Ngā Rangi e Toru



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A Māori data Sovereignty Framework for Artificial Intelligence in Climate Change Research and Adaption

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About

Ngā Rangi e Toru Version 1 is a kaupapa Māori ethics framework for the use of Māori data with Generative Artificial Intelligence (GenAI) in climate change and environmental research. It sets out Te Tiriti o Waitangi obligations, core kaupapa Māori principles, a six-layer metadata schema for environmental Māori data, roles and responsibilities, and a comparison with international frameworks.

The framework is written for organisations, researchers, Crown agencies, AI developers and policymakers working with environmental GenAI in New Zealand, and for iwi, hapū, whānau and kaitiaki asserting authority over environmental Māori data.

The framework was written as a part of the research project "Harnessing generative artificial intelligence to inform nature-based adaptation to climate change" is funded through MBIE's Endeavour Smart Ideas programme (2024–2027). Climate change poses a growing threat to communities, livelihoods, and ecosystems across Aotearoa New Zealand, through rising temperatures, changing rainfall patterns, sea-level rise, and increasingly frequent and severe extreme weather events. Nature-based solutions - those that involve restoring environmental conditions and biodiversity - offer promising approaches to climate change adaptation because they can simultaneously support many other benefits to people and nature.

To plan for climate change and help design nature-based solutions, this research project explores how generative artificial intelligence (GenAI) can improve access to scientific knowledge and support climate adaptation decisions across Aotearoa New Zealand. Ngā Rangi e Toru is the outcome of a central component of the research project. If GenAI is used to support climate change planning in Aotearoa New Zealand, it must be used in a way that respects Māori data sovereignty and mātauranga Māori, Te Tiriti o Waitangi principles, tikanga, and the ethical implications of AI technologies.

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Whakapapa of the name

Ngā Rangi e Toru refers to three stages of nights; Te Rangi o Mua (the sky before us), Te Rangi o Nāianei (the sky of now), Te Rangi o Muri (the sky behind us). It draws on the mātauranga that the past lies in front of us and the future behind.

The framework applies this to Artificial Intelligence in climate change research. Te Rangi o Mua grounds the work in mātauranga, ancestral observation and the restoration of historical Māori data. Te Rangi o Nāianei governs how Māori data is collected, controlled and used today. Te Rangi o Muri ensures that the Māori data, models and decisions made now uphold kaitiakitanga for generations not yet born.

	Te Rangi o Mua (past)	Te Rangi o Nāianei (present)	Te Rangi o Muri (future)
Knowledge	Mātauranga, maramataka, tohu, oral histories	Current observation and monitoring	Projections and AI forecasting
Māori data	Historical and archived Māori datasets, including Māori data taken without consent	Māori data being collected and governed now	Model outputs, long-term Māori data stores
Sovereignty question	Who holds our past Māori data, and how is it returned or restored?	Who decides, controls and benefits today?	Who will be kaitiaki for mokopuna?
AI risk	Biased or colonial training data	Opaque use, lack of consent	Model drift, decisions outliving accountability
Core value	Whakapapa	Rangatiratanga	Kaitiakitanga

Introduction

The deployment of Generative Artificial Intelligence (GenAI) in environmental and climate domains presents unprecedented opportunities and unprecedented risks. These include the acceleration of ecological monitoring, climate modelling, biodiversity forecasting, and resource optimisation. Yet these same systems carry the capacity to reproduce, amplify, and institutionalise longstanding injustices visited upon Māori, rural communities, and ecosystems whose voices are routinely absent from Māori data pipelines and governance tables.

Ngā Rangi e Toru framework grounds a global architecture within Te Ao Māori, applying kaupapa Māori principles, tikanga Māori obligations, and Te Tiriti o Waitangi responsibilities as primary, not supplementary governance instruments.

Ngā Rangi e Toru framework asserts that no environmental GenAI system may be considered ethically sound if it has been designed, trained, or deployed without the Free, Prior, and Informed Consent (FPIC) of the communities, ecosystems, and whakapapa relationships it touches.

Definition of Māori data

Māori data is: Digital or digitisable information or knowledge that is about or from Māori people, language, culture, resources, or environments. Māori data is a Taonga and subject to Māori Governance.

Māori data Sovereignty is Māori data Governance. The principles, structures, accountability mechanisms, legal instruments, and policies through which Māori exercise control over Māori data.

In affirming this stance, the Tribunal emphasises that Māori data Sovereignty is not merely symbolic but entails active governance and authority. This right, which is rooted in Te Tiriti rights and tikanga, grants Māori the power to determine how their Māori data is used, shared, and protected.

1. Scope and Purpose

1.1 Scope of Application

Ngā Rangi e Toru framework applies to Māori data used with a GenAI system including large language models, diffusion models, multimodal systems, and autonomous agents that are:

- Used for environmental monitoring, modelling, or prediction (climate, biodiversity, water, soil, atmospheric, and marine systems);
- Deployed in climate change adaptation planning, mitigation strategy development, or disaster risk reduction;
- Applied to land use planning, conservation prioritisation, or resource management;
- Trained on environmental or ecological Māori data, including Māori datasets that contain, reference, or derive from Māori environmental Māori data; or
- Used to inform or automate decisions that affect ecosystems, habitats, or the communities dependent on them.

1.2 Purpose

Ngā Rangi e Toru framework serves four interconnected purposes:

1. To provide organisations, researchers, and policymakers with a structured ethical basis for the responsible development and deployment of environmental GenAI;
2. To assert the primacy of kaupapa Māori principles and Te Tiriti o Waitangi obligations in the New Zealand context;
3. To enable alignment with international obligations including UNDRIP, the Convention on Biological Diversity (CBD), the Paris Agreement (2015), and global AI ethics instruments; and
4. To create accountability mechanisms that centre the wellbeing of ecosystems, future generations, and those communities most exposed to climate harms.

2. Acknowledgement

Ngā Rangi e Toru framework as presented here does not treat Māori values as an addendum to a Western ethics architecture. It asserts that te ao Māori provides a complete and sophisticated governance framework for the relationship between human knowledge systems, Artificial Intelligence, and the natural world, one that predates and, in many respects, exceeds the scope of recently developed global AI ethics instruments.

This framework is grounded in the recognition that the taiao (natural environment) in New Zealand is not an object of governance but a subject of relationships. Environmental GenAI must be assessed not only for what it does to the environment, but for what it does to the relationships between tangata whenua and the taiao.

3. Te Tiriti o Waitangi Obligations

Te Tiriti o Waitangi imposes binding obligations on all parties operating in New Zealand, including those developing and deploying GenAI for environmental purposes. The three articles of Te Tiriti establish the following specific obligations for environmental GenAI:

Te Tiriti Article	Core Guarantee	Environmental GenAI Obligation
Article 1 - Kāwanatanga / Governance	The Crown exercises governance responsibilities.	The Crown must ensure environmental GenAI deployed in New Zealand is subject to regulatory frameworks that honour Te Tiriti obligations. This includes Māori representation in standards bodies and regulatory processes.
Article 2 - Tino Rangatiratanga / Sovereignty	Māori retain authority over their taonga, including lands, fisheries, forests, and cultural treasures.	Māori exercise authority over environmental Māori data derived from their rohe, mahinga kai, and ecological relationships. Environmental GenAI must not ingest, replicate, or commercialise such Māori data without iwi or hapū consent. Mātauranga Māori about the environment is taonga.
Article 3 - Ōritetanga / Equity	Māori are guaranteed the same rights as other citizens.	Māori must not be disproportionately exposed to harms arising from environmental GenAI, nor excluded from its benefits. Algorithmic systems must not produce racially differentiated outcomes in environmental risk assessment, conservation planning, or adaptation resource allocation.

4. Core Kaupapa Māori Principles Applied to Environmental GenAI

4.1 Kaitiakitanga

Kaitiakitanga is an active, relational, and genealogically embedded obligation to sustain the mana and mauri of the taiao across generations. Environmental GenAI must be assessed against the following kaitiakitanga tests:

- Does the system strengthen or undermine existing kaitiaki relationships between hapū and their rohe?
- Does it enable or displace Māori-led environmental monitoring and decision-making?
- Does it respect the tohu (indicators) that Māori communities use to assess ecosystem health, such as the presence of kōwhai, harakeke, tī kouka, as legitimate Māori data?
- Does it protect wāhi tapu and wāhi Māori from being mapped, identified, or made accessible without whānau, hapū or kaitiaki consent?
- Internally, any AI associated with translating Te Reo Māori or generated multimedia must have the result confirmed by an organisation's mandated Māori staff member with expertise in te ao Māori.

Knowledge that is considered tapu in te ao Māori is never used with a Generative AI without permission of the Kaitiaki. Tapu Māori data includes but is not limited to:

- Urupā
- Sites of cultural significance
- Whakapapa of individuals or collectives including pūrākau, waiata and whaikōrero.
- Any Māori data that is deemed tapu by the kaitiaki of the content of the Māori data.

4.2 Mauri

Mauri is the essential life force present in all things, including ecosystems, water bodies, species, and communities. Environmental GenAI must not be designed or operated in ways that diminish the mauri of the taiao or of the communities it serves. This requires:

- Avoidance of model architectures that treat ecosystems as aggregate Māori data points divorced from their relational and spiritual dimensions;
- Recognition that environmental health indicators meaningful to Māori, including mauri assessments conducted by mana whenua carry epistemic authority equivalent to Western scientific metrics; and
- Assessment of whether the deployment of a GenAI system in each context enhances or diminishes the lived experience of ecological relationship for those communities.

- Considerations of environmental externalities that may occur outside a specific rohe or overseas when using AI to compute outputs, e.g. energy, water, rare earth materials and minerals, carbon use of the infrastructure etc, and consideration of where AI data centres are located and if they impact Māori customary rights.

4.3 Whakapapa

Whakapapa establishes the interconnection of all things. For environmental GenAI, this has direct methodological implications: environmental Māori data is never isolated from the relationships that generated it. A Māori dataset of water quality readings from a Māori-managed awa (river) carries whakapapa connections to the hapū who monitored it, the atua whose domain it falls within, and the generations of kaitiaki (guardian) who tended it.

Environmental GenAI systems must:

- Preserve the whakapapa context of environmental Māori data and not strip Metadata in ways that sever Māori data from its relational origins;
- Avoid aggregating Mātauranga Māori into decontextualised training corpora; and
- Enable iwi and hapū to maintain ongoing relational authority over Māori data derived from their whakapapa connections.

4.4 Manaakitanga

Manaakitanga requires that environmental GenAI serve the wellbeing of communities and ecosystems, not merely extract value from them. This principle operationalises as follows:

- Organisations that benefit commercially from environmental GenAI informed by Mātauranga Māori must provide tangible reciprocal benefits to those communities;
- Māori data extracted from Māori environmental contexts must be returned to communities in accessible, usable forms; and
- Environmental AI deployed in Māori contexts must be designed to enhance rather than supplant local capacity.

4.5 Mana

The deployment of environmental GenAI must not diminish the mana of Māori individuals, communities, or taonga. This requires:

- Recognition that Māori communities hold legitimate sovereign authority over environmental decisions within their rohe;
- That GenAI-generated environmental assessments cannot override rangatiratanga-based environmental governance without the consent of mana whenua; and
- That Māori environmental knowledge systems are not subordinated to or validated by Western scientific frameworks as a precondition for inclusion in AI training Māori data.

4.6 Tikanga Māori

Tikanga Māori provides a comprehensive regulatory framework for the correct conduct of relationships, including relationships with the taiao.

Environmental GenAI must:

- Observe rāhui (temporary restrictions on resource use);
- Respect the tapu status of certain environmental sites, species, and ecological events, such that AI systems do not make this information publicly accessible without appropriate protocols; and
- Ensure that decisions about environmental GenAI affecting Māori communities are made through processes consistent with tikanga, including the possibility of wānanga based deliberation rather than digital consultation alone.

4.7 Mātauranga Māori as Environmental AI Māori data

Mātauranga Māori constitutes one of the world's most sophisticated long-term environmental knowledge systems, encompassing centuries of accumulated ecological observation, classification, and management embedded in oral tradition, whakapapa, and practice.

Its inclusion in environmental GenAI training Māori data retrieved through GenAI tools, raises specific ethical obligations.

4.7.1 Mātauranga Māori data Obligations

1. No Mātauranga Māori may be incorporated into environmental AI training data without the free, prior and informed consent of the appropriate iwi, hapū, or whānau authority.
2. Where Mātauranga Māori informs a model's outputs, that provenance must be disclosed and attributed.
3. Any commercial application of environmental GenAI informed by Mātauranga Māori requires a negotiated benefit-sharing agreement with the knowledge-holding community.
4. Iwi, hapū and other Kaitiaki have the absolute right to withhold Mātauranga Māori from AI training datasets. This right must not be characterised as an obstacle to scientific progress.
5. Māori communities must have the ability to request removal or restriction of AI outputs that disclose or derive from their environmental knowledge.

5. Metadata

All Māori data has a whakapapa (genealogy) and a mauri. Accurate metadata should, at minimum, provide information about the provenance of the Māori data, the purpose(s) for its collection, the context of its collection, and the parties involved.

The responsibility is on the Māori data collector to record where the Māori data came from, what the Māori data is about, Iwi, hapu, marae, whānau and Kaitiaki connections, and kaupapa Māori categories for Metadata, and to treat the Māori data with respect.

Each Metadata field is listed with its Māori term, a plain-language description, the values or format expected, and a note on who has authority to populate or verify it.

Authority columns are critical: a government agency or research institution can act as a Māori data custodian but cannot self-assign kaitiakitanga fields, those must be determined in partnership with the appropriate Kaitiaki.

5.1 Layer One: Entities

These fields identify the human relationships and governance structures connected to the environmental Māori data. They establish who holds authority, who must be consulted, and who must give consent.

Metadata Field	Description
Iwi	The iwi within whose rohe the Māori data was collected, or whose whakapapa connects to the subject matter. Use the full iwi name(s). Note: Not all traditional Iwi are recognised by government standards.
Hapū	The specific hapū with primary kaitiakitanga over the subject. Hapū are the primary political and governance unit, Māori data governance must reach hapū level, not stop at iwi.
Rūnanga	The tribal council or governance body of the relevant iwi or hapū with formal authority to make decisions about the Māori data. Record the full legal name of the rūnanga.
Whānau	Where the Māori data pertains specifically to whānau-level knowledge, practice, or land, record the whānau name or identifier. Whānau rights are distinct from hapū and iwi rights.
Marae	Where the Māori data pertains specifically to marae-level knowledge, practice, or land, record the marae name or identifier. Marae rights are distinct from hapū and iwi rights.
Land Trust	The name of the ahu whenua trust, Māori incorporation, or other statutory land trust that holds governance authority over the physical land from which Māori data was collected.

Metadata Field	Description
Post-Settlement Governance Entity (PSGE)	a permanent structure responsible for managing financial, cultural, and commercial assets on behalf of their members
Kaitiaki	The named individual(s) or group(s) exercising active kaitiakitanga over the taonga, site, or species the Māori data concerns. Must have whakapapa connection but cannot be a government agency.
Mana whenua	The iwi or hapū who hold traditional authority over the specific area. Distinct from 'iwi' as a broad category. Mana whenua is site-specific and may be contested where territories overlap.
Māori data custodian	The organisation or repository physically holding and maintaining the Māori data. Distinct from kaitiaki a custodian has technical stewardship but not cultural authority.

5.2 Layer Two: Place and Territory

These fields capture the geographic and relational identity of the environmental Māori data, using Māori spatial concepts.

Metadata Field	Description
Rohe (territory)	The territorial boundary within which the Māori data was collected, defined by the maunga, awa, moana, and roto named in the relevant iwi's pepeha. Do not use political boundaries as a substitute.
Place name (Māori)	The te reo Māori name of the specific location, prioritised over any colonial or Anglicised name.
Feature type	Classification of the natural feature: awa (river), maunga (mountain), roto (lake), moana (sea), repo (wetland), ngahere (forest), one (beach/sand), puke (hill), wai (water body, general)
Marae	The name of the marae nearest to or most directly connected with the Māori data collection site. Marae provides the primary community governance node for local kaitiakitanga decisions.
Ngā Atua	The atua whose domain the feature falls within: Tāne-Māhuta (ngahere, birds), Tangaroa (water ways, fish and marine mammals etc), Papatnuūāku (land), Rūaumoko (geothermal, seismic), Tāwhirimātea (wind, weather). Noting Iwi variations.

Metadata Field	Description
Ancestral connection	The whakapapa relationship between the natural feature and the iwi, hapū, or Kaitiaki e.g. a maunga as an ancestor, an awa as a tupuna. Record the specific whakapapa narrative reference where known.

5.3 Layer Three: Access and Restriction

Māori shall decide which Māori data shall be controlled (tapu) or open (noa) access or rāhui (excluded). These fields implement that right as structured Metadata. Tapu, rāhui and noa are not binary; they exist on a spectrum and may change with circumstance, season, or ceremony.

Metadata Field	Description
Tapu	Whether the Māori data subject site, species, knowledge, or event is tapu (sacred, restricted, set apart). Tapu Māori data must not be made publicly accessible without appropriate ceremony or kaitiaki authorisation. Record the type of tapu where known: wāhi tapu, tapu tūpuna, tapu species, etc.
Noa	Whether the Māori data is noa (ordinary, unrestricted, free from tapu). Noa status allows general access but does not suspend attribution, benefit-sharing, or whakapapa obligations. Tapu and noa must not be mixed within a single access pathway.
Rāhui	Whether a rāhui (restriction) is currently in effect over the area or resource. Record who imposed the rāhui, the grounds (depletion, tapu, death), the duration, and who has authority to lift it. Or if the Māori data should be removed.
Permission obtained from?	Record the specific named individual(s) or body from whom consent was obtained: the kaitiaki, hapū chair, rūnanga, land trust, or whānau authority. Full name, role, and date of consent must be recorded. Permission from one iwi does not extend to another.
Consent status	Whether Free, Prior and Informed Consent (FPIC) has been obtained. Status options: Obtained (with reference), Pending, Withheld, Not required. Where withheld, the Māori data must not be collected or used.
Commercial restriction	Whether commercial use of the Māori data is prohibited, permitted under conditions, or requires renegotiation.
Right of withdrawal	The Kaitiaki's right to withdraw or restrict the Māori data at any time. Record the process for exercising this right and the timeline for Māori data deletion or restriction upon request.

5.4 Layer Four: Mauri and Ecosystem Health

These fields apply Māori environmental assessment frameworks to ecological Māori data. The mauri of an ecosystem is a legitimate Māori data point with equivalent epistemic authority to Western scientific metrics. Environmental AI systems must not strip these fields in processing.

Metadata Field	Description
Mauri assessment	The assessed state of mauri at the time of collection. Use the four-state mauri model: mauri ora (thriving, full vitality), mauri moe (dormant, low vitality), mauri noho (stressed, at rest), mauri rere (freely flowing, active). Assessment must be by a kaitiaki with direct knowledge of the site.
Ecological health indicator	The specific tohu (environmental indicator) observed that informed the mauri assessment. Examples: presence/absence of kōura (freshwater crayfish), tuna (eel), īnanga (whitebait), pātiki (flounder), kererū (wood pigeon), pūkeko (swamp hen), kiwi.
Tohu type	Classification of indicator domain: ika (fish/freshwater), manu (bird), tipu (plant/vegetation), wai (water quality/flow), oneone (soil/land), repo (wetland), rangi (atmospheric/weather), ngahere (forest health)
Maramataka phase	The lunar/seasonal phase at the time of Māori data collection, using the regional maramataka relevant to the rohe. Maramataka phases affect species behaviour, planting cycles, and water conditions that are essential context for ecological Māori data interpretation.
Tohu taiao (environmental sign)	Specific environmental signs observed at the time of collection that indicate broader ecological or climatic conditions, e.g. flowering of harakeke, arrival of Kūaka (godwit), behaviours of taniwha associated species.
Wairua dimension	Whether the Māori data has a spiritual dimension requiring specific handling under tikanga, e.g. Māori data collected at wāhi tapu, during tapu seasons, or relating to species with direct atua associations.
Mahinga kai category	Whether the site is a mahinga kai site and which resources it supports. Mahinga kai sites carry both resource rights and kaitiakitanga obligations that govern how related Māori data may be used.

5.5 Layer Five: Knowledge Provenance

Environmental Māori data derived from or informed by mātauranga Māori carries whakapapa connections that must not be stripped in AI processing or digital repository ingestion.

These fields preserve those connections.

Metadata Field	Description
Mātauranga classification	Whether the Māori data encodes, derives from, or is informed by mātauranga Māori. Domains: rongoā (medicinal), kaitiakitanga (environmental stewardship), mahinga kai (food-gathering), whakapapa (genealogical), tohu (environmental indicators), maramataka (seasonal/lunar)
Original knowledge holder	The knowledge holder from whose mātauranga the observation or Māori data derives. Record full name, iwi/hapū affiliation, and role. Do not aggregate individual knowledge holders into anonymous community references.
Knowledge transmission mode	How the mātauranga was transmitted: kōrero tuku iho (oral tradition), tohu (observation-based), whakairo (encoded in carving), waiata (song), whakataukī (proverb), karakia (ritual recitation), poukai (tribal gathering)
Benefit-sharing agreement	Whether a benefit-sharing agreement exists. Record reference number, parties, and key terms. Any commercial application of Māori data informed by mātauranga Māori requires a negotiated benefit-sharing agreement before use.
Storage jurisdiction	Physical and virtual location of Māori data storage. Preference is onshore (New Zealand). Record the cloud region and provider where applicable. Māori data about taonga must not be stored in jurisdictions that cannot guarantee Māori access or withdrawal rights.
Review date	When the Māori data governance settings are next to be reviewed with the relevant kaitiaki. Governance settings are not permanent, seasonal, ceremonial, or political changes may require reconfiguration.

5.6 Layer Six: Tikanga and Protocol

Tikanga Māori provides a comprehensive regulatory framework for the correct conduct of relationships, including relationships with the taiao.

These fields ensure that tikanga obligations are recorded alongside the Māori data itself.

Metadata Field	Description
Applicable tikanga	The specific tikanga protocols governing how this Māori data may be used, shared, or published. Record the tikanga domain: tapu lifting requirements, gender protocols, seasonal restrictions, karakia obligations.
Karakia required	Whether karakia (ritual recitation/prayer) is required before accessing or working with this Māori data, and at what points in the workflow. Record the form of karakia required where known.
Seasonal restriction	Whether access or use of this Māori data is restricted to seasons or maramataka phases, e.g. Māori data about spawning grounds during spawning season, ceremonial knowledge during its season.
Engagement protocol	The correct engagement protocol for seeking access or consent: pōwhiri (formal welcome), hui (meeting), wānanga (extended deliberation), marae-based process. Record the required process before Māori data access is granted.
Wāhi type	Classification of the site: wāhi tapu (sacred), wāhi tūpuna (ancestral significance), wāhi Māori (ordinary/unrestricted), urupā (burial ground), pā (fortified site), marae, tūāhu (shrine), mahinga kai site.

6 Roles and Responsibilities

Roles and responsibilities allow for monitoring appropriate permissions and kaitiaki responsibilities.

Metadata: Role	Description of responsibilities under these Frameworks
AI Developers and Vendors	Implement privacy by design; provide FPIC documentation; enable Māori data governance; publish transparency reports.
Crown Agencies and Regulators	Establish Te Tiriti-consistent AI policies; fund Māori AI ethics capacity; require Ethical Impact Assessments as a condition of public procurement; enforce Māori data sovereignty provisions.
Iwi, Hapū, whānau and Kaitiaki	Assert tino rangatiratanga over environmental Māori data; establish Kaitiaki AI ethics protocols; participate in governance structures; exercise FPIC rights; appoint kaitiaki for Māori data relationships.
Research Institutions	Apply kaupapa Māori research methodologies; obtain ethics approval including Māori cultural ethics review; share findings with communities; include Māori researchers as equal partners.
Environmental NGOs and Practitioners	Require suppliers to demonstrate ethics framework compliance; include Māori community representation in project governance; report on kaitiakitanga outcomes.
AI Ethics Advisors	Provide qualified assessment of Te Tiriti compliance; advise on tikanga protocols; represent Māori interests in AI governance processes; contribute to standards development.

7. Epistemological Approach

Kaupapa Māori research methodology requires that research be:

- Centred in te ao Māori values and epistemologies, not merely inclusive of them;
- Responsive to the aspirations and priorities of Māori communities, including those most affected by environmental change;
- Conducted in ways that strengthen rather than extract from Māori knowledge systems; and
- Subject to ongoing community accountability rather than solely institutional review.

8. Community and Expert Engagement

Ethics frameworks of this nature cannot be developed in academic isolation. Future iterations of this framework should incorporate:

- Structured consultation with iwi, hapū and Māori organisations environmental managers and kaitiaki;
- Co-development hui with climate scientists, AI researchers, and Māori data Sovereignty advocates;
- Peer review by qualified Māori legal scholars and AI ethics specialists; and
- Iterative revision through community feedback cycles, including te reo Māori versions of the framework.

9 International frameworks

9.1 Integrated Comparisons

The following table maps equivalences and distinctions to assist practitioners in understanding how they interact with international standards.

Dimension	Global Ethics Framework	Kaupapa Māori Framework
Foundation	International law, AI ethics standards, human rights frameworks.	Te ao Māori, tikanga, Te Tiriti o Waitangi, whakapapa.
Environmental ontology	Nature as a resource system to be managed sustainably.	Taiao as a network of relationships with genealogical, spiritual, and ethical dimensions.
Knowledge authority	Scientific evidence hierarchies; traditional knowledge as supplementary.	Mātauranga Māori as primary epistemic authority within its domain; not subordinated to Western science.
Consent mechanism	FPIC under UNDRIP; ethical review processes.	Tikanga-based deliberation, hui, and hapū/iwi/Kaitiaki decision making as the proper mechanism for consent.
Māori data governance	GDPR-influenced data minimisation, transparency, and accountability.	Māori data Sovereignty principles; rangatiratanga over Māori data; whakapapa-based provenance.
Beneficiary	Humanity; affected communities; future generations.	Whānau, hapū, iwi, Kaitiaki; the Taiao itself; generations yet to come.
Accountability	Regulatory compliance; independent audit; human oversight.	Tikanga obligations; kaitiakitanga accountability to atua, ancestors and mokopuna.
Risk framing	Harm reduction; proportionality; robustness.	Mauri protection; avoidance of breach of tapu; maintenance of relational integrity.

Dimension	Global Ethics Framework	Kaupapa Māori Framework
Prohibited conduct	Harmful automation; greenwashing; surveillance; disinformation.	All global prohibitions plus: unauthorised use of Mātauranga Māori; disruption of kaitiakitanga; diminishment of mana.

9.2 Alignment with international frameworks

Global policy and law regarding Indigenous rights, environmental governance, climate policy and AI ethics and practice provide a surrounding context and align with this Kaupapa Māori Ethics Framework for Climate Change Adaptation and Environmental Management. Such international frameworks provide a strong basis for recognising that Indigenous knowledge, authority, participation and relationships with place are central to responsible environmental decision-making and highlight critical factors that must be considered for responsible AI use.

1. **International biodiversity and climate change policy** provides similar affirmation and frameworks for governance.
2. The IPBES framing has been translated into the **Kunming-Montreal Global Biodiversity Framework**, a global policy framework adopted by Parties to the legally binding CBD. International climate governance has followed a similar trajectory.
3. **The Convention on Biological Diversity (CBD) Article 8(j) (1992)**, established obligations to respect, preserve and maintain the knowledge, and practices of Indigenous and local communities relevant to biodiversity conservation and sustainable resource use.
4. **The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)**, established in 2012, has strengthened this shift in international environmental governance. IPBES reports explicitly emphasise that nature is valued in diverse ways across different cultures, knowledge systems and worldviews, and recognise Indigenous knowledge alongside scientific knowledge.
5. **The Paris Agreement (adopted 2015)** recognises that climate action should respect the rights of Indigenous peoples, and states that climate change adaptation should be guided by Indigenous peoples' knowledge in addition to science.
6. **The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)**, adopted in 2007, affirms Indigenous collective rights. It affirms rights to self-determination, participation in decisions affecting Indigenous peoples, and maintenance, control and protection of traditional knowledge. UNDRIP emphasises participation and free, prior and informed consent, for any framework concerned with Indigenous knowledge or people, and therefore also including ecological knowledge, environmental Māori data and AI-enabled environmental decision-making.

International AI governance frameworks emerged mainly from 2019 onward, coinciding with rapid advances in machine learning and generative AI. International instruments such as:

1. OECD AI Principles
2. UNESCO Recommendation on the Ethics of AI
3. G7 Hiroshima AI Process
4. UN resolutions on trustworthy AI
5. EU AI Act
6. UNESCO Recommendations are particularly relevant for environmental AI as they highlight the importance of Indigenous data governance and environmental impact assessment and require positive environmental outcomes of applying AI.
7. All of which generally emphasise human rights, safety, transparency, accountability, and risk management.

9.3 Comparison Table

The following table maps the framework's relationship to relevant international instruments. The middle column identifies points of alignment; the right-hand column identifies where the Kaupapa Māori framework extends, reframes, or grounds those instruments in te ao Māori.

International framework	Alignment with the Kaupapa Māori Framework	How the Kaupapa Māori Framework extends or reframes it
EU AI Act	Aligns with risk-based governance, accountability, data governance, transparency, traceability and requirements concerning the quality and governance of Māori datasets used in AI systems.	Adds Māori Sovereignty and whakapapa-based provenance as additional governance requirements. Māori data is treated not merely as information to be minimised or technically governed, but as potentially carrying relationships, obligations, authority and cultural significance that must remain visible throughout the AI lifecycle.
G7 Hiroshima AI Process	Aligns with lifecycle risk management, transparency, accountability and safeguards for generative and advanced AI systems.	Adds Māori-specific prohibited and harmful conduct, including unauthorised use of mātauranga, disruption of kaitiakitanga, infringement of rangatiratanga and diminution of mana.
Kunming-Montreal Global Biodiversity Framework	Aligns particularly with recognition of Indigenous and traditional knowledge, Indigenous participation and free, prior and informed consent (FPIC) in accessing traditional knowledge.	Goes beyond protection and participation by locating mātauranga Māori within Māori epistemological and governance authority. Mātauranga is not treated simply as an additional Māori dataset or knowledge source to be incorporated into scientific systems; its use remains subject to Māori-defined tikanga and authority.
The Convention on Biological Diversity (CBD) Article 8(j) (1992)	Recognises the importance of respecting, preserving and maintaining Indigenous and local knowledge, and supports its use	Extends these principles into AI governance through explicit requirements for attribution, provenance, benefit-sharing, collective authority and the ability to restrict or withhold access to

International framework	Alignment with the Kaupapa Māori Framework	How the Kaupapa Māori Framework extends or reframes it
	with the approval of knowledge holders and equitable benefit-sharing.	mātauranga, where authorised by Māori knowledge holders.
The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)	Aligns with international recognition of Indigenous peoples' knowledge, participation and stewardship in environmental governance.	Reframes the environment from a system of resources to be managed towards taiao as a relational, genealogical and spiritual entity. Environmental responsibility therefore includes obligations arising through whakapapa, mauri and relationships with future generations.
OECD AI Principles	Aligns with transparency, accountability, human oversight, traceability, risk management and environmental sustainability.	Reinterprets these principles through kaitiakitanga, whakapapa and relational accountability. Harm is not limited to impacts on individual humans; it can include breaches of tikanga, diminution of mana, damage to mauri and disruption of relationships between people, knowledge and taiao.
The Paris Agreement (2015)	Aligns with the recognition of Indigenous and traditional knowledge as relevant to climate adaptation and resilience (Article 7.5, "as appropriate"), with rights-based language located principally in the preamble.	Extends climate-focused AI governance to include mauri, kaitiakitanga and the wider environmental footprint of AI, including energy and water consumption, extraction of critical minerals and Māori data-centre impacts. Accountability also extends to future generations and relationships with the taiao.
The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) (2007)	The framework operationalises UNDRIP principles concerning self-determination, participation, Indigenous decision-making and free, prior and informed consent (FPIC), particularly in relation to Indigenous knowledge and Māori data.	Grounds FPIC in tikanga-based deliberation (hui, wānanga, hapū/iwi/Kaitiaki decision-making) rather than generic ethical review consent; treats te ao Māori as primary law, not aspiration.
UNESCO Recommendation on the Ethics of AI	Aligns with UNESCO's emphasis on human rights, cultural diversity, Indigenous knowledge, participation, transparency and responsible AI governance.	Provides more culturally specific operational mechanisms for these principles through Māori data Sovereignty, whakapapa-based provenance and tikanga-informed access controls, including distinctions such as tapu, noa and rāhui where appropriate.
UN resolutions on trustworthy AI	Aligns with international emphasis on human rights, trustworthiness, inclusion, accountability and equitable AI governance.	Defines the relevant community and beneficiaries more relationally: whānau, hapū, iwi and taiao, rather than relying solely on an abstract conception of humanity or the individual user. Consent is understood as potentially collective and relational where Māori rights and knowledge are concerned.

10. Glossary

This glossary covers terms only as they are used in this framework. For fuller translations, consult a dedicated reference such as Te Aka Māori Dictionary or the Williams Māori Dictionary.

Kupu	Meaning in this framework
ahu whenua trust	A trust set up under Te Ture Whenua Māori Act 1993 to administer Māori freehold land for its owners
atua	Ancestral deities. Each one holds authority over a domain of the natural world
awa	River
hapū	Subtribe. The main political and governance unit in te ao Māori, and the level Māori data governance must reach
harakeke	New Zealand flax (Phormium tenax). Its flowering is an environmental tohu
hui	Meeting or gathering, held according to tikanga
ika	Fish. Also, a tohu domain covering freshwater and marine species
Īnanga	Whitebait (Galaxias maculatus)
iwi	Tribe. A wider kin group made up of several hapū
kaitiaki	Guardian. A person or group with a whakapapa connection who exercises kaitiakitanga over a taonga, site or species. It cannot be a government agency
kaitiakitanga	Guardianship. An active, relational and inherited obligation to sustain the mana and mauri of the taiao across generations
karakia	Ritual recitation or prayer
kaupapa Māori	Approaches, research and practice based on Māori values, knowledge and aspirations
kāwanatanga	Governance. Article 1 of Te Tiriti o Waitangi
kererū	New Zealand wood pigeon (Hemiphaga novaeseelandiae)
kiwi	Endemic flightless bird (Apteryx spp.)
kōrero tuku iho	Knowledge handed down orally across generations
kotahitanga	Unity, collective action and collective benefit
kōura	Freshwater crayfish
kōwhai	Native tree (Sophora spp.). Its flowering is an environmental and seasonal tohu
kūaka	Bar-tailed godwit. Its arrival and departure are seasonal tohu
kupu Māori	A Māori word or term
mahinga kai	Places and practices for gathering food and other resources. These carry both resource rights and kaitiakitanga obligations

mana	Authority, prestige and spiritual power, held by people, collectives and taonga
mana whenua	Customary authority held by iwi or hapū over a particular area. It is site-specific and can overlap
manaakitanga	Care, generosity and reciprocity. Here it means returning value to communities
manu	Bird. Also, a tohu domain
marae	Communal meeting place and the main community node for local kaitiakitanga decisions
maramataka	Māori lunar and seasonal calendar. It differs by region
mātauranga Māori	Māori knowledge systems, including ecological observation, classification and management
maunga	Mountain. Often an ancestor in iwi and hapū whakapapa
mauri	The life force present in all things, including ecosystems, water bodies, species and communities
moana	Sea or ocean
mokopuna	Grandchildren and descendants. Future generations
Ngā Rangi e Toru	“The three skies.” The name of this framework
ngahere	Forest. Also, a tohu domain
noa	Ordinary, unrestricted and free from tapu
one	Beach or sand
oneone	Soil. Also, a tohu domain
ōritetanga	Equity. Article 3 of Te Tiriti o Waitangi
pā	Fortified village site
Papatūānuku	Earth mother, atua of the land
pātiki	Flounder
pepeha	A formal statement of identity naming one’s maunga, awa, waka, iwi and other connections
poukai	Annual gatherings held at marae as part of the Kīngitanga
pōwhiri	Formal welcome ceremony
puke	Hill
pūkeko	Swamp hen (Porphyrio melanotus)
pūrākau	Ancestral narratives and traditional stories
rāhui	A temporary restriction on access to or use of a resource or area, for example because of depletion, tapu or a death
rangatiratanga	Authority and self-determination. In this framework, Māori authority over Māori data
rangi	Sky. Also, a tohu domain covering atmosphere and weather
repo	Wetland. Also, a tohu domain

rohe	Tribal territory, defined by the landmarks named in pepeha rather than by political boundaries
rongoā	Traditional Māori healing and medicine
roto	Lake
Rūaumoko	Atua of earthquakes, volcanoes and geothermal activity
rūnanga	Tribal council or governance body
taiao	The natural environment, understood as a set of relationships rather than an object
Tāne-Māhuta	Atua of forests and birds
Tangaroa	Atua of the sea, waterways and the creatures that live in them
tangata whenua	People of the land. The Indigenous people of a place
taniwha	Guardian beings associated with particular waters and places
taonga	Treasured possession, tangible or intangible. This includes Māori data
tapu	Sacred, restricted, set apart
Tāwhirimātea	Atua of wind and weather
Te Ao Māori	The Māori world and worldview
Te Rangi o Mua	“The sky before us.” The past
Te Rangi o Muri	“The sky behind us.” The future
Te Rangi o Nāianei	“The sky of now.” The present
Te Reo Māori	The Māori language
Te Tiriti o Waitangi	The Māori-language text of the 1840 treaty between the Crown and rangatira Māori
tī kouka	Cabbage tree (Cordyline australis)
tino rangatiratanga	Full authority and self-determination. Article 2 of Te Tiriti o Waitangi
tipu	Plant or vegetation. Also, a tohu domain
tohu	Signs or indicators, particularly environmental indicators
tohu taiao	Environmental signs that point to wider ecological or climatic conditions
tūāhu	Shrine or sacred altar
tuna	Freshwater eel
tupuna / tūpuna	Ancestor / ancestors
urupā	Burial ground
wāhi Māori	Sites of Māori significance that are not restricted
wāhi tapu	Sacred or restricted sites
wāhi tūpuna	Sites of ancestral significance
wai	Water. Also, a tohu domain
waiata	Song
wairua	Spirit, spiritual dimension
waka	Canoe. Also, the ancestral canoes from which iwi trace descent

wānanga	Extended deliberation, or a forum for learning and decision-making
whaikōrero	Formal oratory
whakairo	Carving
whakapapa	Genealogy. The connections between all things, which also give Māori data its provenance and context
whakataukī	Proverb or ancestral saying
whānau	Extended family