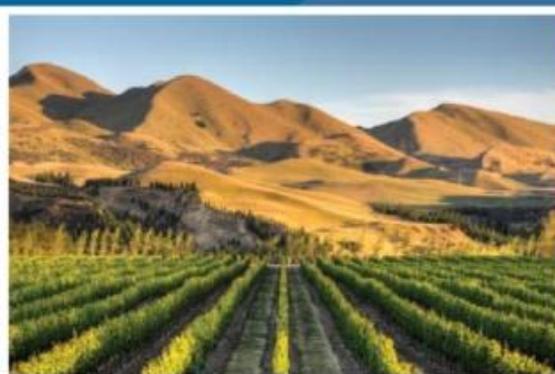


A stylized graphic of a mountain range with a winding river. The mountains are light blue with white outlines, and the river is a darker blue. The background is white.

# A Preliminary Review of Capacity Building Needs in the Land Resource Sector



NATIONAL  
LAND RESOURCE  
CENTRE



# A Preliminary Review of Capacity Building Needs in the Land Resource Sector

**Emily S. Weeks, David Medyckyj-Scott, Alison Collins**

*National Land Resource Centre*

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*National Land Resource Centre, c/o Landcare Research, Massey University, Private Bag 11052, Palmerston North 4442, New Zealand, Ph +64 6 353 4921, Fax +64 6 353 4801, [www.nlrc.org.nz](http://www.nlrc.org.nz)*



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Reviewed by:

Approved for release by:

Ross Abercrombie  
President  
New Zealand Association of Resource  
management

Justine Daw  
GM Science & Policy  
Landcare Research

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## Summary

The National Land Resource Centre (NLRC) conducted a pilot study on the current capacity building needs in soil and land resource science and management. The study provided preliminary insight into capacity needs across a range of professions associated with natural resource management, and highlighted key areas where further investigation is required. This study illustrates the need for a more comprehensive study that would guide the development of a collaborative approach to capacity enhancement. In time, there is potential for more effective transfer of scientific information that will encourage the integrated management of natural resources to meet the need of a growing economy while at the same time protecting the environment.

## Key Findings

1. The need to build capacity to understand and use soil and land resource science is becoming increasingly pertinent for land management.
2. Professionals are concerned that they are unable to keep up with emerging technologies.
3. There is a growing demand for technical training in the use of data and recently developed tools or related applications.
4. Only a limited number of training providers specifically cater to current needs relating to skill building for particular resources.
5. Wider collaboration between science providers would enable more efficient transfer of science knowledge.

## Recommendations

1. Conduct a comprehensive review of regional and national capacity needs in land and soil science and management.
2. Enhance existing capacity by transferring knowledge from experts who are approaching retirement to others.
3. Design a knowledge transfer system so that authoritative information can be delivered from a variety of science providers and presented in a way that fosters efficient and effective understanding of complex science information.
4. Develop a collaborative capacity enhancement strategy that identifies opportunities for on-going knowledge transfer.
5. Build on existing networks of training providers and identify new opportunities for tailored technical development programmes.
6. Support the development of professional recognition programmes that provide certification for specialized sectors and staged training for early-career professionals.

# 1 Introduction

## 1.1 Background

The need to base environmental management on the outputs of innovative science and technological advancements attracts increasing attention. Such a concept requires not only enhanced capacity among all stakeholders but also ample time and effort to diffuse research results successfully to land managers, policy-makers, and practitioners. Despite good science, knowledge gaps are widening between science and environmental management. New environmental regulations and incomplete understanding of scientific information by landowners, pose added challenges for complete and effective implementation of the best environmental practices (Kaniaru et al. 2002). Furthermore, the research required to inform effective environmental management has increased in complexity, requiring greater scientific knowledge and more sophisticated technological tools.

In 1996 the government adopted the Sustainable Land Management Strategy, which established a committee to enhance the capacity of landowners to better manage their land resources (MfE 2010). In 2010 the strategy was updated and identified land degradation and soil health as key areas posing environmental and long-term productive capacity risks for land use. It listed key actions required for better management of land resources, including the development of land management skills.

Since then several joint initiatives between central and regional government were set up to implement the key actions, including the New Zealand Land Management Strategy, the National Science Strategy for Sustainable Land Management (SLM), and the Sustainable Agricultural Facilitation Programme. The focal point of each strategy was land users (i.e. farmers), and as a result at least 55 community-based groups have formed throughout the country to address local problems.

In 2010/11, through the stream of capacity building initiatives, MPI worked with New Zealand Association of Resource Managers (NZARM) and alongside regional councils to develop targeted training packages (on a regional basis) to support knowledge and skill building for land sustainability officers (MPI 2010). MPI provided free workshops for land managers around the North Island that were advertised via NZARM networks and run with the support of regional councils. There included workshops on erosion processes, land-use capability, and catchment and farm systems management.

Since 2011 new tools, online material, and spatial data sets have been released by the science sector. However, at present there are limited opportunities for landowners and managers to gain training in the application of these new resources, meaning better land management

decisions are being hampered through poor understanding of innovative science and technological advancements. 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.

## 1.2 Rationale

In response to feedback from a range of stakeholders on the need for capacity building for better land management, the National Land Resource Centre conducted a short on-line survey of those interested in managing land resources. The survey had three main aims:

- Determine the need for capacity building
- Identify sectors in need of capacity building
- Highlight key areas where professional training is required

The survey, conducted from 1 October to 30 November 2012, included a range of multiple-choice and open-answer questions that addressed the current and future capacity building needs of stakeholders. The survey was open to all those working in the land resource sector (including landowners) and could be completed anonymously and in their own time.

## 2 Results

The following results section reflects the views of the 79 people who participated in the survey. The results were summarized based on the respondents' answers to the multiple-choice questions and their comments in response to the open-answer questions. All respondents answered the multiple choice questions and 30 respondents provided comments for the open-answer questions.

### 2.1 The need for capacity building

According to those surveyed there is growing concern that knowledge in soil and land resource science in New Zealand is waning and there is a need to re-build capacity for better and more sustainable land management. Eighty-four percent of those surveyed 'Agree' or 'Strongly Agree' that there is need for building capacity in the soil and land resource sector within their organisation (Figure 1). Respondents indicated there are limited opportunities

to build this capacity.

**There is a need to build capacity in soil and land resource science and/or management in my organization.**

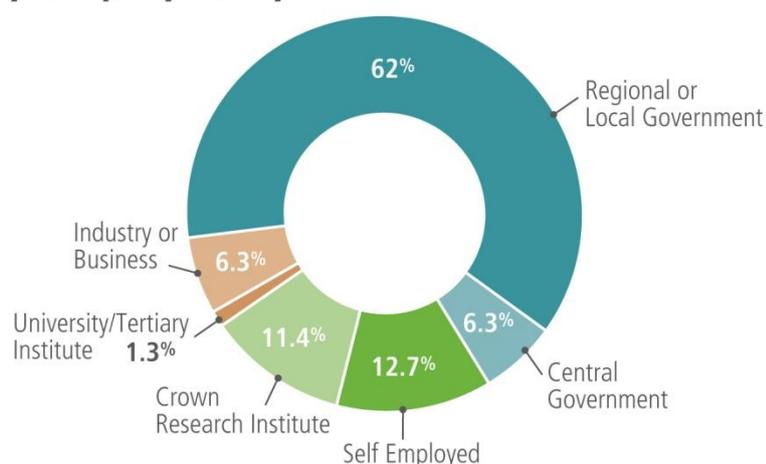


**Figure 1.** Degree of respondents' agreement with the statement "There is a need to build capacity in soil and land resource science and/or management in my organization".

## 2.2 Sectors in need of capacity building

Of those surveyed, 62% were employed by regional or local government, 12.7% were self-employed, and 11.4% worked in crown research institutes (Figure 2). A small percentage of those surveyed were employed by or associated with industry (6.3%), central government (6.3%), and tertiary institutes (1.3%).

### Currently employed by

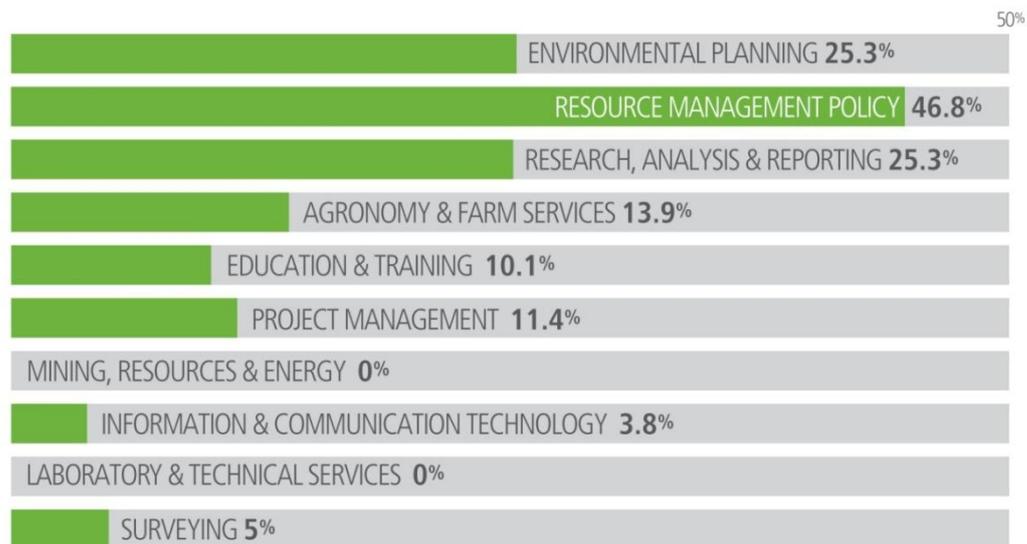


**Figure 2.** Current professions of those that participated in the survey.

The majority of those employed in the land resource sector performed a wide range of tasks, primarily involved in environmental planning and resource

management and policy (Figure 3). These same individuals were responsible for collating information and conducting analysis for reports. Other areas of employment included agronomy and farm services, project management, and education and training; less than 4% perform tasks in IT, and 5% are surveyors.

## Types of Employment



**Figure 3.** Category that best describes the nature of employment of those surveyed.

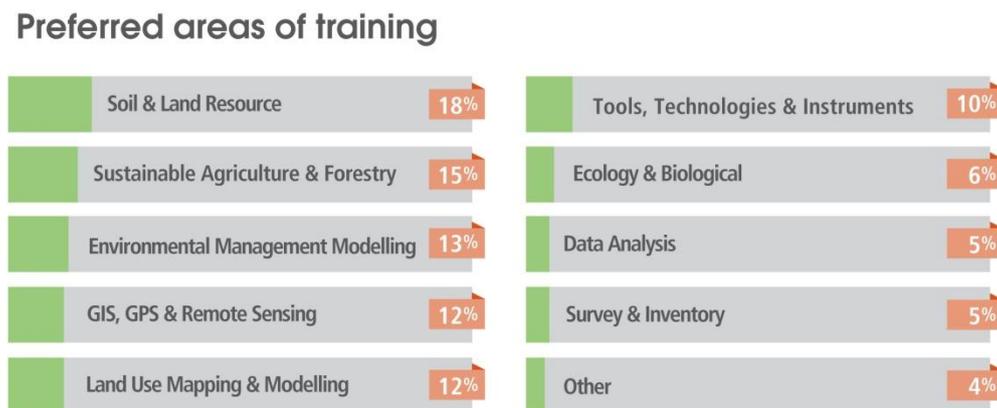
\* The total adds up to more than 100% because respondents were able to tick more than one box.

### 2.3 Key areas where professional training is required

According to those surveyed the need for training varies; while it is required in all areas of land resource management, there is a particular need for GIS, GPS, and remote sensing training (Figure 4). There is also a need for training in soil science and land resource assessment, and environmental management and monitoring. More specifically, there is a demand for technical training in recently developed tools and related applications. Specific comments included “I am aware there are really good, useful data bases out there but I don’t have the capacity and skills to access and use them effectively – I don’t know really what tools I need to do”, and “All tools and resources are widely available. It is the translation of the technical information into field-based solutions which needs conveying to the new breed of land manager”.

Most of those surveyed expressed concern about not being able to keep up with emerging new technologies, along with concern for training in existing land management tools – which include LUC, LCDB, S-Map, and Overseer. A

common request was for an overview course in sustainable land management and skill building in data interpretation and spatial analysis.



**Figure 4.** Preferred areas of training by those working in land resource management and science.

Although the survey identifies an on-going demand for capacity building that supports science-based decision-making, only a limited number of training providers specifically cater to current needs. Respondents indicated that regional councils and CRIs (for example Scion, AgResearch, and Landcare Research) provide sporadic one-on-one and small group training, and universities such as Lincoln University, The University of Waikato, and Massey University offer workshops, degrees, diplomas or certificates in related fields. NZARM and Fertilizer & Lime Research Centre (FLRC) have also provided workshops and short courses and have recently both entered into accreditation and training schemes for people in their organisations to ensure on-going professional development to high standards.

## 2.4 Capacity building opportunities

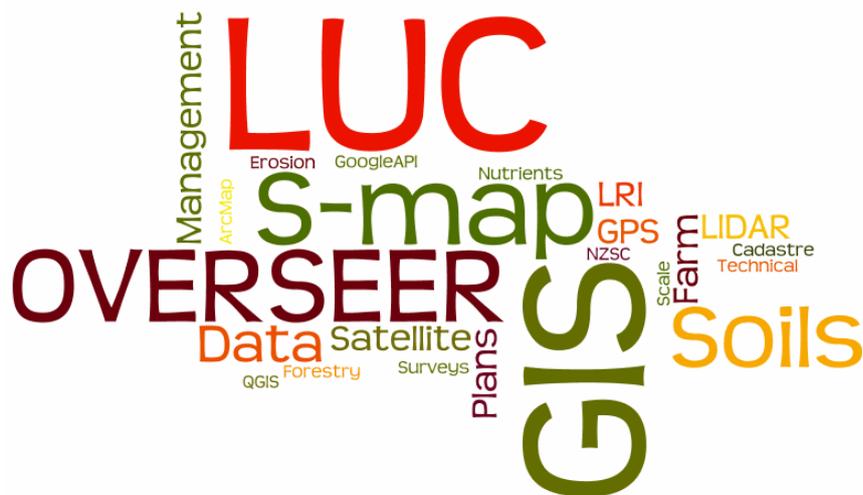
Respondents indicated NLRC could make a contribution by helping coordinate technical training in the use of soil and land resource science and tools. Most of those surveyed supported the NLRC providing workshops, short courses, and specialized technical training. Each of these training opportunities would require 1–3 days of face-to-face contact. A common suggestion was for the NLRC to facilitate web-based training (including webinars) (Figure 5).

## Preferred duration of training course



**Figure 5.** Preferred duration of training courses.

Most of those surveyed also agreed that the NLRC could play a pivotal role in knowledge transfer of many existing tools and technologies provided by various CRIs. Land managers, consultants, and landowners require on-going training in LUC, S-Map, LCDB, Overseer, and a variety of GIS applications (Figure 6). For example, the NLRC could provide a series of workshops and networking opportunities, and also supply informational material (including newsletters) that catered to the needs of each of its stakeholders.



**Figure 6.** Areas where training is requested. The size of the word corresponds to the number of times it was mentioned as an area needed for training – the larger and bolder the word, the more frequently it was mentioned.

Respondents also suggested the NLRC could coordinate (in partnership) a series of workshops/training courses that would make it possible for users to be accredited in the use of different tools and technologies. Several respondents suggested the NLRC could coordinate face-to-face training that catered specifically to different sectors; for example, training in proper sampling methods, the use of geo-statistics, and various standardised Digital Soil Mapping techniques for land managers. It could also provide workshops for land owners (e.g. farmers) and agricultural consultants on how to apply tools

such as S-Map and Overseer at a local scale. It is important that there is a standardised approach to extrapolation of information from each of these tools. These workshops could lead to the accreditation of users of various tools and technologies such as S-Map.

### 3 Conclusions

Today's environmental issues are increasingly challenging and interdisciplinary; 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 ambiguity as to what new knowledge is needed, who needs it, and how it should best be delivered. Research organisations and regional councils in New Zealand are recognizing that collaboration is essential for sustainable management.

Agendas and priorities for land management are developing quickly. There is increasing attention on how to promote economic development while maintaining natural systems. Such shifts in perception require new capacities among business, industry, researchers, and land managers and owners. Improved capacity and more effective transfer of scientific knowledge will strengthen sustainable land management initiatives and empower landowners to deal better with changes in environmental regulation.

Recent legislative changes have led New Zealand to re-evaluate its approach to the delivery of scientific information. Crown Research Institutes are becoming more aware of the needs of the end users of their scientific products and are working collaboratively with end users 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 government and business via a single "one-stop shop" entity. The NLRC 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 in which to share this knowledge effectively with others. The NLRC also facilitates engagement between stakeholder groups, and provides a neutral environment for stakeholders to discuss and develop new opportunities for better management of New Zealand's greatest asset – land.

## 4 Recommendations

### 4.1 Capacity Enhancement Strategy

At present, information on the land resource – and the capacity to commission, generate, interpret, and use it – is distributed across many organisations. There is a need to develop a collaborative strategy that creates a single point of entry into all resource information and experts. This would be implemented in three main phases: Identify critical gaps; Enhance existing capacity; and Nurture knowledge transfer (Figure 7).



**Figure 7.** Three phases of a capacity enhancement strategy.

#### 4.1.1 Phase One: Identify Critical Gaps

Dealing with the discrepancy between the capacity of New Zealand's environmental agencies on paper and in practice has recently become a high priority on the central government agenda. The first phase is to identify those critical gaps in the soil and land resource capability that underpin effective knowledge transfer and improved environmental management. The need for land information is varied among a range of stakeholders. A more comprehensive and targeted (across all stakeholders) investigation of information needs and science ability to meet those needs is required to identify areas most critically in need of capability building.

**Recommendation:** *Conduct a comprehensive review of regional and national capacity needs in land and soil science and management.*

#### 4.1.2 Phase 2: Enhance Existing Capacity

Capacity enhancement has been identified as a successful mechanism to translate knowledge into action (Bogardi & Hartvelt 2000); however, this

depends on access to knowledge and includes providing tools and knowledge to initiate, guide, and support improved understanding of land resource information (Brown 2001; WBI 2004). The second phase aims to enhance existing capacity by identifying researchers' capacity to transfer knowledge and then identifying the capacity of land managers to critique and use this knowledge. During this phase a series of technical training opportunities should be designed for (but not limited to) professionals and land managers who wish both to keep up to date with information provision, and to maintain high professional standards in the soil and land resource sciences. Delivery will need to acknowledge that due to professional commitments many of those taking part may have limited time available.

Enhancing existing capacity also involves transferring knowledge from experts who are approaching retirement – and who have built a repository of knowledge over the years – to others. A good knowledge transfer programme must have a way to sort out the high risk/high value expertise from the expertise that is already out of date or already exists in sufficient bench strength within the organization. To be of real value, knowledge transfer must move such an expert's explicit knowledge and his or her tacit knowledge. Most of the experts who are asked to transfer their knowledge are among the busiest people, so the knowledge transfer exercise has to fit into the fabric of their regular work. Knowledge transfer programmes therefore require a mix of knowledge management tools and knowledge transfer methods.

**Recommendation:** *Enhance existing capacity by transferring knowledge from experts who are approaching retirement to others.*

### 4.1.3 Phase 3: Nurture Knowledge Transfer

The third phase aims to enable businesses, government, researchers, and the public to understand, use effectively, and enhance New Zealand's land resources. This involves developing a strategy that promotes effective knowledge transfer from research providers to end users. This includes testing alternative capacity building strategies and testing each mechanism in its effectiveness to transfer knowledge from researchers to practitioners. This will provide both a framework for on-going knowledge transfer and the development of capacity-building initiatives erected on wider collaboration between environmental managers, scientists, farmers, indigenous land owners and other stakeholders who regularly deliver a broad range of environmental outcomes.

Knowledge transfer should be designed so that authoritative information is delivered from a variety of science providers in a way that can be easily discovered, identified and explored – and provides opportunities to dig deeper as required. Techniques such as information graphics, information

design, and data visualization will foster efficient and effective understanding of complex science data. These techniques, combined with the development of new tools and technologies that present data spatially, will allow for easier and more efficient application of complex scientific ideas.

## 4.2 Meeting current capability building needs

### 4.2.1 Encourage collaboration

A collaborative approach is required to transfer scientific information effectively from science providers to end users. An engagement process needs to be developed that encourages the transfer of the most up-to-date science knowledge and technology about the changing conditions of the environment. In time, there is potential for more efficient knowledge transfer of science knowledge that will encourage the integrated management of natural resources to meet the need of a growing economy while protecting the environment.

The specific intent of a collaborative capacity-enhancement strategy is to promote effective knowledge transfer from a range of science and training providers to a range of end users. At a strategic level it is important to identify modes of partnership that provide mutual benefits between all land-resource stakeholders incorporated within a national research agenda for land resource science. A collaborative strategy should include a framework for on-going knowledge transfer and encourage the development of capacity enhancement initiatives that will consider future regional-, national-, and sector-based priorities.

**Recommendation:** *Develop a collaborative capacity enhancement strategy that identifies opportunities for on-going knowledge transfer.*

### 4.2.2 Building on existing networks

#### *Ministry of Primary Industries*

In 2010/11 MPI developed a series of workshops that included erosion processes, LUC mapping catchment management, and farm management for regional councils. These workshops could be reinstated; however, there would be a need to update materials and to complement them with workshops that cater to the current requirements of regional councils (e.g. nutrient management, S-map, Overseer). NLRC could work alongside MPI (NZARM, and LMG SIG) to facilitate these workshops and collaborate with current course providers such as FLRC (Massey University).

Any programmes (e.g. workshops or short courses) designed to meet the needs of regional councils will in turn provide opportunities for further engagement with those working alongside regional councils (e.g. land managers and consultants working with/for industry). There is also ample opportunity for the NLRC to facilitate engagement with a wider range of stakeholders, by using webinars and providing online training material. This will particularly suit tools or resources, such as LUC, LCDB, Overseer and S-map, that may have on-going updates (improvements), and users will require flexible and easily accessible training, manuals, and guidance (Figure 8).



**Figure 8.** Professional development programmes designed to meet the needs of a range of stakeholders.

### *Fertilizer and Lime Research Centre*

The FLRC is closely associated with the Soil and Earth Sciences Group and the initiatives of Massey Agriculture and Environment, the NZ Centre for Precision Agriculture, and the NZ Biochar Research Centre. It has strong links with industry and other science providers through research contracts and collaborative projects. The Centre offers professional development short

courses tailored to the needs of science, industry, policy and regulatory bodies concerned with primary production and is available to consult on a wide range of issues. FLRC also hosts an annual workshop on a topic of importance to the New Zealand land-based industries. Proceedings are published and comprise an extensive collection of research papers since 1987.

### *GIS training*

Geographic Information Systems and analysis of spatial data is a major component of current land management practices and decision making. However, there is a wide gap between the GIS skills of practitioners and the resources available. Many land managers have little experience with GIS and those who have experience are confronted with the challenge of keeping up with rapid advancements in technology and on-going improvements to spatial data. Although there are numerous resources for GIS skill building, many environmental practitioners have specific tasks (data interpretation) associated with/relevant to the specific datasets they are attempting to execute. To address this, a basic skills workshop could be set up to cater to those with little experience in GIS and address some of the most commonly executed tasks relating to frequently used NZ specific datasets. However, catering to the needs of experienced GIS users may require tailor-made courses and/or one-on-one training that address specific technical requirements.

### *Other Training programmes*

An array of training programmes – short courses, degrees and workshops – are available to land managers and land owners. Most programmes are facilitated through universities such as Lincoln University, Massey University, Southern Institute of Technology, and Otago Polytechnic. Privately owned companies that provide accredited training courses, include Land Based Training, AglTO, Eagle Technology, and PGG Wrightsons. Professional bodies and associations include NZARM, who require its members to maintain professional competence in an approved natural resource field and offers a professional development programme – the NZARM Resource Management Certification System.

**Recommendation:** *Build on existing networks of training providers and identify new opportunities for tailored technical development programmes.*

### 4.2.3 Tailored technical training programmes

#### Central Government

Policy makers are looking for more effective ways of using research evidence to support policymaking and build good practice in land resource management. They seek a closer relationship between research, policy, and practice (Hanger et al. 2013; Weidner 2002). To do this they are steering research towards problem solving and consolidating knowledge about 'what works' (Hanger et al. 2013). 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.

Policy makers seek the development of new tools that enable quick and efficient transfer of scientific information. Scientists and policy makers must work together to develop modes of communication that allows science to be more serviceable/usable for policy-making. This can be delivered using online resources that encourage direct and indirect interaction with science providers

**Recommendation:** *Develop new tools and modes of communication that allow science to be more accessible for policy-making.*

#### Local Government

Regional Councils are currently making decisions about how best to ensure the economic development of their regions while simultaneously protecting environmental integrity – particularly freshwater resources. 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).

**Recommendation:** *Regional councils require on-going workshops and facilitated learning in order to keep up-to-date with changing technology and resource availability.*

#### The Business Sector

The need for land information is varied among a range of stakeholders within the business sector. Businesses dependent on land resource information include banking and financial services, energy suppliers, and those involved in primary production, including landowners (McKinley 2012). Although there is often good integration of land-resource information, and, on occasion, sophisticated in-house systems to consolidate land information within the primary sector, many business stakeholders have limited access to a full range of data and services. Much land data information is collected from a range of sources, and interpretation of data is reliant on the support of consultants or regional councils. Very few business stakeholders have the capacity to manipulate, interpret, and make independent, informed decisions.

**Recommendation:** *Businesses would benefit from bi-annual workshops that encourage information exchange, provide access to full range of data and services from science providers, and include technical training.*

### *Students*

Knowledge transfer seeks to organize, create, capture or distribute knowledge for future users – including youth. Engaging youth in science is a complex and challenging issue (McKinley 2012). Most students like science but do not want to make a career in science – particularly the physical sciences. This is reflected in the decline in the intake of students in soil science courses, which has left a deficit of human resource in soil science. As a result, jobs that require skills in soil science and management are allotted to people in other disciplines. There is a need to generate interest in soil and land science across all levels of education – but particularly at PhD and MSc levels.

To promote learning in soil and land science, there is a need for further, in-depth exploration of the factors or drivers that determine young people's interests, and subsequent engagement with, soil and land science. There is also a need to build scholarships for the completion of Masters and Doctorates at universities, and to offer secondments at CRIs.

**Recommendation:** *Generate interest in soil and land sciences across all levels of education.*

### *Land Owners*

New environmental regulations and the increased complexity of science, combined with the incomplete understanding of landowners, pose added challenges for complete and effective implementation of the best environmental practices. Increasingly, landowners are taking collective action on many land management issues. While some of the land management issues are significant to New Zealand as a whole, a path

towards more sustainable land management remains in the hands of individual landowners. However, many landowners struggle to access and make use of land resource information, and therefore find it difficult to keep up with the rapid changes in land-management regulations.

Landowners often do not have the time or knowledge to navigate multiple, often complex, sometimes conflicting, and generally not “fit-for-purpose” research data sources (Doran 2002). There is also a sense that end-users hold particular values and prejudices (based on previous experience) about data sourcing, which means they exclude or are unaware of data that could play a part in their decision-making; to this can be added a new tranche of potential end-users who are aware of the need for information but have not identified sources to satisfy that need.

**Recommendation:** *Landowners require access to online training and materials that is complimented with regular workshops at key events (e.g. Field Days) that will guide them in the interpretation and application of soil/land information and tools.*

### 4.3 A framework for on-going capacity building

Though the above actions could be immediately implemented to address current professional development needs, a long-term solution is also needed. New Zealand should develop a long-term technical development strategy that aims to maintain standard environmental competencies across soil and land resource management. Each of the listed short-term actions (workshops or activities) could be incorporated into a long-term professional recognition programme that offers continuing professional development (Figure 9).



**Figure 9.** A framework for on-going capacity building.

### 4.3.1 Assessment of environmental competencies

Professional recognition programmes such as certification, registration, and membership of a professional association usually require a candidate to demonstrate professional competency. Most of the assessment institutions have a set of predefined skills against which the eligible candidate for certification, registration or membership is checked. Some examples of general environmental recognition are the Certified Environmental Practitioner (CEnv) (Society for the Environment, UK) and the Registered Environmental Manager (National Registry of Environmental Professionals, USA) (Wever et al. 2002). The Society for the Environment in the UK has a very broad and generic approach towards defining environmental competencies. In comparison, other certification programmes require candidates to select an area of specialisation. In Canada, for example, the Canadian Environmental Certification Board (CECAB) provides a detailed set of criteria for each of the identified sectors within the environmental field.

Institutions can apply a range of ways to assess competencies, including self-assessment, exams, compulsory courses, referee reports, professional

interviews, and reports/reviews. Each requires varying levels of commitment from the candidates and the institution providing the certification.

### 4.3.2 Specialized Certification

In New Zealand, environmental practitioners can become certified through the Environment Institute of Australia and New Zealand. However, this programme has been slow to take off in New Zealand and currently does not incorporate a certification in soil science, nutrient management or other specialized sectors. A certification programme specifically targeted at land and resource management would encourage more consistent environmental decision making and provide an avenue for practitioners to maintain their skills at appropriate levels. To implement such a programme, a needs assessment to identify core competencies, competency gaps, and training needs for those working within specialized areas should be conducted.

### 4.3.3 Continuing Professional Development

In the long term, institutions could offer a specialized continued professional development programme. Certified professionals would be expected to engage in continuing professional development to ensure they maintain the currency of their skills and knowledge and keep up to date with the rapidly changing and expanding knowledge and technology that impact on environmental practice. Certification would be reviewed on a set year basis and at this time should provide evidence of continued professional development.

### 4.3.4 Staged Training

A professional development programme especially designed for early-career professionals with less than 5 years of work experience would help guide and support early-career scientists or managers through the first stages of their career. The programme would focus on equipping early-career professionals (including students) with the competencies needed for certification. Mentoring would be integrated into the programme, which would also encourage the transfer of knowledge from retiring professionals who specialize in areas where capacity is most lacking. It would be important to provide mentors with a clear framework for the engagement and include clearly defined goals and responsibilities.

**Recommendation:** *Support the development of professional recognition programmes that provide certification for specialized sectors and staged training for early-career professionals.*

## 5 Acknowledgements

The NLRC would like to acknowledge the contribution to this paper of Landcare Research, Anne Austin for editing, Ross Abercrombie for his constructive review and all those who participated in the survey.

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United Nations : Sustainable Development (UN)1996  
<http://www.un.org/esa/agenda21/natlinfo/countr/newzea/natur.htm>

Ministry for the Environment (MfE) 2010  
<http://www.mfe.govt.nz/issues/land/soil/strategy.html>

Ministry for Primary Industries (MPI) 2010  
<http://www.mpi.govt.nz/agriculture/funding-programmes/sustainable-farming-fund>

New Zealand Association of Resource Managers (NZARM) 2013  
<http://www.nzarm.org.nz/>

Fertilizer and Lime Research Centre (FLRC) 2013  
<http://www.massey.ac.nz/~flrc/>

Certified Environmental Practitioners (CEnvP) 2013  
<http://www.cenvp.org/>

PGG Wrightson  
<http://www.pggwrightson.co.nz/Services/Training>

AgITO  
<http://agito.ac.nz/>

Otago Polytechnic  
<http://www.otagopolytechnic.ac.nz/schools-departments/central-otago/programmes-and-courses/cromwell.html>

Eagle Technology  
<http://www.w.eagle.co.nz>

## Appendix 1 – Training Needs Survey

### NLRC Training Needs Survey

A key aim of the National Land Resource Centre (NLRC) is to provide on-going training and professional development opportunities for those working in land resource science and management. The first step is to identify capacity building opportunities the centre could provide. To do this we are conducting a short survey in order to know more about the types of courses and training that are available in the land resources sciences and those that are in need.

**1. Please describe your current employer.**

<input type="checkbox"/> Crown Research Institute	<input type="checkbox"/> Industry or Business
<input type="checkbox"/> University or other Tertiary Institute	<input type="checkbox"/> Self Employed
<input type="checkbox"/> Regional or Local Government	<input type="checkbox"/> Student
<input type="checkbox"/> National Government	

Other (please specify)

**2. Please select the category that best describes the nature of your employment.**

<input type="checkbox"/> Research, Analysis & Reporting	<input type="checkbox"/> Agronomy & Farm Services
<input type="checkbox"/> Education & Training	<input type="checkbox"/> Mining, Resources & Energy
<input type="checkbox"/> Environmental Planning	<input type="checkbox"/> Information & Communication Technology
<input type="checkbox"/> Resource Management & Policy	<input type="checkbox"/> Laboratory & Technical Services
<input type="checkbox"/> Project Management	<input type="checkbox"/> Surveying

Other (please specify)

## NLRC Training Needs Survey

**3. In what topics would you like to have training or professional development available for yourself? and for others? (You may select more than one answer)**

	For yourself	For others
Soil & Land Resource Science	<input type="checkbox"/>	<input type="checkbox"/>
Ecology & Biological Sciences	<input type="checkbox"/>	<input type="checkbox"/>
GIS, GPS & Remote Sensing	<input type="checkbox"/>	<input type="checkbox"/>
Environmental Management & Monitoring	<input type="checkbox"/>	<input type="checkbox"/>
Sustainable Agriculture & Forestry	<input type="checkbox"/>	<input type="checkbox"/>
Survey & Inventory	<input type="checkbox"/>	<input type="checkbox"/>
Land Use Mapping & Modelling	<input type="checkbox"/>	<input type="checkbox"/>
Data Analysis	<input type="checkbox"/>	<input type="checkbox"/>
Tools & Technologies	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

**4. Please list any courses, training or professional development that you have taken in the last 3 years in land resource science or management.**

Degrees, Diplomas, or Certificates

Short courses

Workshops

Professional Development

Other

**5. If you undertook training or professional development in the last 3 years in the area of land resources or related areas which organisation(s) provided it?**

**6. Which of the following training and professional development options would interest you and/or your colleagues? (You may select more than one answer)**

- Workshops  Specialized Technical Training
- Short Courses

Other (please specify)

## NLRC Training Needs Survey

**7. What style of training do you think would best suit you or your colleagues? (You may select more than one answer)**

- Self-instruction including self-paced guides, "how to" books, individual workbooks
- Web-based training including webinars
- Distance-learning programs
- Face-to-face training

**8. For training or professional development course that require meeting face-to-face, how long do you want the training course to be?**

- up to 1/2 a day
- 1 day
- 2-3 days
- 3+ days

**9. Which tools and resources do you work with that are widely available but lack training or guidance in their use?**

**10. What do you think is the best way NLRC could help you/your organisation fill any gaps it has in skills or knowledge around land resources?**

**11. What courses should be provided by the NLRC in order to increase the understanding and management of land resources?**

Thank you for taking the time to complete our survey. We appreciate your feedback. Please provide your e-mail address below in order for us to follow up on your comments and provide you with a summary of our findings.

**12. What is your current e-mail address?**