HAWKE'S BAY
REGIONAL COUNCIL

Hawke's Bay Regional Council Science and Technology Strategy 2015-2025

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Resource Management Group

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1 Introduction

The word science originates from the Latin word "*scire*" which translates to "know". In modern times it has been described as "the intellectual and practice activity encompassing the systematic study of structure and behaviour of the physical and natural world through observation and experiment". The word technology comes from early 17th century Greek "*tekhnologia*" which literally translates to "systematic treatment". In more modern times, technology has been described as "the application of scientific knowledge for practical purposes, especially in industry" or "machinery and devices developed from scientific knowledge" [1].

Science and technology are effectively the development of knowledge and application of that knowledge to new ways of doing things. Hawke's Bay Regional Council (HBRC) has legal responsibilities that cover a broad range of resource and natural hazard management areas under the Resource Management, Local Government, Civil Defence, Drainage and Building Acts to name the key ones. Both science and technology are critical components in most of the decisions that Hawke's Bay Regional Council must make and many stakeholders must make for economic, environmental, health or social related reasons.

While various pieces of strategic work have been undertaken in the past, such as the 10-Year Hazard Research Plan first developed in 2003, this is the first time that the Hawke's Bay Regional Council has had a Science and Technology Strategy. While pressures for change arise from a number of issues such as water quality and nutrient loss, the Council currently has no way of steering its many scientific contributions to the management of such issues in a strategic way. Yet new science and technology supported by baseline monitoring work in such areas is going to be crucial to finding solutions to such challenges.

The strategy is intended to guide staff on the science delivery and direction over the next 10 years. It is a non-statutory document but has been developed collaboratively through internal staff workshops and external stakeholder and partner exchanges.

This Strategy seeks to cover all types of science of relevance to the economic, environmental, health and social related accountabilities of the Hawke's Bay Regional Council to the people, resources and environment in the Hawke's Bay. While the primary focus of some of its directions relate to science delivered and or commissioned by the Council, they are also aimed at trying to improve co-ordination and linkages with research commissioned by others in the same or similar areas.

2 Context

HBRC now delivers science in the context of a wide range of national directives and regional initiatives.

The Government has also issued national policy direction in a number of areas that are critical to HBRC, the most recent and significant of these would be the National Policy Statement for Freshwater Management (2014) which imposes a set of significant obligations on Regional Councils in relation to their management of freshwater catchments which they must meet. New requirements have also been issued in relation to air quality management.

The Government has also imposed National Environmental reporting requirements on councils via **the Environmental Reporting Act 2015, the Environmental Monitoring and Reporting Project along with the National Environment Monitoring Standards** will all drive a greater emphasis on high quality monitoring and associated data.

[1] From Google dictionary.

The Government has issued a **National Statement of Science Investment** that sets the strategic direction for the national science system, by identifying the Government's current and future priorities for its science investment. Priorities are:

Producing excellent science of the highest quality

- *Ensuring value by focussing on relevant science with highest potential for impact for the benefit of New Zealand*
- *Committing to continue increasing investment over time*
- *Increasing focus on sectors of future need or growth*
- *Increasing the scale of industry-led research*
- *Continuing to implement Vision Mātauranga*
- *Strengthening and building international relationships to strengthen the capacity of our science system to benefit New Zealand.*

The Government has also issued National Science Challenges, which are ten research areas have been identified to address some of the biggest science-based issues and opportunities facing New Zealand. Challenges of main relevance to HBRC are:

- *Our land and water* – enhance primary sector production and productivity while maintaining and improving our land and water quality for future generations
- *Resilience to nature's challenges* – enhance our resilience to natural disasters
- *Sustainable Seas* – future marine management approaches
- *Deep South* – climate impacts on New Zealand
- *New Zealand's biological heritage* – protect and manage our biodiversity, improve our biosecurity and enhance our resilience to harmful organisms
- *High-value nutrition* – develop high-value foods with validated health benefits

Research under these challenges will focus on national-scale issues, and on science that is likely to have major public benefit for New Zealand.

At the regional government level, Regional Councils have collectively developed and issued a Regional Council Science Strategy setting out their collective research interests and priorities. They have also worked together to establish Land and Water Aoteoroa – an initiative that aims to share scientific information covering the ambit of regional council responsibilities in order to assist community decision making on resource management and related issues. Special interest groups involving scientists from regional councils across the country have also developed more detailed research strategies for a number of areas of mutual interest across the ambit of regional council responsibilities. HBRC science work is hugely guided and influenced by these initiatives.

HBRC also has its Annual Plan, Long Term Plan, Regional Policy Statement and Regional Resource Management Plan, Regional Coastal Plan, its Strategic Plan and Land and Water Strategy and its 10-Year Hazard Research Plan which guide its investment in science. Also underway is the development of the National Environment and Conservation Roadmap, a Department of Conservation and Ministry for the Environment led project.

3 Purpose

This Science and Technology strategy seeks to:

- describe the role of science and technology in relation to the Council's accountabilities including resource management, local government, civil defence, drainage, biodiversity and biosecurity as they apply to the Hawke's Bay region
- describe the Council's relationship with local iwi in relation to science and technology
- ensure better alignment of the Council's science interests with those of other key stakeholder groups in the Hawke's Bay
- assess the current state of science and technology usage and delivery relevant to the Council's accountabilities
- set out a desired future state for science and technology relevant to the Council's accountabilities
- describe how science needs will be prioritised, procured, delivered and then used and communicated going forward
- identify when the Council should lead science and technology work as opposed to support the efforts of others
- identify when others should/will be involved and how in the prioritisation, procurement, delivery and uptake of science and technology
- help minimise overlaps/duplication in research efforts.

4 Vision and values

The Vision for this Science and Technology Strategy is as follows:

Robust and understandable science and technology incorporating Mātauranga Māori, that enables a connected region with a vibrant community, a prosperous economy and a clean and healthy environment, now and for future generations.

Science and technology provides the vital tools to unlocking the kind of society, economy and environment that the people of Hawke's Bay want now and into the future. In order to achieve this science and technology developed by the Council under this Strategy will reflect the following values:

Inclusive– science and technology will reflect all key economic, environmental, social and cultural values (Māori as well as non-Māori)

Excellence – science research will be robust, objective, and credible

Timeliness– science research will aim to provide sufficient information to inform decision making in a timely manner rather than complete information that might take too long to gather

Communication – The Council will proactively engage key stakeholder groups affected by its science and research work as far as practicable

Transparency – Council decisions will be informed by objective and up-to-date science where the science is distinct from the decision(s) and justification for decisions is transparent

Accessibility– science and technology information will be understandable and made available in the easiest searchable manner

Forward thinking, ***and innovative*** – science and technology efforts will be based on current and future needs and will respond to and address emerging issues and open up opportunities to innovate

Mātauranga Māori – Māori traditional knowledge and values will be understood, respected and incorporated into the science research agenda

Kaitiakitanga – science information and development will inform the guardianship and/or protection of the environment

Value for money – science and technology research prioritisation, phasing and procurement decisions will maximise the value of available internal and external funding, including by leveraging off work done by others

Partnerships – science and technology needs will be prioritised, delivered and used collaboratively reflecting the interests and needs of the broader community.

5 Current state

In undertaking work for this Strategy a number of issues became apparent with the development and use of science and technology by the Council including:

- Science is currently commissioned, procured, delivered, shared, and used in a relative ad hoc manner across the Council's accountabilities.
- Science and technology work can tend to be commissioned quite informally and often quite reactively and frequently experiences delays in expected delivery
- Approaches to the procurement and use of science and technology vary across departments within the Council and there is no attempt to align research work in any systematic way with the boundaries between why research is undertaken in house versus procured not clear
- Community engagement in research by Council is currently ad hoc and inconsistent – and depends on individual relationships. There is a lack of proactive communication efforts across a number of research streams
- There is a need for a more systematised approach to consultation and a genuine openness to feedback, and given perceptions that some consultation is really about informing stakeholders of decisions that have already been implicitly taken or proposals that not likely to change
- The Council's interpretation of science is perceived to be precautionary at times – i.e. the regulatory response is at the strict/inflexible end
- Science is perceived by some stakeholders to be of mixed quality and concerns include the nature of the questions being addressed and the extent to which the resulting research addresses all key stakeholder interests (e.g. impacts on biodiversity) not just a singular interest (e.g. flood management)
- The science used to support some decisions by the Council is frequently being challenged through the Courts, resulting in uncertainty and delay
- There is a lack of understanding by all parties of Mātauranga Māori and how to successfully incorporate Māori values into science and research priorities

- There is low stakeholder awareness of HBRC's in-house science and technology capability and activity, and science delivery and peer review processes
- Some stakeholders perceive that there is a tendency to use existing networks/research contractors rather than looking for who is best to deliver it i.e. research is not being commissioned in a contestable manner when it should be.
- There is a perceived lack of accessibility to translation of research and follow-through on findings and recommendations
- There are perceived overlapping research efforts in water quality, freshwater fish, coastal processes and biodiversity between Regional councils and other research providers and perceived gaps in research efforts and understanding, such as in recreational values, socio-economic research and the state of biodiversity.

On the other hand, some strengths of current practice were also identified:

- Council commissioned science work is considered high quality by some stakeholders consulted
- There is a strong commitment to using science to support the Council's accountabilities
- Most in-house research is peer reviewed internally, with significant pieces of work receiving external peer review
- There is good co-operation across regional councils at a staff level and generic agreement on regional council collective priorities
- The council's engagement with stakeholders is considered to be improving.
- Hazard research is commissioned in accordance with a 10-Year Hazard Research Plan and priorities set out in the Hawke's Bay Civil Defence Emergency Management Plan. In addition surveys have been completed to discover whether the supply of hazard information provided is adequate for Territorial Authorities and professionals involved in land use planning decision.
- A hazard information portal was launched July 2015 as a publicly accessible GIS regional web-based platform providing a single authoritive hazards module for Hawke's Bay, where the most current hazard data and information will be held in the future.

6 Drivers, challenges and opportunities to 2025 and beyond

Looking forward, there are a number of challenges and opportunities confronting the Hawke's Bay region with implications for the future science and technology work of the Council including:

- Given the increased intensity of land uses:
  - Pressure on existing water resources seems likely to continue increasing posing challenges for water allocations and water quality and consequently, some land uses and a potential shift to land uses less reliant on water
  - Soil erosion (and soil compaction from more intensified uses) may increase resulting in greater nutrient loss

  - Pressure on soil quality seems likely to increase, posing challenges for productivity
  - There will be growing demand for better nutrient management and pesticide management
  - Water quality problems will, in turn, impact on coastal values and inshore fisheries
  - There will be growing pressure to address high risk sites and land use practices (i.e. those that appear to be key drivers behind decreasing water quality).
- Climate change could exacerbate the above effects and create new biosecurity risks, for example
- The nature of natural hazards will continue to evolve and present new or different risks
- There will be growing demands to understand and incorporate Mātauranga Māori and kaitiakitanga principles in environmental monitoring and science efforts and an increasing role of iwi claimant groups in economic development and environmental protection in the region
- Market patterns will continue to evolve as new competition emerges and displace existing players or industries and economic influences drive changes in investment patters and production processes
- Technology will likely continue to evolve rapidly including in more virtual forms (e.g. using clouds) and in areas like bio and nano technologies and robotics
- Consumers are likely to become even more environmentally conscious – demanding sustainably managed products and an increasing number may favour home grown organic produce
- The profitability of traditional agriculture products seems likely to come under increasing pressure given rising environmental costs and growing offshore competition and there will be changes in land use
- There will likely be growing pressure to move away from traditional forms of energy and adopt more sustainable forms
- The voice of recreational water users is likely to grow stronger if their values are undermined by deteriorating water quality
- There is likely to be growing acknowledgement of the need for, and demand for, the protection of biodiversity and natural ecosystems
- Governments will respond with ever increasing demands around environmental bottom lines including stronger rules for water and air quality
- There will be an underlying need to invest in science capability/workforce development, including Mātauranga Māori capability, particularly given the aging of the current scientific workforce across science research institutions
- Government research priorities will likely evolve further (e.g. into food based research and climate change and away from more traditional agricultural research).

7 Desired future state by 2025 and beyond

In light of the vision and values and current challenges, the desired future state by 2025 is as follows:

- The identified science and technology needs reflect the Council's relationship with local iwi and human health, economic, social, cultural and environmental values.
- Science helps Council meet its responsibilities in managing hazards, including supporting risk reduction, the four well-beings, the safety of the public and the protection of property.
- Science is prioritised, planned, funded and procured in a systemic manner
- There is a greater appreciation of the needs for which science must deliver and the issues and challenges (including likely timeframes) that science will face in delivery.
- Science is managed in collaborative ways as to maximise its acceptance, utilisation and uptake and opportunities for further innovation and initiatives that would otherwise not be possible
- Science is delivered in the most robust and professional manner
- Science is used to enable decisions to be made on 'sufficient' not 'perfect' information – where sufficiency is in part determined when the risks of delaying a decision are greater than the risks of making one. Science is then used to address outstanding uncertainties over time
- There are 'no surprises' with Council science work, given the extent to which it is planned and delivered collaboratively and transparently
- Science and technology information, including that in support of decisions, is accessible and presented in an understandable way and contributes to an informed community that is more aware of the impacts of its choices and behaviours using a fuller range of tools including social media tools.
- Council decisions are based on robust, unbiased, accessible and understood science and technology facilitating constructive debates on the results and implications of the science (what to do about it) and not the science itself where the rationale for decisions is transparent.
- The Council is lead in areas where that is essential to its accountabilities and others are not able to do so; and supports other research efforts that are supportive of its accountabilities where others are better placed to lead.
- There has been sufficient investment in establishing the base information and knowledge to understand problems and their significance, and a shift in focus towards research that informs change (i.e. mitigation/adaptation options and win-win opportunities).

8 Key commitments necessary to achieve this desired state

Given the complexities associated with many of its accountabilities (e.g. water), science provides a crucial and impartial underpinning to any Council decisions in such areas.

To be effective though, the science must be seen to be objective, credible, and communicated in a manner that can be easily understood by those affected. The Council also needs to ensure it is assessing all relevant values/impacts (i.e. across environmental, economic, social and cultural aspects). It is these areas where the Council could focus some more attention as discussed further below.

8.1 Understanding of science a core competency of Council

The Council is committed to ensuring its decisions are based on sound science and that any justification for its decisions is made transparently.

It is also essential that the Council has employed managers and staff who have sufficient understanding about the relevant science to be able to commission it effectively, who know good science from bad, and can communicate it effectively to affected stakeholders.

8.2 Understanding of the separate concepts of Mātauranga Māori and Kaitiakitanga

In acknowledgement of the Council's obligations and relationship with local iwi, there needs to be a better understanding of what the concepts of Mātauranga Māori and Kaitiakitanga mean and their implications for decision making as it relates to Science and Technology.

Mātauranga Māori is traditional knowledge and values and it is important that this knowledge is understood, respected and incorporated into the science research agenda. This knowledge is held by individual iwi and hapu in the region – there is no singular view.

Science information and development supports the responsibilities of kaitiakitanga, which is the guardianship and/or protection of the environment.

The Council needs to commit to improving its understanding of and application of these concepts in its science related work.

8.3 Measurement and assessment of "baseline" factors is a critical Council role

A critical science role for Council is to ensure the measurement and monitoring, and assessment and analysis of trends in relation to the state of natural resources, environment and assets across the Council's accountabilities i.e. state and trend information and communication on water quantities, water quality levels, air quality levels, erosion and research into what might be driving changes in these given its legal accountabilities (for example, under Section 35 of the Resource Management Act).

While some CRIs and other research institutes provide information in these areas:

- many CRIs are under significant financial pressure and are cutting some of their current monitoring functions that are of direct importance to regional councils (e.g. some current NIWA and Landcare monitoring programmes been cut)
- no organisation apart from the Council has primary accountability for ensuring the provision of such data relevant to the Hawke's Bay.

So this is a critical lead role for the Council and one that seems likely to be increasing in importance (given changes going on within CRIs). Where others (e.g. CRIs) are providing such information adequately the Council need not have much of a role – but it should have the role of ensuring that any gaps in such information are being filled.

The Council has previously set out its approach to monitoring water, air quality and land in a series of strategies as follows:

- Guide to Environmental Monitoring Strategies 2006
- Surface Water Quality Monitoring Strategy 2006-11
- Air Quality Monitoring Strategy 2006-11
- Land Monitoring Strategy 2006-11

- Coastal Monitoring Strategy 2006-11

These strategies are supported by the strategies developed by the Special Interest Groups for each of these (and other) areas – working across Regional Councils.

8.4 Supporting others' research efforts

In light of the growing need for multi-interest and -disciplinary collaboration to ensure effective outcomes, a secondary role for the Council then seems to be in supporting the efforts of others to adapt management practices and behaviours that address environmental issues in a more sustainable way whether that is new farming viticulture or horticultural practices for example, in relation to particular Hawke's Bay circumstances. Such research efforts are likely to need some kind of Council involvement but should generally be led by others who are most incentivised to generate innovative solutions – e.g. industry most affected, and run in a collaborative manner. But this should not typically be a primary lead role for the Council, unlike the one above.

8.5 Other research areas of possible interest

There is a spectrum of other research work that is more national rather than regional in nature – e.g. into methodologies and mitigation technologies. These are areas where the Council might choose to engage given the level of likely implications for the Hawke's Bay – but this is more of a choice – again others will more likely have the lead role – the question is whether Hawke's Bay might wish to participate/collaborate. The Council should engage when there is a clear gap in such methodology work that is impacting on Hawke's Bay interests.

8.6 Research prioritisation

The Council will prioritise its research efforts according to its core accountabilities, where it can support others, and gaps in its knowledge/research base. The major groups of research activity will comprise the following in order of priority:

1. Monitoring and related research into baseline environmental data i.e. risks, impacts and causes in relation to Council accountabilities in particularly resource management and natural hazard management. As noted earlier, an example would be water quality levels and causes of any changes in those levels in Hawke's Bay catchments. This is core Council work upon which all other research (and related decision-making) must be based. It includes research into economic, social and cultural impacts (using a range of social sciences and other disciplines), as well as environmental (physical sciences).

2. Identification and application of mitigation and adaptation options to Hawke's Bay circumstances. This is applied work that can show stakeholders how they can respond to issues identified from (1). It is a secondary but important role for the Council given its regulatory responsibilities to set rules that people can actually comply with.

3. Application of more sustainable land management practices specific to Hawke's Bay circumstances. This is also applied work that the Council should ideally support industry to lead and is about showing fuller solutions to increase acceptance of the need to change. Council may need to initiate or seed such work but should try and partner with industry to deliver.

The attached table sets out the initial research high level priorities for the Council.

8.7 10 Year Science Monitoring and Research plan

These priorities will be used to determine the 10 Year Science and Research Plan for the Council. The 10 Year Science and Research Plan will set out, among other things:

1. The baseline environmental monitoring work and assessment that will be undertaken over the period
2. The projects to be commissioned by the Council over the 10 year period – based on current information
3. The purpose, likely resources needed, outputs sought and timing of such work
4. The likely delivery model e.g. in house/procured
5. The nature of stakeholder involvement in each project.

This Plan will be updated at least annually and published on the Council's website or newly proposed Science portal.

8.8 Explicit engagement on the Research Plan during consultation on the Long Term Plan

The Council will consult interested stakeholders in dedicated sessions at the time of the Long Term Plan – on the Council's latest proposed 10 year Science and Research Plan including progress to date, priorities going forward and proposed methods of involving stakeholders.

This would enable stakeholders to comment on the Plan and the research projects of interest to them before decisions are made on the Plan and it is included in the Long Term Plan with associated rating implications.

8.9 Virtual email groups to be used to keep stakeholders abreast of research

Stakeholders want more involvement in areas of research of interest to them – but in a manner that is not overly demanding on their time. The Council will seek to involve stakeholders in research in the most effective manner for both parties.

The Council will use email groups to keep stakeholders informed about research in areas of interest. For example, email groups could be formed to be engaged on

- soil quality/nutrient management research
- water quality/quantity research for particular catchments ,
- ecosystem services and biodiversity research and
- climate change and extreme climatic events research.

Stakeholders could self-nominate to go on email lists for each of such groups and then be invited periodically (e.g. once or twice a year) to presentations on the research in these areas as it is progressed. The groups could be used to identify land owners who might be needed to test research outputs.

These groups would have some simple ground rules (e.g. around use of email) and will vary in terms of their level and nature of engagement depending on the needs and the interests of the area and stakeholders concerned.

If there is sufficient interest, the Council will then explore development of a Science portal to enable these groups to access the Council's latest and past research in an easier and more interactive manner.

8.10 TAG Groups to be used for highly complex research areas with competing interests

More sophisticated approaches could be used for dedicated streams of work that include research alongside other initiatives – such as with the Coastal Hazard Strategy work.

Technical Advisory Groups (TAGs), such as the TANK TAG, will be used for areas of greater complexity where there are potentially competing interests and a greater level of stakeholder engagement is warranted to improve understanding and trust and enable science to be conducted in a more inclusive manner – reflecting all stakeholder needs.

8.11 Choice of in house versus going external

The Council constantly faces the choice as to whether to use in house or external resource to provide science research outputs. Aside from needing capacity across the relevant parts of the organisation to be able to commission and understand science, the question is what in house research capacity the Council wishes to retain as opposed to when it when it will want to seek this expertise from other research providers. This consideration seems likely to flow down from the factors above and needs to be aligned with an understanding of the following factors:

- The extent to which the skill is related to a core role of the Council itself
- The extent to which the skill is likely to be continuously needed as opposed to needed infrequently or on an ad hoc basis and the associated likely volume of work
- The extent to which the skill is likely to need to be adaptable to rapidly changing circumstances as opposed to operate in a steady or unchanging environment (and be efficiently contracted for)
- The extent to which the skill relies on access to specialised skills or equipment that may or may not be justifiable for the Council to try and control and operate
- The extent to which independence and/or the need to reduce risks facing the Council is considered necessary with the area of work in question.

These factors will affect the costs and risks of either of these choices – in house or going external. Skills sets that are needed continuously, and be able to adapt to rapidly changing circumstances and do not require direct access to complex equipment seem likely to justify in house resourcing. Skills that are only needed periodically and/or can be described in a relatively certain manner and/or may rely on expensive equipment seem to suit being contracted out.

This seems to imply the core research areas provided in house should be those that involve translation of baseline data into policy development and implementation in high priority areas like water quality and quantity and coastal science and land science.

Areas that might be more appropriate for consideration of contracting out are those where the volume of work is steady, low, and easy to predict or in-frequent and requiring specialist skills and/or equipment that is not ordinarily needed.

The Council commits to making more transparent decisions about its in house capacity versus contracting decisions using the above principles so that other providers know the areas where the Council is likely to want to secure their expertise.

8.12 Umbrella contracts with research providers

Currently there are no umbrella contracts across the entire ambit of Council responsibilities with key research providers like NIWA, Landcare, and the Cawthron Institute. That said, some departments within the Council appear to have such arrangements with some organisations. Umbrella contracts with key research providers can provide advantages in terms of:

- Signalling medium to longer term research capacity needs likely to be needed by the Council
- Reducing transaction costs involved in the procurement of individual pieces of research work
- Potentially providing greater value for money.

The Council will explore negotiating umbrella contracts for the key research providers that it uses the most and make these medium to long term contracts i.e. 5-7 years.

8.13 Peer review of Council research

Stakeholders suggested there might be ways to improve the perceived credibility of HBRC research by ensuring some independence in the utilisation and choice of peer reviewers. The Council commits to:

- continuing to seek peer review for all research that it commissions and
- seeking external peer review for work that is to inform policy decisions and may be controversial and
- publishing that peer review work alongside the research itself.

8.14 Improved access to research

The Council will endeavour to improve the design of its website and provide plain English summaries of the research it undertakes or commissions so as to improve the accessibility and transparency around its current research efforts. It will continue to support and develop the information portals, and also undertake to improve access to the large body of research work which is already available on its website but not that accessible.

The Council will also seek to explain and publicise research underway and completed through smarter web tools, notifications and invites to occasional presentations to the virtual email groups discussed earlier, publication of research in science journals, press releases to local media, and more presentations to other external audiences when opportunities arise for this.

9 Acknowledgements

The contributions of various parties inside and outside Council were integral and significant to the development of this strategy, and we acknowledge those contributions.

Appendix A Research Categorisation for the proposed Hawke's Bay Science and Technology Strategy

Key

	Areas of core responsibility for HBRC where it would typically lead to ensure research is provided in this area unless others were already providing research in this area (in which case it would collaborate)
	Areas of core responsibility that justify particular priority looking forward
	Areas of research where HBRC could collaborate with Government/industry/stakeholders where there is a case for this
	Areas of research where HBRC could collaborate where there is a case for this that appear to warrant particular priority
	Areas where HBRC would typically just monitor
	Areas where HBRC is currently leading/collaborating in areas where it might normally monitor

Note:

(i) red areas will typically require dedicated resourcing either in house or contracted

(ii) orange areas may require capacity - in house or contracted

(iii) light yellow areas will typically require no material dedicated resourcing

Area of research	**Methodologies for how to asses values** (eg how to assess economic value of soil quality)	**Methodologies for assessing risks, causes, impacts from damage** (eg how to assess soil quality levels and causes of any changes in soil quality)	**Monitoring risks and their impact on values** (eg measuring soil quality levels in the Hawke's Bay)	**Methodologies for understanding Matauranga Maori and kaitiakitanga in the Hawke's Bay** (eg identifying Mauri values and perspectives in relation to soil quality)	**Research and monitoring of causes behind changes in impacts** (eg researching causes of changes in soil quality)	**Direct mitigation options and their environmental, economic, social and cultural impacts** (eg researching options for mitigating reductions in soil	**Application of direct mitigation options to specific Hawke's Bay circumstances** (eg research into direct ways of mitigating reductions in soil quality)	**Identification of more sustainable production and management practices that mitigate such impacts** (eg research into alternative land uses that have lower impacts on soil quality)	**Application of much more sustainable production practices to specific Hawke's Bay circumstances** (eg research into alternative land uses that will have lower impacts on soil quality in specific Hawke's Bay locations)	**Social adaptation research and application to Hawke's Bay** (eg research into barriers to changing land owners' behaviour and ways of addressing these)
Soil quality										
Erosion: sources, pathways and mitigations										
Nutrient losses: sources, pathways and mitigations										
Fresh water quality										
Ground water quality										
Coastal water quality										
Fresh water quantity and allocation										
Ground water quantity and allocation										
Drainage maintenance										
River management										
Coastal processes										
Air quality										
Ecosystem services										
Ecosystem health										
Biodiversity										
Biosecurity										
Natural hazards (eg earthquakes, tsunamis)										
Climatic extremes (eg drought)										
Climate change										
Regional economic research										
Regional social research										