systems, explanations, and terminology. It captures both traditional knowledge as well as new knowledge being created every day in Māori communities. Mātauranga Māori is a dynamic and evolving knowledge system, has both qualitative and quantitative aspects, and includes the processes for acquiring, managing, applying, and transferring that body of knowledge.
Maunga	Mountain
Mauri	Life principle, life force, vital essence, special nature, a material symbol of a life principle, source of emotions – the essential quality and vitality of a being or entity. Also used for a physical object, individual, ecosystem, or social group in which this essence is located.
Moana	Sea, ocean, large lake.
Motu	Island, country, land, nation, clump of trees, ship - anything separated or isolated.
Ngāngara	Insect, reptile.
Noa	To be free from the extensions of tapu, ordinary, unrestricted, void.
Rāhui	A closure to harvesting and/or activities within a particular site, due to, but not limited to, health and environmental disturbances (i.e., the earthquake and its associated sewer impacts), any incidents from being in the sea, or marine habitat restoration purposes.
Rangatiratanga	Self-determination, sovereignty, autonomy, self-government, domination, rule, control, power. For instance, the capacity of hapū and iwi to exercise authority over their own affairs. The Crown has the duty to recognise hapū and iwi rights to exercise this authority and self-determination.
Rohe	Boundary, district, region, territory, area, border (of land).

Rūnanga	This is the customary/tribal/sub-tribal assembly or council.
Taiao	World, Earth, natural world, environment, nature, country.
Tangata whenua	Indigenous people of Aotearoa New Zealand, literally 'people of the land'.
Taonga	Treasures of cultural and historical significance to Māori, e.g., can include species of indigenous flora and fauna.
Tapu	To be sacred, prohibited, restricted, set apart, forbidden, under atua protection.
Te ao Māori	Māori worldview.
Te reo Māori	Māori language.
Tikanga	Māori customary law, values, and practices. Also encompasses the correct procedure, custom, lore, method, and practice. The customary system of Māori values and practices or set of protocols that have developed over time and are deeply embedded in the social context.
Tohu	Sign, mark, symbol, cue, landmark, distinguishing feature.
Wai	Water, stream, creek, river.
Wairua	Spirit, soul - spirit of a person which exists beyond death. It is the non-physical spirit, distinct from the body and the mauri. To some, the wairua resides in the heart or mind of someone while others believe it is part of the whole person and is not located at any particular part of the body.
Whakapapa	Whakapapa in a literal translation is the act of layering or creating a base. This term is commonly understood in English as genealogy. However, this translation misses the relational nature of this concept. Whakapapa supports a kincentric ecology compared to the direct lineal relationships of genealogy.
Whānau	An extended family, family group, or a familiar term of address to a number of people.
Whanaungatanga	Relationship, kinship, sense of family connection - a relationship through shared experiences and working together which provides people with a sense of belonging. It develops as a result of kinship rights and obligations, which also serve to strengthen each member of the kin group. It also extends to others to whom one develops a close familial, friendship or reciprocal relationship.