

Appendix 29: Monitoring and Evaluation

1. Introduction

Monitoring and evaluation of actions to restore and protect the health and wellbeing of the Waikato River are essential for:

- Measuring success: Assessing progress of restorative actions towards achieving a healthy and well Waikato River.
- Supporting adaptive management: Ongoing reviews of progress allow strategies to be adapted to meet targets if the expected progress does not occur.
- Providing accountability: The Waikato River Authority will need to provide transparency and accountability for actions it chooses to fund (in its role as trustee for the Waikato River Clean-up Trust).
- Engaging communities: Community-based environmental monitoring programmes assist individuals, community groups and organisations to actively participate in caring for their surrounding environmental resources and assets.

Monitoring and evaluation underpin the Report Cards that are discussed in Appendix 30: Report Cards.

1.1 Monitoring and evaluation as stated in Te Ture Whaimana

The development and implementation of a Cultural Health Index (CHI) for the Waikato River is clearly outlined in Te Ture Whaimana – the Vision and Strategy for the Waikato River. To date, the CHI has only been applied to wadeable streams (Tipa and Tierney, 2006), so the approach will probably require modification for application to the large main stem sections of the Waikato and its lakes. Te Ture Whaimana Strategies 2–4 are to:

- Establish what the current health status of the Waikato River is by utilising maatauranga Maaori (Maaori knowledge) and latest available scientific methods.
- Develop targets for improving the health and wellbeing of the Waikato River by utilising maatauranga Maaori and latest available scientific methods.
- Develop and implement a programme of action to achieve the targets for improving the health and wellbeing of the Waikato River.

The methods listed in Te Ture Whaimana to implement Strategies 2–4 within an eight year timeframe include (but are not limited to):

- Develop and implement a Cultural Health Index (CHI) for the Waikato River to understand environmental matters and the mauri (life force) of the Waikato River. The CHI will incorporate maatauranga Maaori and latest available scientific methods to direct and prioritise resources for restoring and protecting the health and wellbeing of the Waikato River.
- Monitoring undertaken by statutory agencies and other stakeholders to determine if there are deficiencies in their information, including an analysis of adverse cumulative effects, required to understand threats to the health and wellbeing of the Waikato River.

1.2 Community-based environmental monitoring

The United Nations Environment Programme stresses public participation as an essential component of sustainability (Au et al., 2000). Community-based environmental monitoring programmes assist individuals, community groups and organisations to actively participate in caring for their surrounding environmental resources and assets (e.g., India¹, Canada² and New Zealand^{3,4,5}). Such initiatives provide the coordination, networks, knowledge, training and support required by communities to monitor, track and respond to issues of common concern (Conrad and Daoust, 2008; McKenzie et al., 2000; Whitelaw et al., 2003).

Community involvement regarding the identification of relevant indicators to monitor progress towards environmental management goals is increasingly recognised, within literature, by academics and environmental managers alike as an important component of sustainable and effective management (Fraser et al., 2006; Jollands and Harmsworth, 2006; Leach et al., 1999; Reed et al., 2008; Whitelaw et al., 2003). A shift towards participatory ‘bottom-up’ approaches combined with conventional ‘top-down’ systems is evident internationally. This is largely due to the failure of ‘top-down’ systems to realise sustainable environment management (Fraser et al., 2006; Sharpe and Conrad, 2006).

In an assessment of participatory processes (i.e., bottom-up approaches) on indicator identification and environmental management, Fraser et al., (2006) drew three key conclusions that are relevant to the Study. They are:

- That the process of engaging people to identify locally relevant indicators not only provided valuable databases for making management decisions, but also an opportunity for community empowerment and education that current conventional approaches fail to provide.

¹ <http://www.sipcotcuddalore.com>

² <http://www.envnetwork.smu.ca>

³ <http://www.waicare.org.nz/site/main/about-wai-care.aspx>

⁴ http://nwp.rsnz.org/content/Pollution_Detectives/projects_pollutiondetective.htm

⁵ <http://www.niwa.co.nz/our-science/oceans/publications/all/cou/2007-16/life>

- Multi-stakeholder processes must formally feed into decision-making forums or they run the risk of being viewed as irrelevant by policy makers and stakeholders.
- Since ecological boundaries rarely meet with political jurisdictions, it is necessary to be flexible when choosing the scale at which monitoring and decision making occurs.

1.3 Cultural Health Index for Maaori

Part 2 of the Resource Management Act (particularly Sections 5, 6(e), 7(a) and 8) refers to the relationship Maaori have with the environment. Resource management agencies are required to recognise and provide for the culture and traditions of Maaori relating to ancestral lands, water, sites, waahi tapu (sacred sites) and other taonga (treasured areas). They must also have particular regard to kaitiakitanga (guardianship) and take into account the principles of the Treaty of Waitangi. Thus, as a Treaty partner, Maaori interests are recognised as being distinct from those of other stakeholders. Given these statutory provisions, Maaori expect resource managers to recognise and provide for their cultural beliefs and practices and that they are included and actively involved in environmental management processes (Tipa and Teirney, 2006).

Although many resource management agencies attempt to recognise cultural practices, many struggle with the intangible or metaphysical aspects of Maaori values; thus, finding it difficult to understand what these represent and how to adequately or appropriately recognise and provide for them (Tipa and Teirney, 2003). Tipa and Teirney (2003 and 2006) have developed the Cultural Health Index (CHI) to facilitate the participation of iwi (tribes) in land and water management processes and decision making. Utilising tools such as the CHI recognises that only Maaori are able to provide the clarity needed by resource managers when dealing with Maaori spiritual and cultural issues and, significantly, supports application of the Treaty of Waitangi principle that *“the spiritual and cultural significance of a freshwater resource to Maaori can only be determined by the taangata whenua who have traditional rights over the river”* (Ministry for the Environment, 1987; Tipa and Teirney, 2003). The CHI responds to these beliefs by enabling Maaori to identify waters of special significance and use an assessment tool which is grounded in Maaori beliefs and values to ensure cultural data informs management of that taonga (Tipa and Teirney, 2006).

The Cultural Health Index articulates cultural values, assesses the state of the environment from a cultural perspective, and assists with establishing a role for Maaori in environmental monitoring. However, Maaori also need to know that contemporary resource managers support the use of tools such as the CHI, recognise the validity of the data collected and will respond to the information provided (Tipa and Teirney, 2003). The CHI provides information that can be used as the basis for discussions between taangata whenua (people of the land) and territorial authorities

or industry. To appreciate the detail within the CHI scores and, therefore, the issues in greater detail, resource managers and taangata whenua need to work together. By analysing the scores of the index, taangata whenua are able to diagnose issues, decide on priorities and determine the remedial actions they see as necessary to restore or enhance the cultural values of the site. The CHI also provides the ability to monitor changes and improvements after restoration has been carried out at a stream site (Tipa and Teirney, 2006).

1.4 Importance of existing monitoring programmes and additions to support adaptive management

Existing monitoring programmes will play a particularly valuable role in identifying responses of the conventional indicators that they cover because they provide long-term 'before change' datasets against which response can be measured. Notable amongst these are programmes run by NIWA and Environment Waikato that provide long-term time-series of flows, water quality^{6,7}, macroinvertebrate communities and habitat in wadeable streams⁸, lake condition (LakeSPI)⁹, and riparian fencing and vegetation¹⁰. Continued monitoring of responses to integrated catchment management at Whatawhata (monitoring established in 1995 with changes implemented in 2001; e.g., Dodd et al., 2008; Quinn et al., 2009) is also likely to continue to provide valuable insights that can be applied in adaptive management elsewhere in the Waikato.

There is also a need to expand on this current monitoring, and that proposed using the CHI, to support the use of adaptive management in the Waikato River restoration. This will involve additional targeted monitoring to evaluate responses to restoration actions of the biophysical systems (e.g., nutrient leaching rates, pathogen retention in wetlands and riparian buffers, stream hydrology) and social systems (e.g., changes in people's understanding, attitudes and practices). We recommend developing a series of "restoration practice monitoring catchments", adapting the model used in the Whatawhata ICM project (Dodd et al., 2008) and the Dairy Best Practice Catchments (Wilcock et al., 2007) where a whole systems approach is taken to monitoring the farm system, practices, economics, performance of mitigations and stream responses in areas with contrasting geographic settings.

⁶Beard (2010) <http://www.ew.govt.nz/Publications/Technical-Reports/TR-201011/>

⁷Ballantine and Davies-Colley (2009) <http://www.mfe.govt.nz/publications/water/water-quality-trends-1989-2007/html/index.html>

⁸Collier and Hamer (2010) <http://www.ew.govt.nz/Publications/Technical-Reports/TR-201004/>

⁹Edwards et al., (2009) <http://www.ew.govt.nz/Publications/Technical-Reports/TR0914/>

¹⁰Storey (2010) <http://www.ew.govt.nz/Publications/Technical-Reports/TR-201007/>

2. A description of the prioritised action(s)

The scope of this Study includes providing guidance on how to develop a monitoring programme to support the restoration of the health and wellbeing of the Waikato River. Monitoring is discussed in some detail in Section 8. Specific monitoring actions include:

- a. The development of Cultural Health Indices and monitoring programmes.
- b. Creating and maintaining a repository of environmental monitoring equipment that can be used by volunteer monitors.
- c. Developing regional or centralised database(s) for storing environmental monitoring and background data for use by each iwi, including a dedicated person managing and supporting it.
- d. Supporting new targeted monitoring of biophysical, economic and social responses to restoration actions at various spatial and temporal scales to complement CHI monitoring and existing monitoring programmes by Environment Waikato, local authorities, Crown Research Institutes and dischargers.
- e. Establishing a system of regular Report Cards to monitor and communicate the progress of restoration activities.

2.1 A Cultural Health Index for the five river iwi

Tipa and Teirney (2006) provide guidelines outlining how to identify areas for evaluation, setting up a CHI programme and the collection and analysis of data. It is important to note that thus far this index has only been utilised in streams and rivers (Taranaki District Council, 2007; Tipa and Teirney, 2003 and 2006; Young et al., 2008) and further research will be required to extend it to other areas (as part of Action A). Each river iwi will need to develop their own CHI to assess the cultural and biological health of a stream or catchment of their choosing. This includes:

- Development of appropriate indicators to be included in the CHI framework.
- Design and implementation of monitoring programmes (e.g., monitoring specific values and at specific sites of importance).
- Databases (e.g., Web-based for increased accessibility) for each iwi to securely store the CHI monitoring information over the long-term.

ACTION A:

The development and implementation of a Cultural Health Index (CHI) for the Waikato River includes the following components:

- The development of cultural indicators by each river iwi.
- Development and implementation of cultural health monitoring programmes by each river iwi.

Māori have already begun developing indicator and monitoring tools, mainly in response to the Resource Management Act (RMA) and as part of the Ministry for the Environment environmental indicator programme (Taranaki District Council, 2007; Tipa and Teirney, 2002, 2003 and 2006; Townsend et al., 2004; Young et al., 2008). A large number of potential indicators that could be used by individual iwi when they develop their own CHI's for the Waikato River were captured during discussions at the hui (meetings) (for more information see Appendix A at the end of this paper). These lists of indicators provide a valuable resource to facilitate the development of Cultural Health Indices by the five river iwi.

The majority of these indicators were unable to be scored by the Study team at this time because the relevant information does not yet exist, but they are identified in the sample Report Cards provided in Appendix 30: Report Cards to highlight key knowledge gaps. This is not unique to this Study and a similar approach was undertaken in an assessment of wellbeing that was used to engage communities in forestry planning in western Canada (Fraser et al., 2006).

As mentioned previously, it is for the five river iwi to identify the range of cultural indices that they want to see developed that are consistent with their values and aspirations. It is unrealistic to expect one CHI to be developed that is applicable in its entirety to all five iwi. But it is essential that cultural indices are integrated with, and reported alongside, scientific and economic data in the Report Cards developed, otherwise holistic assessments of the health and wellbeing of the Waikato River will not be achieved. It is, therefore, recommended that combinations of the indicators presented in Appendix A (at the end of this paper) be packaged together to provide a subset of cultural indices that are assessed by all five river iwi. It is suggested that this agreed subset of cultural indices (approved by all five river iwi) are then monitored and the information provided to the Waikato River Authority for collation into the Aspiration Report Cards (see Section 8). The five river iwi may also choose to monitor more cultural indices than is supplied to the Waikato River Authority as they see fit.

Three potential cultural indices are presented below. These are merely examples for illustrative purposes, to show how this tool could be developed and used by the five river iwi and incorporated into the Aspiration Report Cards.

For example, utilising Tipa and Teirney’s (2006) CHI framework and the list of potential indicators provided by the five river iwi (see Appendix A at the end of this paper), a cultural recreational index could be constructed by iwi to monitor the progress of the restoration actions in realising Aspiration 6 – Swimming and Boating, (i.e., improving the use of the Waikato River and its lakes, wetlands and tributaries for recreational purposes).

A cultural recreational index could comprise the following indicators, or selection of:

Cultural recreation index
Examples of indicators that could be incorporated
Iwi satisfaction regarding access to boat ramps, their location and condition.
Number of negotiated access agreements over private land.
Number of safe swimming sites.
Satisfaction of iwi users in relation to waka ama/waka taua (outrigger canoe/war canoe) with (a) flow levels, (b) ability to enter and exit water safely, (c) level of weed and algae present and (d) water quality.
Satisfaction of iwi users with experience given presence of invasive species.
Satisfaction of whaanau (family) and hapuu (sub-tribes) with protection of key sites/river reaches.
Satisfaction of iwi with ability to use preferred skills, practices and methods when interacting with the river.
Use of the Waikato River for waka ama.

The ability of the river to sustain taonga species is vitally important if the health and wellbeing of the Waikato River is to be restored (Aspiration 11 – Taonga species). A possible index to assess the health of taonga species from the perspective of taangata whenua could comprise the following measures, or selection of, as part of a cultural species index’:

Cultural species index
Examples of indicators that could be incorporated
Presence/absence of valued species (e.g., kai (food), cultural materials and other taonga species).
Number of taonga species to be in gradual decline, threatened or endangered.
Cultural materials (fit for purpose) available at appropriate sites.
Yes/No having to purchase customary kai species (renowned species) for marae (sacred meeting place).
Level of contaminants and food safety.
Number of waterbodies without pest fish, numbers per kilogram of pest fish removed.
Number (and area) of new reserves established.
Number of koohanga (nurseries) for valued species that are protected/restored/created e.g., proportion of whitebait spawning sites in the Waikato River that are protected compared to agreed historical baseline.
Percentage of the customary rights exercised (e.g., permits granted).

Some participants at the consultation hui held during the Study prioritised increasing the participation and engagement of their members in the restoration of the Waikato River (Aspiration 2) and may therefore benefit from development of a cultural participation index which could comprise the following indicators, or selection of:

Cultural participation index
Examples of indicators that could be incorporated
Number of iwi commissioners: (a) trained, and (b) practicing.
Number of whaanau engaging in cultural activities at specific sites (e.g., waananga, programmes).
Number of new monitoring sites introduced for cultural or Report Card indices.
Number of hapuu and iwi environmental officers.
Extent of whaanau and hapuu monitoring of restoration activities.
Extent of iwi participation in restoration activities on public and private land.
Number of whaanau and hapuu members engaged as volunteers in restoration activities.
Number of whaanau and hapuu members engaged as employees in restoration activities.
Number of RMA Section 33 transfers ¹¹ (ratio of approved versus total applications).

¹¹ Section 33 allows a local authority to transfer any one or more of its functions, powers or duties under the Act to any public authority (including any iwi authority) set up for the purposes of Section 80 (preparation, implementation and administration of combined regional and district documents), subject to certain conditions.

Cultural participation index (cont.)
Examples of indicators that could be incorporated
Whaanau, hapuu and iwi are satisfied with their ability to participate and influence decisions and achieve outcomes benefitting the river.
Total number of restoration projects initiated compared to number of programmes that are iwi initiated.
Increase in Maaori/cultural specific degrees for freshwater and aquatic sciences.
Increase in funding for marae-based restoration activities.

2.2 Environmental monitoring equipment for communities

In Nova Scotia, the Community-Based Environmental Monitoring Network has developed partnerships with other organisations to create the Environmental Stewardship Equipment Bank. The goal of this initiative is to provide equipment for environmental monitoring to any person who requires it but would otherwise not be able to access it. The Community-Based Environmental Monitoring Network provides this service to help augment monitoring costs and enable more community groups and individuals to be involved in environmental monitoring.

To assist individuals, community groups and organisations to actively participate in the monitoring and evaluation of the health and wellbeing of the Waikato River, a proposed action is the formation of repositories of monitoring equipment which would be available to iwi and the wider community. These repositories would be maintained by the Waikato River Authority and borrowed by volunteer monitors to:

- Enable the collection of monitoring information for use in Report Card assessments.
- Increase engagement of in the restoration of the health and wellbeing of the Waikato River.

ACTION B:
<ul style="list-style-type: none"> • Develop and maintain a repository of environmental monitoring equipment that can be borrowed by volunteer monitors to meet report card assessments required for funded projects and general state monitoring at a variety of scales.

2.3 Environmental monitoring database network

The development of databases (Web-based for increased accessibility) for each river iwi to securely store the CHI data and other environmental monitoring information collected over time will be crucial to supporting the implementation of monitoring programmes such as the CHI (see Action D). Training workshops will also need to be held for iwi members who are responsible for the management and maintenance of these databases.

A further action includes the implementation of a centralised database that is able to securely hold the information submitted by the five river iwi, volunteer groups and local authorities. It is recommended that this is managed by a dedicated person within the Waikato River Authority.

ACTION C:
Database for storing environmental monitoring and background data: <ul style="list-style-type: none">• Database for storing environmental monitoring and background data for use by each iwi.• Create centralised database, coordinated by a dedicated person managing and supporting it.

2.4 Expanded monitoring to support adaptive management

Considerable additional monitoring of the biophysical, economic and social responses to restoration actions will be required to confirm what works, what unforeseen consequences occur and how to improve/fine tune actions in an adaptive, learning cycle to get the best return on investment. This monitoring will complement the iwi-based CHI and build on existing established monitoring programmes that provide long-term records. The nature of the monitoring will be determined by the actions chosen by the Waikato River Authority .

ACTION D:
Monitoring programmes developed to determine factors influencing the effectiveness of key restoration actions. These will include biophysical, economic and social aspects, as appropriate.

3. Action Report Card – monitoring and evaluation

Action Report Cards summarise monitoring information that measures the success of a single action or a number of closely related actions (see Section 8). To enable stakeholders to track the development and implementation of monitoring and evaluation actions the following targets, indicators and scores for the current state of the proposed actions are recommended:

Monitoring and evaluation				
Action	Measure or indicator	Target	Current state	Score
A	Implementation of cultural health monitoring programmes by each river iwi	5	1	E
B	Repository of equipment are available and being used by iwi and community groups for monitoring	10	2.5	D
C	Iwi databases established and contributions held by a centralised database for Waikato River monitoring data	6	2	C-
D	Implementation of targeted monitoring programmes on the effects of restoration actions to support adaptive management	15	3	D

3.1 Current state

In the table above the current state of these actions has been preliminarily scored based on the information gathered as part of this Study:

- **Action A:** The current state of this action is scored as an E (i.e., very poor). While it is recognised by the Study team that some river iwi are engaged in developing cultural health indicators and associated monitoring programmes, this is not common to all five river iwi and therefore this action has not yet been implemented in a coordinated manner as set by the targets outlined in Te Ture Whaimana.
- **Action B:** The state of this action is currently scored as a D (i.e., poor). This score is to reflect that although some monitoring equipment does exist and is being used by community monitoring and restoration groups (e.g., the Stream Health Monitoring and Assessment Kit (SHMAK)), its use and knowledge of its availability is disparate and uncoordinated. The target for the number of monitoring equipment repositories has been set at total of 10 (one for each iwi and five that are available throughout the catchment for community groups involved in restoration activities).
- **Action C:** The state of this action is currently scored as a C- (i.e., fair). This score is to reflect the existence of environmental information that is currently collected and managed by the local authorities within the Waikato River catchment (e.g., Environment Waikato). However, the ultimate target is for each river iwi to have a database to securely store data that is collected as part of their cultural health monitoring programmes, a selection of which is provided to a centralised database for the purpose of reporting restoration progress.

4. How will the action(s) be accomplished?

The Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 and Ngati Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Bill outlines co-management arrangements that are to be implemented including: (1) a mandatory Integrated River Management Plan within three years, (2) an optional Iwi Environmental Plan, and (3) mandatory Joint Management Agreements with local authorities within 18 months. The Joint Management Agreements provide for the local authority and Waikato River Authority to work together in carrying out a number of duties and functions. In relation to monitoring, these joint management agreements include meeting no less than twice per year to:

- Discuss and agree on priorities for monitoring, methods for and extent of the monitoring and discuss the potential for the river iwi to participate in the monitoring.
- Discuss appropriate responses to address the outcomes of the monitoring, including the potential for review of RMA planning documents and enforcement under the RMA including criteria for commencement of prosecutions, applications for enforcement orders, the service of abatement notices and the service of infringement notices.
- Agree appropriate procedures for reporting back to iwi on the enforcement actions taken.
- Discuss and agree on role of the river iwi Trusts in a five yearly review in Section 35(2A) of the RMA.
- Discuss potential for persons to be nominated by the river iwi Trusts to participate in enforcement action under the RMA.

In terms of monitoring, the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 and the Ngati Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Bill also establishes and grants functions and powers to the Waikato River Authority to:

- Monitor the carrying out, effectiveness and achievement of the Waikato River Authority.
- Monitor the implementation, effectiveness and achievement of Te Ture Whaimana, including any targets and methods.
- Monitor the implementation, effectiveness and achievement of clean-up initiatives funded by the Waikato River Clean-up Trust.
- Report every five years on the results of the monitoring.

5. Where in the Waikato River catchment should the actions occur?

The development and implementation of a CHI for the Waikato River is clearly outlined in Te Ture Whaimana. The targets listed in Te Ture Whaimana in regards to the timeframe and extent of the Waikato River catchment to be covered by this initiative is:

- Within two years: 25 percent of the Waikato River has been incorporated within a CHI monitoring programme.
- Within four years: The CHI has been incorporated within the monitoring regime for the Waikato River.
- Within eight years: 100 percent of the Waikato River is subject to the Waikato River CHI monitoring programme.

6. What is the cost of the action(s)?

The estimated costs of the proposed monitoring and evaluation actions include:

Action	Description	Set up costs	Ongoing costs (i.e., after set up)
A	Development of river iwi-specific cultural indicators	\$250k/iwi	
	Implementation of cultural indicator monitoring programmes by each river iwi	\$500k total	\$100k/iwi/year
B	Develop and maintain a repository of quality equipment for environmental monitoring	\$300k total	\$15k/year
C	Develop a database appropriate for storing environmental monitoring data collected by each river iwi	\$150k	--
	Database training (workshop) for river iwi representatives	\$30k	--
	Develop a centralised database, that is managed and supported by a dedicated person	\$120k	\$50k/year
D	Implementation of targeted monitoring programmes on the effects of restoration actions to support adaptive management	\$1000k	\$1500k/year

7. Who could do it and how long would it take?

The timeframes for the implementation of the CHI by the five river iwi are clearly outlined in Te Ture Whaimana (see Section 6 above). The actions proposed here require the involvement and input from all iwi, the Waikato River Authority, Environment Waikato and LA's. There is also potential to involve Crown Research Institutes in specific aspects of the additional monitoring to support adaptive

management. Monitoring and evaluation should be an ongoing activity throughout the restoration starting before actions are implemented (e.g., Parkyn et al., 2010).

8. What are the interactions with other activities (co-benefits, drawbacks)?

The actions proposed here will increase the involvement and participation of iwi and the wider Waikato community in monitoring and evaluating the health and wellbeing of the Waikato River. These outcomes will contribute to the restoration of Aspiration 1 – Holism “*That the management of the Waikato River and its lakes, wetlands and tributaries to protect their health and wellbeing is conducted in a holistic, integrated way*” and Aspiration 2 – Engagement “*That people feel engaged with the Waikato River and its lakes, wetlands and tributaries, and processes, initiatives or actions to restore and protect their health and wellbeing.*”

9. An analysis of uncertainties and information gaps

The five river iwi need to know that resource managers support the use of tools such as the CHI, recognise the validity of the data collected and will respond to the information provided (Tipa and Teirney, 2003). Some of this uncertainty will be addressed through the implementation of the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 and the Ngati Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Bill. Intellectual property agreements between the river iwi and local authorities may be required to ensure that the information supplied by iwi is used only for the purposes that are jointly agreed upon.

10. References

- Au, J.; Bagchi, P.; Chen, B.; Martinez, R.; Dudley, S.A.; Sorger, G.J. (2000). Methodology for public monitoring of total coliforms, *Escherichia coli*, and toxicity in waterways by Canadian high school students. *Journal of Environmental Management* 58: 213–230.
- Conrad, C.T.; Daoust, T. (2008). Community-based monitoring frameworks: Increasing the effectiveness of environmental stewardship. *Environmental Management* 41: 358–366.
- Dodd, M.B.; Quinn, J.M.; Thorrold, B.S.; Parminter, T.G.; Wedderburn, M.E. (2008). Improving the economic and environmental performance of a New Zealand hill country farm catchment: 3. Short term outcomes of land use change. *New Zealand Journal of Agricultural Research* 53: 155–169.
- Fraser, E.D.G.; Dougill, A.J.; Mabee, W.E.; Reed, M.; McAlpine, P. (2006). Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable

- environmental management. *Journal of Environmental Management* 78: 114–127.
- Harmsworth, G. (2002). Coordinated Monitoring of New Zealand Wetlands, Phase Two, Goal 2: Maori environmental performance indicators for wetland condition and trend. Report prepared for Lincoln University. Landcare Research, Palmerston North. 66 p.
- Jollands, N.; Harmsworth, G. (2006). Participation of indigenous groups in sustainable development and monitoring: rationale and examples from New Zealand. *Ecological Economics* 62: 716–726.
- Leach, M.; Mearns, R.; Scoones, I. (1999). Environmental entitlements: Dynamics and institutions in community-based natural resource management. *World Development* 27(2): 225–247.
- McKenzie, L.J.; Lee Long, W.J.; Coles, R.G.; Roder, C.A. (2000). Seagrass-watch: Community based monitoring of seagrass resources. *Biol. Mar. Medit.* 7(2): 393–396.
- Parkyn, S.; Collier, K.; Clapcott, J.; David, B.; Davies-Colley, R.; Matheson, F.; Quinn, J.; Shaw, W.; Storey, R. (2010). The restoration indicator toolkit: Indicators for monitoring the ecological success of stream restoration. NIWA, Hamilton. 132 p.
- Pauling, C.; Lenihan, T.M.; Rupene, M.; Tirikane-Nash, N.; Couch, R. (2007). State of the Takiwā: Te Ahuatanga o Te Ihutai: Cultural Health Assessment of the Avon-Heathcote Estuary and its Catchment.
- Pauling, C. (2008). Ngā Wai Pounamu: Cultural Health Assessment of South Island Waterways. Paper presented at the Environmental Defence Society Conference: Conflict in Paradise: the Transformation of Rural New Zealand. June 2008. 15 p.
- Pauling, C.; Arnold, J. (2009). Cultural Health of the Lake. In: Te Waihora/Lake Ellesmere: State of the Lake and Future Management. Hughey, K.F.D.; Taylor, K.J.W. (eds). EOS Ecology, Christchurch. 77–84.
- Quinn, J.M.; Croker, G.F.; Smith, B.J.; Bellingham, M.A. (2009). Integrated catchment management effects on runoff, habitat, instream vegetation and macroinvertebrates in Waikato, New Zealand, hill-country streams. *New Zealand Journal of Marine and Freshwater Research* 43(3): 775–802.
- Reed, M.S.; Dougill, A.J.; Baker, T.R. (2008). Participatory indicator development: what can ecologists and local communities learn from each other. *Ecological Applications* 18: 1253–1269.

- Sharpe, A.; Conrad, C. (2006). Community based ecological monitoring in Nova Scotia: Challenges and opportunities. *Environmental Monitoring and Assessment* 113: 395–409.
- Storey, R. (2010). Riparian characteristics of pastoral streams in the Waikato region, 2002 and 2007. *Environment Waikato Technical Report 2010-07*. 57 p.
- Taranaki District Council (TDC). (2007). A cultural health index for Reservoir Creek. Indicators for recognising and expressing Tangata Whenua ki Whakatu values. June 2007. 35 p.
- Tipa, G. (1999). Taieri River Case Study. *Technical Paper No. 58*. Ministry for the Environment, Wellington.
- Tipa, G.; Tierney, L. (2002). Mauri and mahinga kai indicators project: developing a Cultural Health Index. Unpublished report. Tipa and Associates, Dunedin.
- Tipa, G.; Tierney, L. (2003). A Cultural Health Index for streams and waterways: Indicators for recognising and expressing Māori values. ME475, June 2003. Ministry for the Environment, Wellington.
- Tipa, G.; Tierney, L. (2006). Using the Cultural Health Index: How to assess the health of streams and waterways. ME711, February 2006. Ministry for the Environment, Wellington.
- Tipa, G.; Tierney, L. (2006). A Cultural Health Index for streams and waterways: A tool for nationwide use. ME710, April 2006. Ministry for the Environment, Wellington.
- Townsend, C.R.; Tipa, G.; Tierney, L.D.; Niyogi, D.K. (2004). Development of a tool to facilitate participation of Maori in the management of stream and river health. *EcoHealth* 1: 184–195.
- Whitelaw, G.S.; Vaughan, H.; Craig, B.; Atkinson, D. (2003). Establishing the Canadian Community Monitoring Network. *Environmental Monitoring and Assessment* 88: 409–418.
- Wilcock, R.J.; Monaghan, R.M.; Thorrold, B.S.; Meredith, A.S.; Betteridge, K.; Duncan, M.J. (2007). Land-water interactions in five contrasting dairying catchments: issues and solutions. *Land Use and Water Resources Research* 7: 2.1–2.10.
- Young, R.; Harmsworth, G.; Walker, D.; James, T. (2008). Linkages between cultural and scientific indicators of river and stream health. *Motueka Integrated Catchment Management (Motueka ICM) Programme Report*. November 2008. 39 p.

11. Appendix A

Types of indicators that could be included by the river iwi in their cultural health indices:

This list of potential indicators was identified during the Study, the majority of which reflect the issues and aspirations that the river iwi identified during the consultation hui held in July/August 2009 and February 2010. They are presented in no particular order of priority.

Examples of indicators that could be incorporated
Iwi satisfaction regarding access to boat ramps, their location and condition.
Number of negotiated access agreements over private land.
Appropriate controls on access are initiated in areas of high risk and sites of significance.
Number of culturally specific sites restored.
Ability to implement and enforce local-based management measures such as raahui (temporary ritual prohibition).
Presence/absence of valued species (kai, cultural materials and taonga species).
Percentage of the customary rights exercised (e.g., permits granted).
Cultural materials (fit for purpose) available at appropriate sites.
Distribution and abundance of valued species compared to historical baseline.
Number of whaanau engaging in cultural activities at specific sites (e.g., waananga, programmes, generational).
Iwi are satisfied that protocols for harvesting customarily important kai species are (a) appropriate and (b) observed.
Yes/no to having to purchase customary kai species (renown species) for marae.
Number of safe swimming sites.
Water quality standard is the food gathering standard.

Examples of indicators that could be incorporated
Satisfaction of iwi users in relation to waka ama/waka taua with (a) flow levels, (b) ability to enter and exit water safely, (c) level of weed and algae present and (d) water quality.
Identified springs/groundwater meet drinking-water standards.
Number of marae that have access to healthy drinking-water.
Number of taonga species in gradual decline, threatened or endangered.
Satisfaction of iwi users with experience given presence of invasive species.
Number of waterbodies without pest fish, numbers per kilogram of pest fish removed.
Number of re-introductions of taonga species.
Number of new monitoring sites introduced for CHI or Report Card indicators.
Increase in hapuu and iwi environmental officers.
Increase in whaanau and hapuu monitoring activities.
Increase in iwi participation in restoration activities on public and private land.
Number of iwi hearings commissioners (a) trained and (b) practicing.
Number of RMA Section 33 transfers (ratio of approved versus total applications).
Number of economic development opportunities initiated by whaanau, hapuu and iwi directly related to the river and/or resources.
Percentage of Maaori lands being used as whaanau, hapuu and iwi desire.
Whaanau, hapuu and iwi are satisfied with their ability to participate and influence decisions and achieve outcomes benefitting the river.
Total number of restoration projects initiated compared to number of programmes that are iwi initiated.
Satisfaction of whaanau and hapuu with protection of key sites/river reaches.
Percentage of cultural materials available and used today compared to historically.
Number of whaanau households that still gather kai and cultural materials.
Number of traditional practices that can be reinstated as a result of restoration activities.
Number or percentage of rangatahi (youth) perceiving species and cultural practices as still relevant and meaningful today.
Whaanau and hapuu are satisfied at the level of protection in place for sites of significance.
Whaanau and hapuu confirm (yes/no) that linkages between key sites/river reaches and other sites in significant cultural landscapes are protected.
Number of damaging activities at or in the vicinity of identified sites of significance.

Examples of indicators that could be incorporated
Number of place names changed at request of iwi.
Number of corrections to incorrect/dislocated place names.
Number of whaanau and hapuu members engaged as volunteers in restoration activities.
Number of whaanau and hapuu members engaged as employees in restoration activities.
Whaanau and hapuu are satisfied at how the river is being treated.
Whaanau and hapuu have a sense of pride in how the river looks.
Whaanau and hapuu believe the river is a healthy environment with which they and communities can interact.
Whaanau and hapuu are satisfied with the nature and extent of publicly available information advising of their association with the river.
Number of programmes in place for transmission of knowledge (e.g., waananga).
Number of iwi participants in each programme.
Number of whaanau who still engage in cultural practices. Percentage of rangatahi engaged in cultural practices.
Traditional sites recorded are restored or have an action plan.
Satisfaction of taangata whenua that range of healthy habitats used in river and along riverbank (e.g., shelter, tuna burrows covered etc.).
Number of koohanga for valued species that are protected/restored/created.
Proportion of whitebait spawning sites in the Waikato River that are protected.
Islands identified by iwi are maintained and protected as islands.
Number (and area) of new reserves established.
Number of regulatory barriers removed (e.g., policies, bylaws, methods, rules removed).
Satisfaction of iwi with ability to use preferred skills, practices, methods when interacting with the river.
Iwi specific flow preferences identified.
Whaanau, hapuu and iwi satisfied at river flow regimes.
Iwi satisfaction with balance of floods/freshes/low flows.
Iwi satisfied that flow variability and changing currents do not pose safety risks.
Area of land (hectares) exposed to frequent flooding (historical compared to today).
Increase in Maaori/cultural specific degrees for freshwater and aquatic sciences.
Increase in funding for marae-based restoration activities.