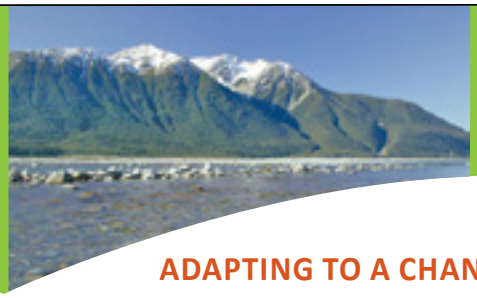



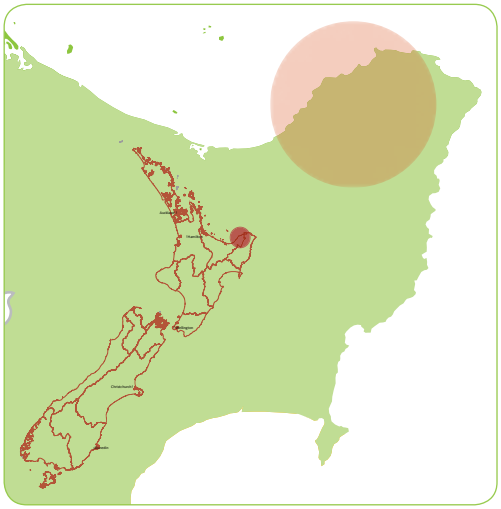

ADAPTING TO A CHANGING CLIMATE: CASE STUDY 10

WEATHER AND CLIMATE CHANGE INDICATORS

NGA TOHU HUARERE O TE WHĀNAU-Ā-APANUI

WHAT IS CLIMATE CHANGE?

Climate change is the change over time in the average (mean) state of the atmosphere over decades or longer. Climate change may be due to natural processes or external forces, or to persistent human activity that alters the composition of the atmosphere or land use (www.climatechange.govt.nz).



Tangata whenua have a wealth of traditional knowledge about their rohe, including the weather and climate. Environmental indicators are important for understanding how to live closely with the land, and how to survive and thrive.

Over time many iwi have noticed changes not only in the climate, but also in traditional indicators that predict weather and seasonal patterns.

Climate is the long-term average in weather, usually judged over a 30-year period. The global climate is altering in part as a result of human activities and will continue to change over the next century. Iwi, hapū and whānau will need to understand what the changes mean for their rohe, whenua and taonga to continue to survive and thrive.

Several Te Whānau-ā-Apanui elders worked with the National Institute of Water and Atmospheric Research (NIWA) through their Māori unit, Te Kūwaha, to record and enrich their mātauranga Māori (Māori knowledge). The aim was to recover and document knowledge on how to adapt to a changing climate.

The Te Whānau-ā-Apanui people live in the North Island with their iwi territory extending from Te Taumata-ō-Apanui (between Tōrere and Hāwai) to Pōtaka. The 13 hapū (sub-tribe) are situated along the narrow coastal strip between the Raukūmara Range and the eastern Bay of Plenty (go to www.teara.govt.nz and search under "Māori New Zealanders"). At the 2006 census 11 808 people identified as being of Te Whānau-ā-Apanui descent.

The community of Te Whānau-ā-Apanui has been dependant on the natural environment for food and resources for many generations. Even in recent times, fishing and hunting to supplement food stores is common. Climate change could have a significant impact on Te Whānau-ā-Apanui, making issues of community resilience particularly important.

By understanding and anticipating weather and climate changes, Te Whānau-ā-Apanui knows what to expect, can plan effectively for change and make important decisions. However, with change comes the need for adaptation and in order to adapt, it is valuable for Te Whānau-ā-Apanui to record and benchmark what they currently know.

MĀORI ENVIRONMENTAL KNOWLEDGE

For this case study, weather is described as the state of the atmosphere at a specific time. It is the short-term variations in the atmosphere, as opposed to the long-term, climatic changes like global warming. Weather is usually described using terms like sunshine, cloudiness, humidity, rainfall, temperature, wind, and visibility (www.niwa.co.nz). Over time, Te Whānau-ā-Apanui (and other iwi) have used oral histories, waiata (songs), purākau (narrative), pakiwaitara (stories), mōteatea (laments) and kōrero no tua whakarere (family histories), to pass on their understanding of the weather.

"Climate change" is a phrase used to describe changing climate patterns that:

- can be attributed to human activity that alters the earth's atmosphere; or
- are beyond natural climate variations observed over comparable time periods.

Te Whānau-ā-Apanui have seen changes in their environmental indicators and over time this has resulted in anecdotal evidence that not only are weather patterns changing but the climate has also changed in their rohe. This has meant that the Māori environmental knowledge is also changing and this guides how Te Whānau-ā-Apanui fish and gather foods in their traditional mahinga kai (food gathering areas), what they pass on to their mokopuna (grandchildren), where they grow their food and how to maintain and protect their rongoā (Māori medicine).

There are pressures on this information. Much has been lost due to a range of factors including colonisation, cultural assimilation and urbanisation. One of the important roles of this research was to record the traditions of the iwi in another method, outside of the oral history. This can assist future generations to better understand climate change and in turn assist the iwi to effectively adapt.

To guide this research, Te Kūwaha believed that there were three key strands of knowledge that could be gained through the project.

1. The naming and classification of local weather and climate phenomena;
2. The oral recording of weather and climate based events and trends;
3. The forecasting of weather and climate based environmental indicators.

STAGE ONE – KAUMATUA CONSULTATION

The first step involved kaumātua being invited to discuss the use of Te Reo Māori (the Māori language) in the naming of climate phenomena. Te Whānau-ā-Apanui have named many of their local weather phenomena. For example, the winds, their style and direction were all given names and therefore a place within traditional and contemporary language use.

Names were also provided for cloud formations, the diverse types of rainfall and the Te Whānau-ā-Apanui view that there are six seasons that characterise their local climate. These indicators have always provided guidance as to when to go out and collect kai moana (food from the sea) for Te Whānau-ā-Apanui. They have provided warnings of weather and the iwi have long heeded the signs to avoid the sea and rivers during certain times for the safety of the gatherer. These indicators still provide warnings and this environmental knowledge can be passed down through oral histories to support environmental restoration programmes.

Table 1 is an example of the information gathered and outlines the words used to identify clouds.

TABLE ONE: LOCAL CLOUD TERMINOLOGY USED BY TE WHĀNAU-Ā-APANUI

KUPU MĀORI (MĀORI WORD)	ENGLISH EQUIVALENT
He-ao-te-rangi-ka-uhia	Cloud covered sky
Taipuapua-o-te-rangi	Thick clouds in rounded white masses (cumulus)
Purei-kohu	Small floating clouds in patches
Pūrehurehu	Misty clouds lying in small detached portions (cirrus)
Titi-o-te-rangi	Long streaky clouds
Pīpipi-o-te-rangi	Cloud with long drawn out points (stratus)
Taumarumaru	Low hung clouds (overcast)

STAGE TWO – ORAL RECORDING

The second area of discussion centered on the oral recording of weather and climate based events and trends. This is based on the understanding that by passing information down through the generations, a collective understanding amongst the iwi, hapū and whānau develops around large and small scale events, providing an understanding of trends over time and a view of change.

Te Whānau-ā-Apanui recognises that these indicators are changing and that they need to re-assess the way in which they use and understand their traditional indicators. One of the most noticeable changes is a reduction in the occurrence of kōpaka (frosts). Other changes discussed include how the early flowering of plants and trees has influenced the correct timing for planting crops, which is reliant on the rohe (tribal area), the soil, the timing and the variation of the season and the weather.

A statement from Grace Kemara reflects this:

"The trees are flowering much earlier now and they don't tell us what they used to. This might be a result of climate change".

G. Kemara 25/05/2005

(In King, D; Skipper, A; Tawhai, WB (2008) "Māori Environmental knowledge of local weather and climate change in Aotearoa – New Zealand"; *Climatic Change*, vol 90; pp 385-409)

The holistic view of the iwi finds that many factors are intertwined and are creating cumulative negative impacts on the environment.

Further discussions reviewed the frequency and severity of storms and flood events. Te Whānau-ā-Apanui believe that these phenomena have increased and this is having a negative impact on kai production and collection, and wāhi tūpuna (sites of significance) specifically urupā (burial sites) located on coastal areas.

Te Whānau-ā-Apanui elders describe this time as a period when the natural environment is increasingly threatened. The holistic view of the iwi finds that many factors are intertwined and are creating cumulative negative impacts on the environment.

Extreme events have also been recorded in oral history, for example, a flash flood in 1900 that claimed the lives of children (from Omaio School) and two adults while trying to cross the Motu River in a canoe. Several local Māori changed their names to reflect this tragic event, for example, Mere Pita changed her first name to Matemoana meaning "deadly water" (King *et al*, 2008 pp 398).

These events hold an important place in the tribal memory of Māori - they are retained to warn others of the causes and to remember the people of the times, as well as cautioning others of the nature of local areas. They also provide important information as to large-scale events in iwi history.

WEATHER FORECASTING USING ENVIRONMENTAL INDICATORS

The final focus of the research was the forecasting of weather and climate using environmental indicators. These indicators were important traditionally as they reflect how all things are connected and the way in which Māori relate to their environment. By understanding one component, Māori were able to link that knowledge to how the connected components would then react – for example, connecting the flowering of plants or trees, with growing times for crops.

Table 2 identifies a range of the collected weather and climate indicators.

These environmental indicators have provided guidance to local iwi about when to plant foods or harvest them, to gather kai moana (sea food) and to leave areas to regenerate. This information has supported a subsistence lifestyle that still exists to a certain extent today. Through this work, Te Whānau-ā-Apanui can now recognise if the crops they used to grow or gather are no longer in abundance, or may have slightly different growing times. This information will help direct their activities in the future in order to maintain or change their crops.

BENEFITS OF THE RESEARCH

The information gathered through this research was published and disseminated widely amongst Te Whānau-ā-Apanui through presentations and educational materials. This included a poster describing these indicators which was published through NIWA.

This research can be a catalyst for future restoration programmes particularly in regards to the retention of mātauranga Māori. By promoting projects such as this one, the relationship between the natural world and iwi can be re-invigorated. The closer the relationship, the easier it will be for tangata whenua to read and understand change early, adding to their ability to be more resilient to the impacts of climate change.

With this data Te Whānau-ā-Apanui have vastly improved information on which to base their future decisions. This research has provided a record of tribal history, events and their impacts particularly around hazard management. The information can be used to guide locations of new homes so as to avoid areas noted as previously being affected by floods. Where there is an increase in these events over time, the research can provide ongoing trends, if there are changes.

Te Whānau-ā-Apanui has recovered a great amount of information in a form that can be retained for the future. The project greatly assisted in building a comprehensive store of knowledge on climate change from a Māori world view. The research concluded that the "local classification models can contribute to western scientific understanding of meteorology and climate by providing new ways of seeing local environmental phenomena"(King *et al*, 2008 pp 401). This has also led

TABLE 2: WEATHER AND CLIMATE INDICATORS FROM TE WHĀNAU-Ā-APANUI-BAY OF PLENTY

NAME	INDICATOR	EXPECTED OUTCOME
Tihirau (Cape Runaway)	The clouds in the sky above Tihirau	Approaching rainfall or storm
Ngā Ngaru (Waves)	The booming sound of waves across the land	A storm is coming
	The sound of waves hitting local rocks	Rough or calm weather conditions are expected
Poanganga (Clematis)	Periodic blooming	A warm season lies ahead with gentle breezes
Whakaari (White Island)	The plume lies to the left	Rainfall is expected
	The plume stretched intact across the horizon	Fair weather is expected

to a wider understanding of climate related issues and adaptation opportunities for all Māori.

Iwi based studies about the use and credibility of local environmental indicators as well as relevant scientific data to support this information will be essential moving into the future. The contribution that Māori environmental knowledge can make to the wider western science environment has yet to be fully understood and appreciated. However these studies add to both mātauranga Māori and a non-Māori view on climate and weather.

Te Whānau-ā-Apanui have been engaged in a project that has added value by building on a store of knowledge that has been passed down through countless generations. Through this research the iwi can prepare effectively using their own mātauranga Māori in forums natural to them. Subtle changes in indicators help Te Whānau-ā-Apanui adapt to climate change by altering hazard management and crop preparation practices.

THIS IS ONE IN A SERIES OF CASE STUDIES CALLED ADAPTING TO A CHANGING CLIMATE

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FOR MORE INFORMATION

- King, D; Skipper, A; Tawhai, WB (2008) Māori Environmental knowledge of local weather and climate change in Aotearoa – New Zealand; *Climatic Change*, vol 90; pp 385-409. Available at **www.springerlink.com**
- Federation of Māori Authorities **www.foma.co.nz**
- Te Puni Kokiri **www.tpk.govt.nz**
- Taupō District Council **www.taupodc.govt.nz**
- Environment Waikato **www.ew.govt.nz**
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