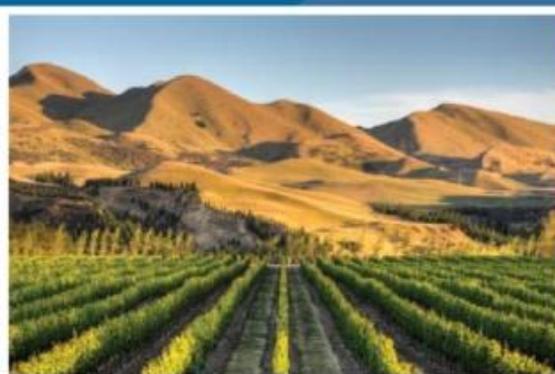


A stylized graphic of a mountain range in shades of light blue and white, with a winding river in a darker blue below it. The river flows from the center towards the right side of the frame.

Alignment of Land Special Interest Groups and the National Land Resource Centre Priorities



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CENTRE

Alignment of Land Special Interest Groups and the National Land Resource Centre Priorities

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June 2013

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Summary

In September 2011 the Regional Council RS&T strategy was released. For this document the Land Monitoring Forum (LMF) and Land Managers Group (LMG) identified a number of different critical issues and associated research priorities that were important to sustainable land management. Since then there have been several institutional and environmental changes that require new discussions on land, soil and water issues and on associated research priorities. To respond effectively to these changes a collaborative approach involving the LMF, LMG and the new National Land Resource Centre (NLRC) could offer significant value to regional councils and those sectors interested in land and resource management.

This report provides information to test current critical issues and research priorities as well as investigate a possible foundation for a wider partnership between the LMF, LMG, and NLRC to enable the development of, and easier access to, the best available science to support Regional Council decision-making. One NLRC goal is to allow regional councils to draw on capability from across the CRIs and prioritise future development as part of a national research agenda.

Rationale

The specific intent of this project was to test research priorities against known shifts and determine how best they might be met through collaboration. At the strategic level the project aims to establish a pathway for greater cooperation between the LMF, LMG, and the NLRC to prioritise activities and incorporate these priorities within a national research agenda for land resource science. This research agenda will consider national and sector-based priorities and identify the best investment mechanisms to address them. It therefore focuses on:

- providing material to update the 2013 Regional Council Research Strategy
- identifying opportunities for alignment between the LMF, LMG and NLRC
- developing a collaborative approach to land-based research

Key Findings

1. Despite changes in political agendas, the critical issues relating to land and soil in New Zealand are enduring and depend on best available and defensible information.
2. Although significant research activities address current land and soil needs, there is a gap in science delivery to policy and end-users.
3. Organizations in New Zealand who are working in the land and soil area show significant willingness to develop a collective prioritising of information needs.
4. The land and soil sector is fragmented, with focus on individuals or institutional endeavours. Access to expertise and information often depends on individual relationships.
5. While land and soil science priorities may change, the need for stable and accessible land resource information will remain and is required to anticipate and respond to future needs.

Recommendations

1. Develop a land and soil research strategy that considers immediate and long-term issues and includes a wider range of stakeholders.
2. Bridge the science-implementation gap by agreeing on land and soil priorities, working across the land and water domain, and moving beyond the unidirectional transfer system that traditionally operates between science and end-users.
3. Progress a national land and soils perspective that incorporates five stages of action: develop a work plan; take inventory; increase capacity; enhance knowledge; and build awareness.
4. Stakeholders must work collectively to ensure issues are addressed and decided on through an inclusive collaborative process.
5. Develop a framework that better anticipates future land and soil research needs and ensures an enduring capability to draw on.

1 Introduction

1.1 Background and Roles

Primary production from agriculture, horticulture, and forestry generates 64% of New Zealand's merchandise export earnings and contributes around 12% to GDP. Success in primary production is underpinned by successful, sustainable management of land resources. However, increasing demands on the availability of resources and intensification of farming practices present issues of water quality decline, erosion, and nutrient and sediment loss. Addressing these issues will require the application of new research and technologies and the adoption of a more inclusive approach (involving all stakeholders) to resource management.

Regional Councils are currently making decisions about how best to ensure the economic development of their regions while simultaneously protecting environmental integrity. The *Land Monitoring Forum* (LMF) and *Land Management Group* (LMG) are the Special Interest Groups (SIGs) representing Regional Councils on land management issues and related science. The LMF consists of staff from regional councils that have roles relating to land and soil research, monitoring and management. The LMG works closely with landholders, community groups, industry, and government agencies to promote the adoption of land management practice. They address problems such as soil erosion and sustainable land use, provide assistance for biodiversity protection, and liaise with farmers and community groups about regional land management. The LMF and LMG work together to discuss land-related matters and develop approaches that aim to improve the management and monitoring of land and soil resources. They also provide input into policy development and coordinate technical and policy information between regional councils and other organisations where appropriate.

The *National Land Resource Centre* (NLRC) is a collaborative initiative designed to help identify priorities for land-based research and create more impact from research undertaken across the science system. The NLRC was established by Landcare Research to enable businesses, government, researchers, and the public to understand, make effective use of, and enhance New Zealand's land resources. The NLRC is a virtual centre, communicated through a web presence. It provides gateway services, data product development, networking, and capability building. Further, the NLRC provides an effective vehicle for science organisations to add value to end-users through data sharing, integration of diverse data sets, and collaboration in developing innovative applications and customised solutions.

Given the strong alignment between the intent of the three parties (LMF, LMG and NLRC) there is potential value in the LMF and LMG building a strategic

relationship with the NLRC, collaborating to analyse needs, working together to develop a research strategy, and then communicating this to those CRIs that are partners within the NLRC.

1.2 Drivers and Shifts

In September 2011 the Regional Council RS&T strategy was released, with updates made in April 2012. Since then there have been several shifts at both institutional and macro-operating environment scale, against which land, soil and water issues and associated research priorities should be tested for enduring relevance. Major shifts, representing those changes most relevant to regional council and science practice, are illustrated in Figure 1.



Figure 1 Timeline of major drivers and shifts since research priority setting.

1.3 Rationale

The specific intent of this project is to test research priorities against known shifts and to determine how best they may be met through improved collaboration. At the strategic level the project aims to establish a pathway for greater cooperation between the LMF, LMG, and the NLRC to prioritise activities and incorporate within a national research agenda for land resource science. This research agenda will consider national and sector-based priorities and identify the best investment mechanisms to address them.

1.4 Methods

The project was conducted in two phases:

1. Assessment phase:

- Review key commissioned reports with a particular focus on the recommendations for further research made within these.
- Conduct a survey of key regional council staff to identify priority issues of concern to regional councils and the two SIGs.
- Use a facilitated workshop format (with both LMF and LMG) to explore further key issues and develop a pathway forward (including those identified as critical priorities through the earlier interviews/survey and in the Regional Council RS&T strategy).

2. Recommendations phase:

- Analyse the outputs of the assessment phase and incorporate them into a research strategy outlining key gaps and possible opportunities for alignment.

1.5 Participants

Sixteen regional and unitary councils were invited to identify priority issues and research needs in soil and land management. Detailed responses were received from fifteen regional councils. This assessment was supplemented by information from a workshop with scientists and land managers who were members of the LMF and/or LMG. The majority (75%) that responded were located in the North Island and primarily represented three main councils (Hawke's Bay, Bay of Plenty, and Greater Wellington).

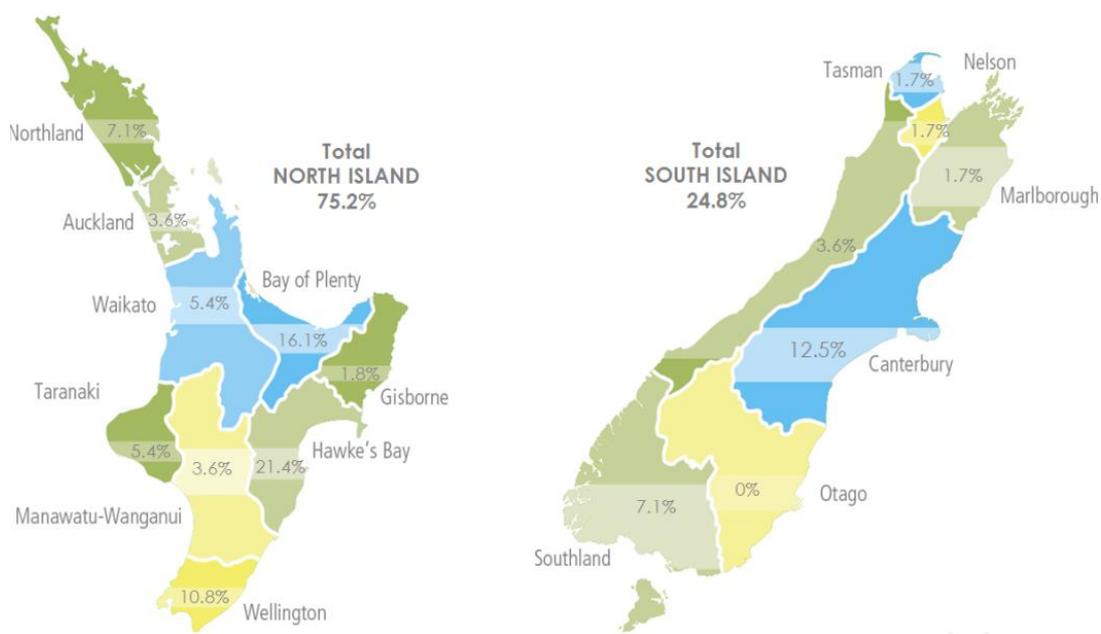


Figure 2 Regional distribution of participants.

Regional councils have a significant focus on land and resource management. A number of responding regional council staff have multiple roles: 33% have some role in environmental science and other sciences, 19% in applied land management, and 13% in general management. The remaining respondents focus on policy, regulatory enforcement, planning, and community services.

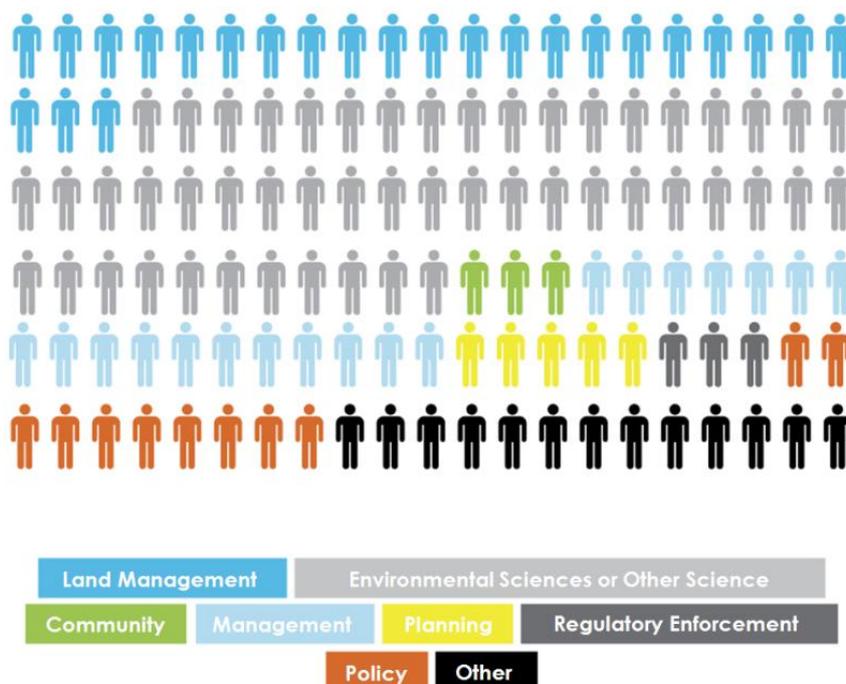


Figure 3 Work activities of regional and unitary council staff.

In the last few years SIGs have played a significant role in identifying critical issues and research needs and incorporating within a pan interest strategy. There are over 15 different SIGs that work collaboratively to identify longer-term research priorities and capability needs and aim to enhance inter-council collaboration and support.

Over 33% of respondents were members of the LMG and 17% were members of the LMF. The remaining respondents were either not members of an SIG (17%) or members of one the remaining SIGs. Due to the high number of responses from the LMF and LMG, the results from this survey primarily reflect those staff associated with the LMF and LMG.

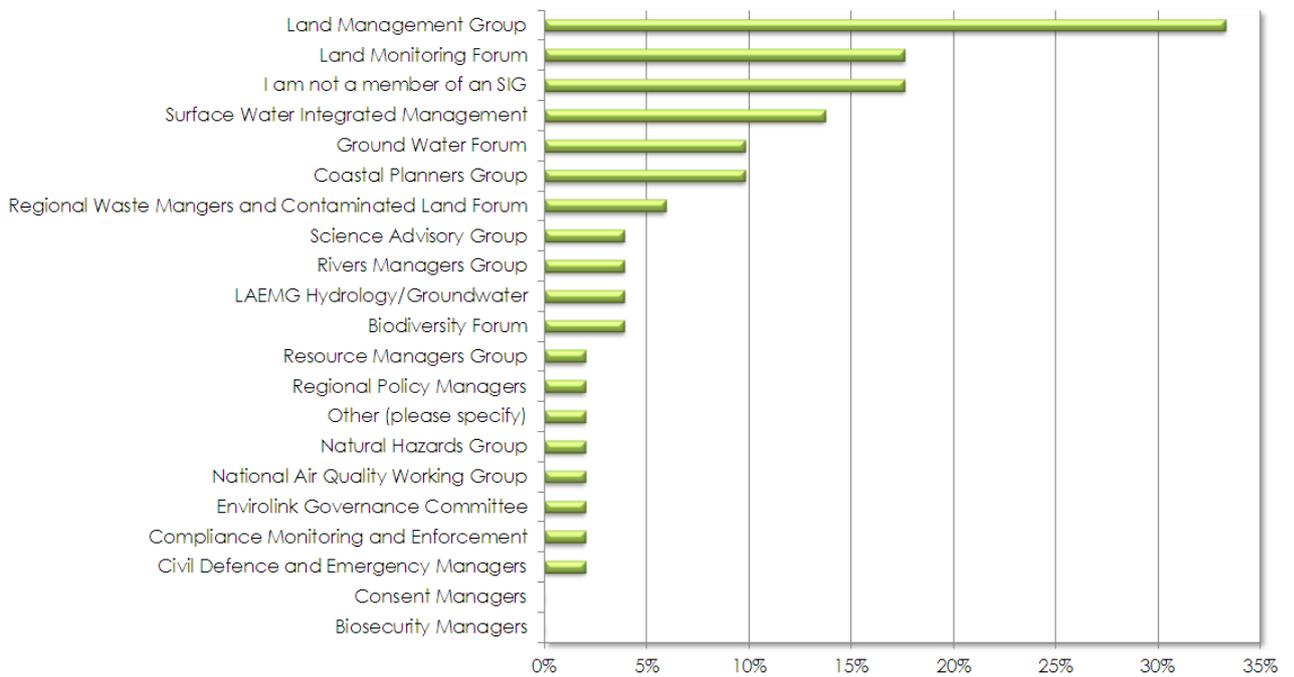


Figure 4 Percentage of regional and unitary council staff members of different Special Interest Groups (SIGs).

2 A Review of Critical Issues

Key Finding 1: Despite changes in political agendas, the critical issues relating to land and soil in New Zealand are enduring and depend on best available and defensible information.

Regional Councils are currently making decisions about how best to ensure the economic development of their regions while simultaneously protecting environmental integrity. This significant challenge requires access to robust and defensible information and the capacity to assess environmental conditions and changes. Specific challenges include identifying trade-offs between different ecosystem services, the value of natural capital, the extent of soil contamination and how to manage it, as well as improved soil and land-use information to support decision-making on setting and meeting limits (particularly for freshwater).

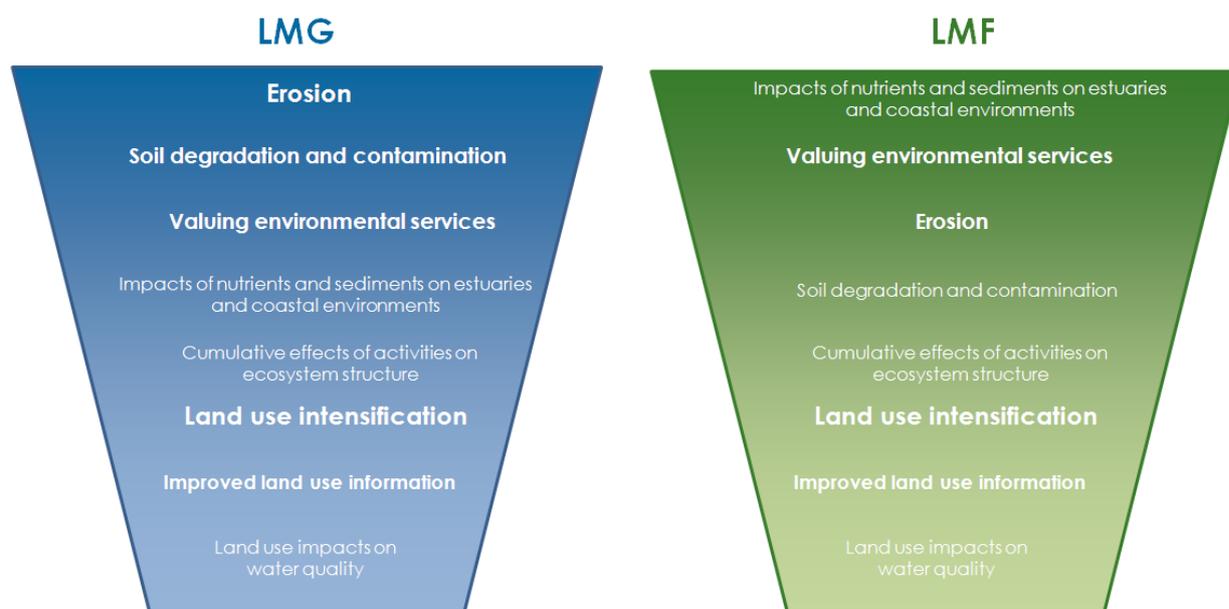


Figure 5 Comparison of top three critical issues identified by each of the land SIGs.

The LMF and LMG have identified a number of different critical issues that are important to regional councils (Figure 5). Most issues identified in the 2011 RS&T strategy have not changed over time however the priority of these issues vary depending on stakeholder needs. The LMG works closely with land users to promote better management of land resources. One of their main activities is to prepare soil conservation farm plans to address soil erosion problems. They identified the following top three critical issues (in order of priority): 'Erosion', 'Soil and Contamination', and 'Valuing environmental services'.

In comparison, the LMF focuses more on developing soil and land science into technical and policy information. From the LMF perspective the top three (in order of priority) critical issues are: 'Impacts of nutrients and sediments on estuaries and coastal environments', 'Valuing environmental services', and 'Erosion'.

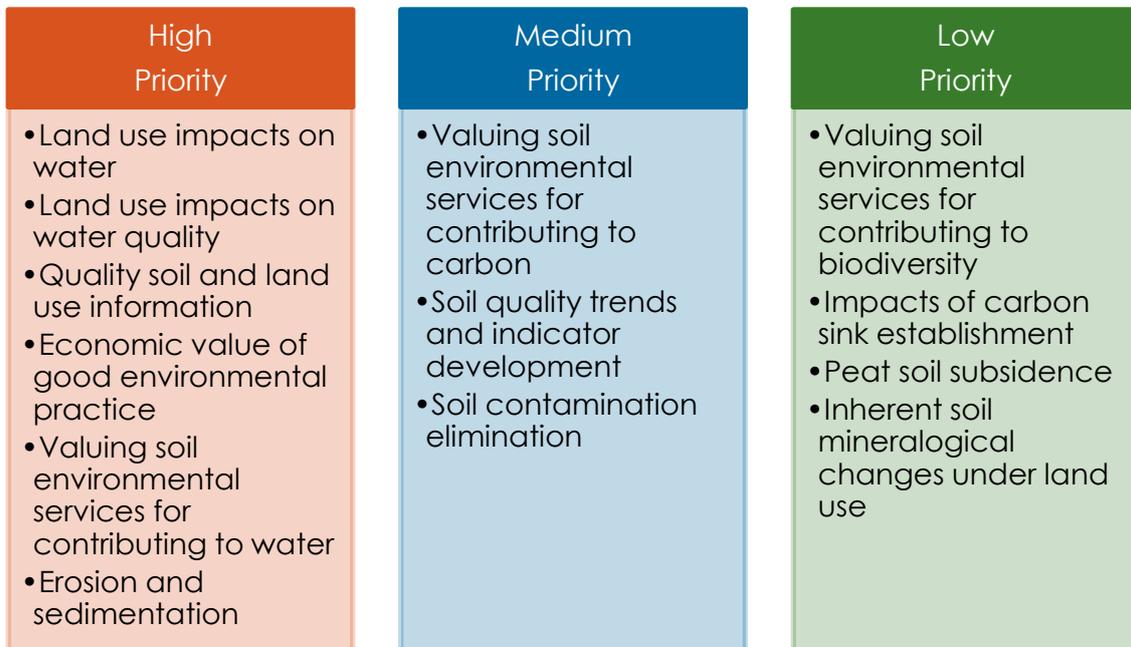


Figure 6 Critical issues of high, medium, and low priority, identified by regional council staff.

Critical issues considered to be of high strategic importance to other regional council staff varied from those identified by the two land-based SIGs. Land-use impacts on water quality remain the most important current issue, followed by land-use intensification and the cumulative effects of activities on ecosystem structure. Figure 6 illustrates the key issues identified by all regional and unitary council staff from highest to lowest priority. Issues of highest priority include: land-use impacts on water quality, loss and management of high class soils, and quality soil and land use information. In comparison, issues of lowest priority were environmental services for contributing to biodiversity, impacts of carbon sink establishment, and peat soil subsidence.

Recommendation 1: Develop a land and soil research strategy that considers immediate and long-term issues and includes a wider range of stakeholders.

3 Research Priorities 2013 and Beyond

Key Finding 2: Although significant research activities address current land and soil research needs, there is a gap in science delivery to policy and end-users.

New Zealand's science system, which is undergoing significant change, is being challenged to find ways to support a growing economy within environmental limits. Managing the impact of agriculture, forestry and other primary-based industries to meet this challenge and respond to increasingly discerning markets is becoming more urgent.

Despite the vast amount of research available significant knowledge gaps still remain. Changing societal values and increasing demands on productive land challenge environmental management. Consequently, the research required to inform effective environmental management has increased in complexity, requiring a more interdisciplinary approach to resource management (e.g. socio-economic science) and more sophisticated technological tools that address land user needs.

3.1 Update Priorities

Figure 7 highlights proposed updates to the current RS&T strategy identified during the 2013 LMF and LMG workshop. Though all issues identified in 2011 remained current, a number of proposed additional research projects were required to address these issues appropriately in 2013 and in the future. Barriers to addressing these issues using current data and resources were also highlighted.

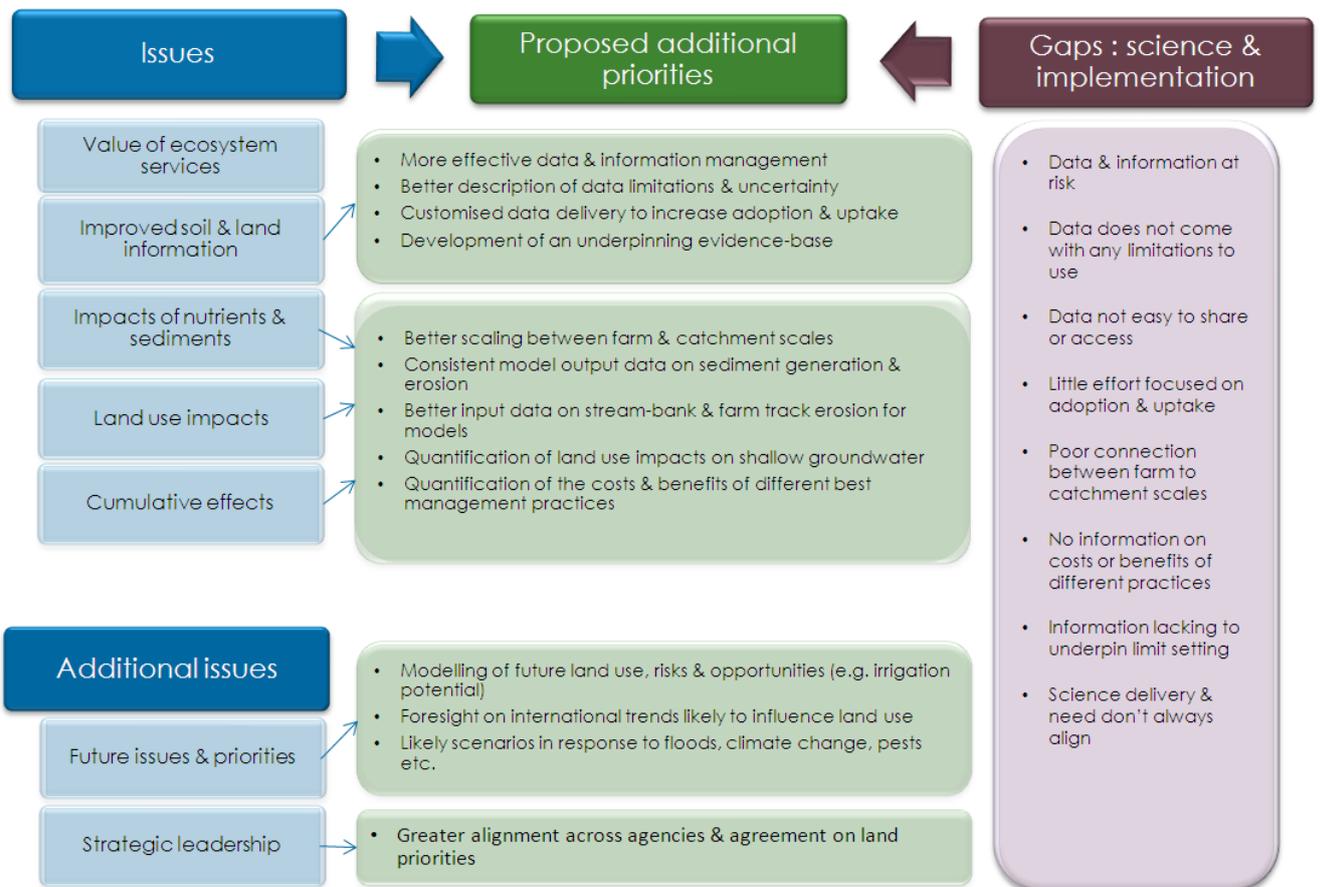


Figure 7 Proposed additional critical issues and research priorities.

Key issues that have not previously been addressed include:

- The development of a research agenda for future issues such as modelling future land-use risks and scenarios the better to anticipate changes in climate, and land use. This responds to comments about *“Due to rapid land-use change need to better predict/anticipate future impacts”*. A more foresight-driven priority was thought to be a worthy inclusion as there is a perceived mismatch between the pace of science and policy needs – *“Challenges haven’t changed but the rate at which science is needed to assist in policy and improve practices has”*.
- A message voiced very strongly was the need for greater alignment across agencies and pan-sector agreement on land priorities; comments included *“Closer collaboration between science providers is needed”*; *“More focused science addressing the real issues – not science for science sake”*; *“Challenges remain the same due to lack of funding and lack of coordination”*.

Additional priorities that emerged during the workshop and through comments made in the survey are also represented in Figure 7:

- A number of additional priorities for enhancing data through: description of data limitations and uncertainty; input data on stream-bank and farm track erosion for models; and scaling between farm and catchment scales. These priorities are underscored by comments such as *“Improve the quality of data that feed into models”*
- A significant gap exists in values and customised data delivery to increase adoption and uptake, as well as quantification of cost-benefit of different BMPs. This gap suggested a role beyond the biophysical science, drawing on the domain expertise in informatics, and social, economic and cultural research *“more social science input”*.

3.2 Urgency Check

Despite significant research activity focused on addressing current needs, a significant need was for the updating of key information and data assets. The most urgent needs are to update land-use change information and improve access to land information (Figure 8).

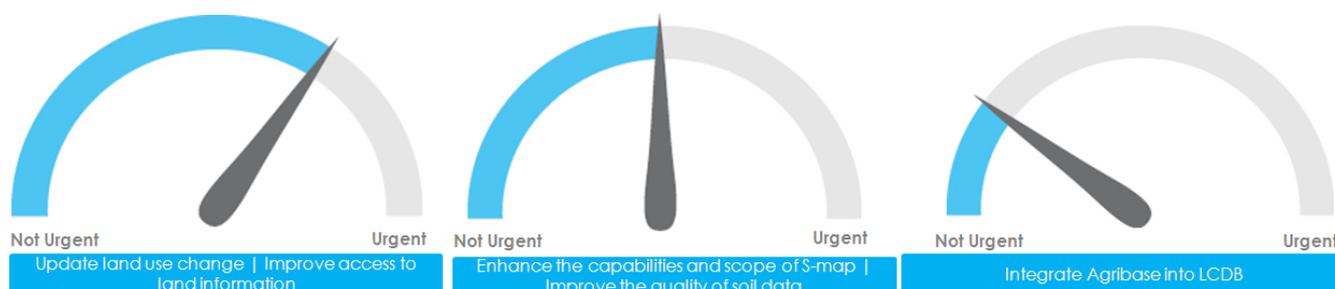


Figure 8 Most urgent to least urgent research priorities.

There is also a general need to increase capability across the land and soil sector. With capability declining there was a perceived need to share the knowledge of experienced soil experts through tools such as S-map and to increase the accuracy and access to more farm-scale data products. This will respond to the drive for more precise management of land and better nutrient management on farms. This capability is urgently needed for farm planning where there is great demand for skilled operators who can provide credible land management advice and interpret land-use information such as LRI/LUC. This demand is likely to increase in importance given the focus on improving water quality.

3.3 Bridging the gap

There is a significant challenge in bridging the gap between science and implementation and fostering more efficient and effective understanding of complex science data. Bridging this gap emerged as one of the most significant issues at the combined LMG, LMF, and NLRC workshop.

Significant issues contributing to this gap between science and implementation included:

- *Increasing complexity:* Many of the challenges in the land domain can be categorised as complex problems, where there is no one right answer. Science can contribute by providing evidence on potential options – but this will increasingly demand a more integrated, inter- and trans-disciplinary approach and ensuring issues are addressed and decided fairly.
- *Science versus solution focus:* The scientific method emphasises objectivity, and focus is generally on identifying the best statistically supported solution. The reality is however that land managers must identify and balance multiple values, taking a more pragmatic and often case specific solution.
- *Institutional versus pan-sector endeavours:* Over the years, under a contestable investment system, there has been an ever expanding suit of data sources, tools and expertise available to help inform and guide decision making. Greater effort in showing interoperability and guiding decisions about which tools to use when are needed to help bridge the gap between science and implementation.
- *Transactional versus strategic relationships:* A frequent comment during the workshop was the experience that project endeavours stopped on the completion of contracts. Little effort was invested by either partner in ensuring uptake and implementation of project results.
- *Science communication:* Despite significant research activity it was apparent that sufficient attention is not paid to how best to communicate and make science accessible and palatable. A potential game changer was identified in working collaboratively with end users to develop scientific outputs that can be easily implemented.
- *Disconnect between science and outcomes:* Evidently there is a need for a clear 'map' of existing research, and how it links to desired outcomes. Research outputs are disparate, with sporadic promotion to end-users, and are not led by clear national-level direction. Furthermore, scientists must work collaboratively with end-users to better transfer science information into practice.

3.4 Beyond land and into water

Given the drivers explored in Figure 1, the extent and need for effort across land and water domains demand reappraisal. Given the polarising aims of the Business Growth Agenda (increasing productivity) and the Freshwater Reforms (preserving environmental integrity), significant challenges are posed for water use and water quality. Specific priorities in relation to water emerged from the survey, including:

- Generation of specific, farm-scale information and partially defined water management zones
- Quantification of contamination loadings from point and non-point source
- Better understanding of the impacts of land-management activities, including nutrients and sedimentation generation and the transport to freshwater and coastal ecosystems
- Better understanding of the cumulative effects of land use on water quality
- Investigation of the transfer pathways and attenuation of nutrients and contaminants through soil, shallow groundwater, and the vadose zone.

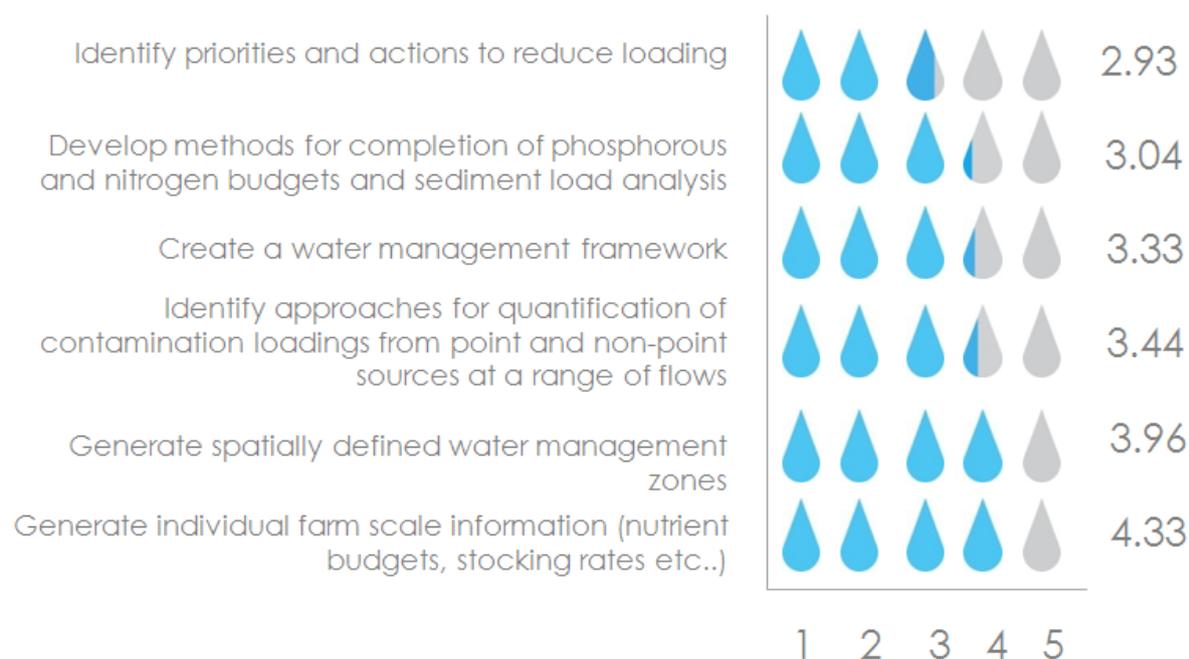


Figure 9 Water general knowledge gaps ranked from according to relevance to research priorities for land management.

The findings also indicate that the cross-sectorial nature of land and soils research has resulted in insufficient attention being given to the development of shared research priorities to make the most of available resources and funding, and to guarantee the on-going development of national soils data and physical infrastructures. A cross-sector strategy could address these shortcomings and, most important, improve the effectiveness and efficiency of soils research in New Zealand to address a range of important policy issues.

Recommendation 2: Bridge the science–implementation gap by agreeing on land and soil research priorities, working across the land and water domain, and moving beyond the unidirectional transfer system that traditionally operates between science and end-users.

4 The Way Forward

4.1 A National Land and Soils Perspective

Key Finding 3: Organizations in New Zealand who are working in the land and soil space show significant willingness to develop a collective prioritising of information needs.

The combined workshop involving the LMG, LMF, and NLRC revealed a genuine appetite to work with others in developing a coherent vision for land and soil research – including the impact of land on water. The proposal below builds on these discussions and offers suggestions as to the key building blocks that may be required to realise this bigger picture (see Figure 10).

4.1.1 Develop a Work Plan

There have been a number of changes in New Zealand's science agenda. There has been a strengthening of the positioning of science within the highest level of policy formation, recognising that science has a broader part to play in New Zealand's growing economy. The Government's total cross-portfolio funding for science and innovation recently rose from \$1.24 billion in 2012/13 to \$1.36 billion in 2013/14. Increasing attention is also being paid to improving the transfer of knowledge from the public to the private sector and strategies to increase New Zealand's private sector investment research and development. Furthermore, the National Science Challenges have highlighted the importance in investment in science across a broad range of domains.

Land and soil science has struggled to keep up with rapidly changing government science agenda. There has been a massive growth in all facets of research, data, and delivery in information from a range of providers, particularly within the private sector. As a result funding has become increasingly competitive and decision-making continues to be localized. There are a variety of well-laid plans – driven by legislation, policy statements, action plans – but currently there is insufficient focus on the big picture and a lack of centralized policy or strategy to move forward.

Against all these changes and shifts it is important to think collectively to determine the major game changers in the science-policy system.

Build Awareness

Create awareness that encourages investment in the value of soil and land resources.

Enhance Knowledge

Further multi-disciplinary research that addresses immediate and future issues.

Increase Capacity

Foster capacity building and capture knowledge from retiring experts.

Take Inventory

Identify gaps in soil and land information and develop standards for future reporting.

Develop a Work Plan

Nurture endemic processes that drive soil and land research.

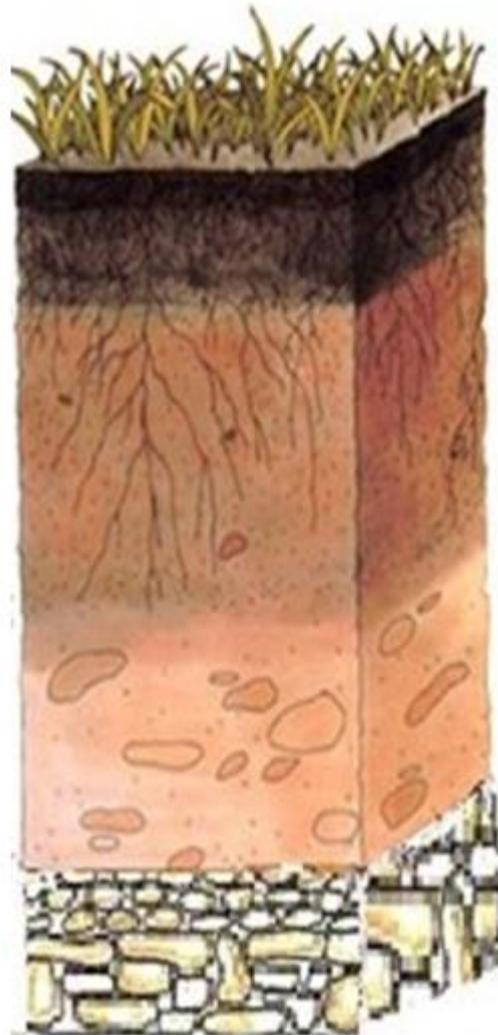


Figure 10 Different horizons (stages) of a national land and soil perspective.

4.1.2 Take Inventory

A key initial step will be in establishing gaps in soil and land information and, where necessary, enhancing the system to meet needs. Having a robust information platform is likely to reduce the risks of poor decisions, locally, regionally, and at the national scale. Soil and land resources change across space, over time, and in complex ways as they are managed.

The information describing these dimensions of change can be broadly grouped as mapping, modelling and monitoring. These are interdependent approaches to obtaining and using land resource information; together they provide the information necessary to improve land management and soil and land health over time and across landscapes. The information products needed are site data of various forms, maps, images, and spatial data,

trends and projections and models, tools and analytical approaches. The full set covers processes (such as the biological drivers of soil health, nutrition and carbon cycling, physical aspects of soil water movement, storage and plant use, chemical activity on clay and humus surfaces, and the combined factors that constitute a soil's capability for agriculture and wider ecosystem functions) and their distribution over time and space.

New Zealand has had excellent programmes in land resource assessment, soil, and ecosystem modelling, and some components of environmental monitoring. There is a strong legacy of process knowledge and world-leading model capability, leadership in remote sensing and in data that provides context for soil and land information, and a long legacy of on-farm soil information. However, current national databases are using a mixture of this information, some of which was collected more than 20 years ago. There is an urgent need for updated high-resolution data and information on national, regional, and local resources. It is also of utmost importance that existing soil and land data are accessible, appropriately managed, and brought together in one database and information system.

4.1.3 Increase Capacity

Capacity enhancement has been identified as a successful mechanism to translate knowledge into action; however, this depends on access to knowledge and includes providing tools to initiate, guide, and support improved understanding of land resource information. Through another activity, the NLRC revealed a significant gap in capability to use and interpret science and information. This issue was made more problematic by the growing number of land experts in science and government approaching retirement.

Though capacity enhancement is high on the national science agenda, there are limited opportunities to gain training in the application of new resources. A new approach is needed to build the knowledge of and skills for land resource management that in turn will help bridge the gap between science and practice. One of the first steps in building capacity is to identify potential actions that would nurture critical staff competencies that underpin effective knowledge transfer and improved environmental management. For example, land managers require the capacity to critique and use knowledge effectively and to work out and use policy options in a dynamic environment. This can be achieved by identifying the capacity of researchers to transfer knowledge and in turn by identifying the capacity of land managers to critique and use this knowledge.

4.1.4 Enhance Knowledge

There are a large number of research activities and land-related projects around the country. Many projects would benefit from increased coordination with other on-going research activities. Communication among research communities dealing with various aspects of land and soils can be limited, with insufficient focus on inter- and trans-disciplinary research.

Building bridges between various research communities could bring substantial benefits to the national scientific knowledge base. Breaking disciplinary barriers between geology, soil science, agronomy, forestry, farm management, water quality, and ecosystems research could improve the quality and applicability of research and provide new avenues for future integrated research and development programmes.

The biophysical aspects of research must be associated with relevant research into social, political, and economic issues that are inherently tied to the whole questions of soil protection/conservation through soil management.

4.1.5 Build Awareness

Over the last two decades, investment and technical cooperation for soil and land information have been lacking, but greater attention is now being paid to these invaluable resources. Soil knowledge and soil implications on water, biodiversity, and food issues are not properly addressed in the general education system, so a widespread effort is needed to create public awareness and strengthen curricula and training on the importance of sustaining soils and their functions.

Creating awareness at all levels about the importance of soil and land resources for supporting life will be a key element to increased investment in the soil and land space. Awareness-raising campaigns and other mechanisms should be used to raise awareness and related support activities. Furthermore, education in the field of soil science should be reinforced as a profession. This has been neglected in recent decades and as a consequence there are limited technical capacities both in countries and in international bodies dealing principally with sustainable soil management.

Recommendation 3: Progress a national land and soils perspective that incorporates five stages of action: develop a work plan, take inventory, increase capacity, enhance knowledge, and build awareness.

4.2 Strategic Collaboration

Key Finding 4: The land and soil sector is fragmented in New Zealand, with focus on individuals or institutional endeavours. Access to expertise and information often depends on individual relationships.

Today's environmental issues are increasingly challenging and inter-disciplinary; meeting these challenges requires continuing communication between science providers, government, land-managers, landowners, and the public. While the need for research has never been greater, the changing need and composition of research users pose new challenges to research and science delivery. This change in management has led to a lack of clarity as to what new knowledge is needed, who needs it, and how it should best be delivered. Research organisations in New Zealand recognise that collaboration in management and research is essential for sustainable management.

4.2.1 Provide Leadership

Managing soil and water resources in a sustainable and equitable manner needs a new political vision. There is much more to it than just coordinating science research – there is a need to have awareness of the issues at every level, from parliament through to children within schools.

Strategic leadership is needed to ensure research evidence is incorporated within policymaking and good practice in land resource management. To do this requires a steering of research towards problem solving and consolidating knowledge about 'what works'. Much discussion is still needed about how to facilitate knowledge transfer efficiently and effectively to achieve more systematic and transparent methods to identify, synthesise, and communicate scientific knowledge into policy.

4.2.2 Foster Alignment

To build greater strategic alignment there is a need to build partnerships across science, government, and business as well as develop a collaborative strategy to prioritize research efforts. Science providers are becoming more aware of the needs of the end users of its scientific products and are working collaboratively with them to develop scientific outputs that can be easily implemented. More specifically, the NLRC has been established to enable the science sector to deliver authoritative fit-for-purpose land resource, management, and sustainability data, information, tools, and services to regional councils and other stakeholders via a single "one-stop shop" entity. The Centre provides access to information for a wide range of user interest

groups and aims to help develop the capacity of those researching, governing, and managing the land resource by focusing on capturing knowledge from those experts and developing ways to share this knowledge effectively with others. It aims to better connect research to users in the science community by communicating information in a way that is valuable to specific user needs. The Centre also facilitates engagement between stakeholder groups, and provides a neutral environment for stakeholders to discuss and develop new opportunities for better management land. In the longer term, enhanced capability supported through secondments, seminars, workshops and online training will also enable better information exchange.

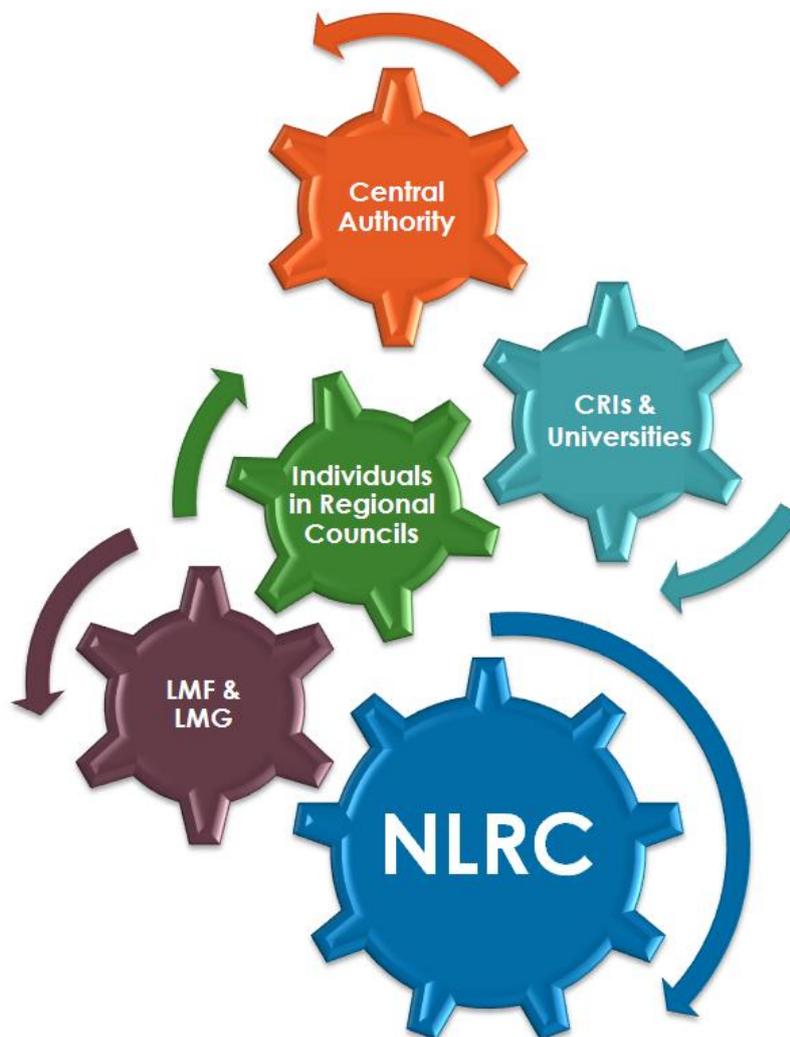


Figure 11 Good alignment is critical to drive the land and soil science and management machine.

Recommendation 4: Stakeholders must work collectively to ensure issues are addressed and decided on through an inclusive collaborative process.

6 Conclusions

In 2007, the Regional Council's CEO forum and Resource Managers Group endorsed the development of the Research, Science & Technology Strategy. The Strategy provides the structure and institutional arrangements needed to strengthen national research capability and better address regional research and development issues.

There are opportunities to improve cooperation and collaboration and adopt a more strategic approach to soil and land management within the framework of the RS&T strategy. At present, information on the land resource – and the capacity to commission, generate, interpret, and use it – is distributed across many organisations.

An improved work plan must focus on developing a collaborative approach to land and soil research. Regional councils and science providers must collectively progress a research strategy that considers immediate and long-term issues and is inclusive of a wide range of stakeholders. This strategy must work across both the land and water domain, and move beyond the unidirectional transfer system traditionally operated between science and end-users. While barriers to this approach still exist, there are a number of opportunities that promise to bridge or shrink these gaps. Key to this is the transfer of science information into land management and planning through one coordinated effort, such as the NLRC. In time, there is potential that all land-based decision-making will draw on the same consistent information, increasing the effectiveness of regional council operations and streamlining the interactions with farmers and other stakeholders.

7 Acknowledgements

The NLRC would like to acknowledge the generous contribution of time and intellectual effort by LMF, LMG, a number of regional council staff through surveys and workshops. Anne Austin for editing, and Landcare Research staff are also acknowledged in the production of this report.

Appendix 1 – Survey

Regional Councils Critical Issues and Research Priorities 2013

Background Information

Please provide us with some general background information about where you work, what type of work you do, and any professional associations you belong to.

1. Region

- Gisborne
- Auckland
- Bay of Plenty
- Marlborough-Nelson
- Hawke's Bay
- Manawatu-Wanganui
- Northland
- Taranaki
- Waikato
- Wellington
- Canterbury
- Otago
- Southland
- West Coast

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2. Job classification

- Compliance and Enforcement
- Administration
- Communication and Marketing
- Community
- Environmental Sciences or Other Science
- Planning
- Management
- Horticulture
- Information Management
- Information Technology
- Project Management
- Regulatory Enforcement
- Policy
- Other (please specify)

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3. Which of the following Special Interest Groups (SIG) are you a member of?

- Envirolink Governance Committee
- Science Advisory Group
- Resource Managers Group
- Consent Managers
- Civil Defence and Emergency Managers
- Science Advisory Group
- Consent Manager
- LAEMG Hydrology/Groundwater
- Compliance Monitoring and Enforcement
- Land Monitoring Forum
- Land Management Group
- National Air Quality Working Group
- Biosecurity Managers
- Biodiversity Forum
- Regional Waste Mangers and Contaminated Land Forum
- Surface Water Integrated Management
- Ground Water Forum
- Rivers Managers Group
- Coastal Planners Group
- Regional Policy Managers
- Natural Hazards Group
- I am not a member of an SIG

Other (please specify)

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Critical Issues

In this section there are series of questions relating to land and soil critical issues. The questions are designed to identify what you feel are the most important ('critical') immediate and future land and soil issues. The questions consist of a variety of formats including ranking (Q4), short answer (Q5), and scaling (Q6). Please read the instructions carefully for each question. For each of the questions select the best answer based on the options provided.

4. Below is a list of issues identified for soil and land science. Please rank the following issues from 1 = most important to 8 = least important.

<input type="text"/>	Valuing environmental services
<input type="text"/>	Improved soil land use information
<input type="text"/>	Soil degradation and contamination
<input type="text"/>	Erosion
<input type="text"/>	Land use intensification
<input type="text"/>	Land use impacts on water quality
<input type="text"/>	Impacts of nutrients and sediments on estuaries and coastal environments
<input type="text"/>	Cumulative effects of activities on ecosystem structure, function and resilience

5. If there are any other issues not listed in Q4 please identify these issues and indicate where they would rank in relation to those listed in Q4.

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6. The following is a list of critical soil and land issues identified in 2010. Please identify the relative priority (1= low priority to 5 = high priority) of each issue for 2013.

	1	2	3	4	5
Valuing soil environmental services for contributing to water services	<input type="radio"/>				
Valuing soil environmental services for contributing to biodiversity	<input type="radio"/>				
Valuing soil environmental services for contributing to carbon	<input type="radio"/>				
Soil contaminant accumulation	<input type="radio"/>				
Land use impacts on water quality	<input type="radio"/>				
Quality soil and land use information	<input type="radio"/>				
Erosion and sedimentation	<input type="radio"/>				
Soil quality trends and indicator development	<input type="radio"/>				
Impacts of carbon sink establishment	<input type="radio"/>				
Loss and management of high class soils	<input type="radio"/>				
Economic value of Good Environmental Practice	<input type="radio"/>				
Peat soil subsidence	<input type="radio"/>				
Inherent soil mineralogical changes under land use	<input type="radio"/>				

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Research Priorities

The following questions are designed to identify the immediate and future research needs in land and soil research. The questions consist of a variety of formats including scaling (Q7, Q8 and Q9), ranking (Q10) and open answer (Q11). The answers provided have been derived from documents and previous discussions around land and soil research. Please select the best answer based on the options provided.

7. Please indicate your level of agreement to each of the following statements

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Current research is not led by clear national level objectives or direction	<input type="radio"/>				
We have limited social and economic research that is integrated with biophysical science	<input type="radio"/>				
We need a clear 'map' of all existing research, how it links together, and the links to outcomes	<input type="radio"/>				
Competition for science compromises research outputs and uptake	<input type="radio"/>				
Research outputs is disparate with sporadic promotion to end-users	<input type="radio"/>				
Variable capacity at regional level affects science uptake into policy	<input type="radio"/>				
There is a current shortage of skilled and qualified specialists in land and soil science	<input type="radio"/>				
There are a range of really good tools and resources available but it is difficult to gain access to them	<input type="radio"/>				
Greater emphasis is needed on the translation of technical information into field based solutions	<input type="radio"/>				
There is a need for greater collaboration between science providers and local authorities	<input type="radio"/>				
There are many tools and models available but there is limited on-going support for these tools	<input type="radio"/>				

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8. Below is a list of research needs. Please evaluate each research need using the following criteria.

Importance- How important is the research to improve land management?

Significance - How significant is the research to the wider community?

Dependence - Is future research dependent on the completion of the research?

	Importance	Significance	Dependence
Develop a tool to identify the financial and non-financial value of land resource services	<input type="text"/>	<input type="text"/>	<input type="text"/>
Provide a methodology for adopting an evidence-based approach to policy development	<input type="text"/>	<input type="text"/>	<input type="text"/>
Better understand the effects of nutrients and sediment generation and transport on freshwater and coastal ecosystems	<input type="text"/>	<input type="text"/>	<input type="text"/>
Provide a spatial representation, model and accumulation rate of contaminants	<input type="text"/>	<input type="text"/>	<input type="text"/>
Better understand the cumulative effects of land use on water quality	<input type="text"/>	<input type="text"/>	<input type="text"/>
Better link between farm scale and catchment scale models	<input type="text"/>	<input type="text"/>	<input type="text"/>
Better understanding of the transfer pathways and attenuation of nutrients and contaminants through soil and the vadose zone	<input type="text"/>	<input type="text"/>	<input type="text"/>
Improved understanding of the cumulative effects of on-site and off-site activities on natural systems	<input type="text"/>	<input type="text"/>	<input type="text"/>
Understand the biological effects of contaminants	<input type="text"/>	<input type="text"/>	<input type="text"/>

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9. Please indicate the relative urgency of each of the following research needs.

	Very Urgent	Urgent	Somewhat Urgent	Not Urgent
Enhance the capabilities and scope of S-map	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrate AgriBase and LCDB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Update land use change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improve the quality of soil data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Update Land Use Categories (LUC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improve access to land information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. Please rank the following water general knowledge gaps according to the relevance to the research priorities for land management.

Create a water management framework

Generate spatially defined water management zones

Develop methods for completion of phosphorous and nitrogen budgets and sediment load analysis

Identify approaches for quantification of contamination loadings from major point and non-point sources at a range of flows

Identify priorities and actions to reduce loadings

Generate individual farm scale information (nutrient budgets, stocking rates etc..)

11. Please list any additional research priorities, needs or gaps that you feel should have been listed in the above questions.

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Strategy

The following questions are designed to receive feedback on science challenges and strategies identified in the 2011 Regional Council Research, Science and Strategy Review.

12. Please provide specific examples as to how to best address the following challenges.

Better connect research to users

Create greater research linkages to policy

Nurture greater strategic alignment

Greater identification of limits of acceptable environmental change

Facilitate more integrated and cross-disciplinary research

13. In what ways do you feel science challenges have changed in recent years? How do Regional Councils and associated science providers need to adapt their science strategies to address these new challenges?

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Alignment

The following section aims to identify opportunities of alignment between the National Land Resource Centre (NLRC), Land Mangers Forum (LMF) and the Land Management Group (LMG). The NLRC is a collaborative science centre that operates beyond current institutional boundaries, communicates science without exclusivity of language or form, and provided the evidence and capability from which to enhance and unlock the 'land economy'. You do not need to be familiar with the NLRC and its work in order to answer the following questions. If you would prefer to learn more about the NLRC before proceeding, please refer to their website (www.nlrc.org.nz).

14. Below is a list of issues identified by the NLRC. Please indicate to what extent you agree with each statement.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
The science sector is fragmented with focus on individual or institutional endeavours.	<input type="radio"/>				
There is no agreement on research priorities across sectors and this has lead to knowledge gaps or duplication of effort.	<input type="radio"/>				
Science is often unable to be mobilised quickly enough to meet needs.	<input type="radio"/>				
There is a lack of robust, defensible and integrated evidence to support decision-making.	<input type="radio"/>				
Current science knowledge has gaps in spatial, temporal and thematic coverage.	<input type="radio"/>				
The current science model focuses on responding to and not anticipating issues.	<input type="radio"/>				
Expertise and information resides in many institutions and access depends on individual relationships.	<input type="radio"/>				
Science is not packaged for easy adoption.	<input type="radio"/>				
Knowledge of land and water resides in an ageing group, with a reducing capacity to use science outputs.	<input type="radio"/>				

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15. Please identify which of the following actions best address each of the science challenges listed below. You may select more than one action.

	Build partnership across science, government, and business	Establish cross-sector research priorities for land and water research and information	Develop a collaborative strategy to prioritize research efforts	Create a single point of entry into all resource information, organisations and experts	Ensure science is communicated in a way that is valuable to specific uses and needs	Lift collective capability through seminars, training workshops, providing online resources and other targeted activities (e.g. secondments)
Better connect research to users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Greater research linkages to policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Greater strategic alignment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Greater identification of limits of acceptable environmental challenges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More integrated and cross-disciplinary research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Please provide suggestions on how the NLRC can support Regional Councils and/or support the LMF and LMG in achieving their desired goals and outputs.

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Additional Comments

Please provide any additional comments and feedback that you feel have not been addressed in this survey and are relevant to the topic area. For each comment please indicate if it is specific to one of the topic headings provided in the survey (Background Information, Critical Issues, Research Priorities, Strategy, Alignment or Other).

17. Please provide any additional comments and information you feel will be valuable in identifying immediate and future issues and research priorities relating to the land and soil science and management.

18. If you would like to receive the results from this survey and/or the final report, please supply your e-mail address below.