

2014-19

STATEMENT OF CORPORATE INTENT



Landcare Research
Manaaki Whenua

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Statement of Corporate Intent 2014–19

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Cover photo: Senior technician Larry Burrows undertaking high country carbon research above Lake Ohau.

Landcare Research's Core Purpose

Our Statement of Core Purpose

Landcare Research's Core Purpose is to drive innovation in New Zealand's management of terrestrial biodiversity and land resources in order to both protect and enhance the terrestrial environment and grow New Zealand's prosperity.

Our service

- We provide tailored science and research-based knowledge, tools and integrated solutions.
- We deliver tangible environmental benefits especially through:
 - The Natural Resources Sector
 - Businesses implementing sustainable good practice, and
 - Māori organisations.
- We achieve these outcomes through effective leadership and targeted collaborations and partnerships.

Our National Outcomes

Along with our stakeholders, we contribute to achieving four Outcomes of national importance:

1. Improve the measurement, management and protection of New Zealand's terrestrial ecosystems and *biodiversity*, including those in the conservation estate.
2. Achieve the sustainable use of *land resources* and their ecosystem services across catchments and sectors.
3. Improve the measurement and mitigation of *greenhouse gases* from the terrestrial biosphere.
4. Increase the ability of New Zealand industries and organisations to *develop within environmental limits* and meet market and community requirements.

Our scope of operation

Landcare Research is recognised as the lead CRI in the following areas:

- Catchment-level ecosystems (including wetlands) and related ecosystem services
- Terrestrial vertebrate pest control
- Terrestrial carbon processes and inventory, and other greenhouse gases from soil and land
- Land cover, land use capability and effects, and spatial land information that integrates across sectors and scales
- Soil characterisation, processes and services
- Integrated social and biophysical research to support the sustainable management of terrestrial biodiversity and land resources.

Landcare Research is expected to work with other research providers and end-users to contribute to the following:

- Biosecurity, land, soil and freshwater management
- Climate change adaptation and mitigation
- Industry and business environmental performance including verification
- Indigenous forestry
- Urban environments
- Antarctica

Chair & Chief Executive's Overview

We are pleased to present Landcare Research's Statement of Corporate Intent (SCI) for 2014–2019. This provides a foundation for our contribution to outcomes of importance to New Zealand and its future.

Strategy 2017

Landcare Research is implementing a new strategy – *Strategy 2017* – to respond to the significant changes presently under way in the operating environment. These include changes to the New Zealand science system through the establishment of National Science Challenges, science Hubs and next-generation CoREs, at the same time as the country is implementing major environmental reforms, and global markets demand more robust environmental certification for goods and services.

Strategy 2017 will enable Landcare Research to make strategic decisions and prioritise activity in the context of a clearer organisational purpose, work effectively both internally and externally, and build resilience as an organisation. Through *Strategy 2017*, Landcare Research will maximise its ability to drive, respond to and take full advantage of foreseeable future scenarios by positioning itself as:

- The core provider of independent science to central government and regional councils, supplying knowledge and tools for the land environment and land–water interface
- An enabler of industry groups and the private sector in meeting their stakeholder and market expectations, leveraging our deep expertise to provide environmental science advice and integrated solutions
- A preferred partner for Māori, enhancing the sustainable production and value of Aotearoa's land and biodiversity-based natural resources
- An active driver, integrator and enabler in relevant National Science Challenges and Hubs, enhancing collaboration, innovation and adoption
- An innovator that enhances knowledge transfer, adoption and impact, pursuing the commercialisation of our intellectual property when appropriate
- A foresighted, agile and responsive partner, leading responses to external drivers and changes in collaboration with our clients and industry peers

As reflected in this Statement of Corporate Intent, the thematic areas of *Strategy 2017* are to:

- Increase the effectiveness of client and stakeholder engagement and understanding
- Grow our research leadership in priority areas and extend our reputation for science excellence
- Build business acumen and related commercialisation skills
- Develop our people and culture for the future
- Enhance our organisational identity, and ensure we have fit-for-purpose smart systems and processes and the right facilities to deliver effective research and outcomes into the future
- Reinforce our financial strength and resilience

With the *Strategy 2017* commitment to continuous improvement, we will welcome findings from the review of Landcare Research commissioned by MBIE. The review, the third of seven CRI 'rolling reviews', is scheduled to conclude by 30 June 2014. We expect to be able to respond to review recommendations in the 2014/15 year.

Strategic outlook

We are reaping rewards from efforts started last year to improve our value to clients, redirect capability to growth areas and improve cost-efficiencies. Our Enviro-Mark Solutions subsidiary has achieved a pleasing turnaround in its performance.

In line with *Strategy 2017* and the Government's Business Growth Agenda, Landcare Research will remain primarily focused on supporting the public sector (both central and local government), especially the Natural Resources Sector. Our expertise in national and regional-scale research provides the evidence base for sound resource management in New Zealand, helping avoid the high cost of poor policy and regulation. We will continue to contribute to the new national environmental reporting framework, provide ongoing support for water and RMA reforms, and look forward to contributing to the planned national Natural Capital Assessment.

The expertise we bring to the public sector is also of significant value in the private sector where there are market and community expectations for managing impacts on the natural environment. We will continue to

work both directly with private sector clients and via primary-sector-focused CRIs to underpin the environmental credentials of New Zealand businesses.

We will also continue to work directly with iwi and other Māori stakeholders, and also support the Crown in its response to the Māori Economic Development Taskforce report. Science can play a critical role in optimising economic outcomes from land-based natural resources in ways that are environmentally, socially and culturally appropriate.

Key initiatives

In line with *Strategy 2017* and major external drivers, Landcare Research will focus in the coming year on achieving new levels of collaboration, value and knowledge transfer in several key areas as follows.

National Science Challenges

Landcare Research is known for its interdisciplinary research, strong collaboration ethic and its ability to work with a wide range of research collaborators, end-users and sectors; we welcome the intent of the Challenges. Landcare Research will be bidding as host agency for the *New Zealand's Biological Heritage Challenge* (page 36), having co-led the bidding process with Plant & Food Research. We are pleased with the current trajectory of planning and collaboration. The *Biological Heritage Challenge* has high potential to deliver next-generation technologies and techniques, novel citizen science, science engagement and outreach approaches, and deliver more integrated research from across the science system, public sector, philanthropists and the private sector.

The Lincoln Hub

Landcare Research has been a strong proponent of the Lincoln Hub since the February 2011 earthquake, which brought several organisations to Lincoln, showing the added value of co-location. Landcare Research considers that the Hub can unlock much potential innovation and build essential capability across sectors. We look forward to contributing leadership in soil and land management systems, biosecurity risk management, natural resource policy support, and helping food exporters meet emerging standards for product environmental footprint verification. The latter is a growing trend among global firms driven by changes in Europe. We will continue to work with other providers and potential private sector partners to achieve the maximum potential of the Hub (page 6).

Open data access

Landcare Research has been a leading practitioner in open data access – growing data use by the public and private sector many-fold through advanced data standards, infrastructure, management and access systems (page 28). Examples include authoritative online identification keys for biota, the national S-map Online, the Antarctic Portal and the Māori Land Visualisation Tool. We look forward to providing ongoing leadership in this area and ensuring that the National Science Challenges adopt best practice.

Commercialisation, leveraging collections and citizen science

Despite our profile as a public-sector-facing organisation, Landcare Research recognises the critical importance of commercialising IP to achieve uptake and impact from our science. We have engaged a successful technology entrepreneur to mentor our staff on commercialisation practices and will be supporting this with training to build commercial culture, knowledge and skills. This is a strategic priority for us in the new financial year. We have also reshaped our commercialisation strategy accordingly.

In part, this work builds on strategic investment in our collections and databases – key assets that can deliver even greater value and impact for New Zealand through digitisation and sophisticated modelling platforms to better support biosecurity and biodiversity stakeholders.

We also recognise the value of engaging the public in our science and have increased our focus on the use of 'apps' to make information more widely accessible, to engage the public in topical issues, and to 'crowd-source' ideas to inspire new research directions. This is a key direction for the future.

Infrastructure and assets

We continue to invest in strategic infrastructure and new research technologies (page 35). We also are continuing a programme to upgrade buildings and other assets at various sites. Our major sites are co-located with universities and we foster close relationships through science programmes, teaching and engaging graduates in our research. At Lincoln we will upgrade infrastructure in a way that contributes to the Lincoln Hub, seeking opportunities to share with other partners, and be innovative in the use of capital resources.

Stakeholder Engagement

Goal

Landcare Research's key stakeholders value engaging with us – receiving trustworthy and fit-for-purpose science that meets their needs, contributing to our strategic direction and allocation of resources and providing an effective pathway to adoption for our work.

Our stakeholders

In keeping with our *Strategy 2017*, we will focus on increasing the effectiveness of client and stakeholder engagement processes to ensure strong, long-term partnerships with industry, government and Māori. Mutual understanding and agreement on science priorities will contribute to influential, high-value relationships that deliver real impact.

The Government, through MBIE, is our most significant stakeholder, providing Core funding investment and setting National Outcomes and Impacts to be achieved through that investment. We engage frequently with MBIE and, through MBIE, with our shareholding Ministers.

Other important stakeholders with whom we work closely are MPI, DOC, TBfree New Zealand (part of OSPRI New Zealand), MfE, LINZ, Māori organisations and regional and local government. Around 90% of our work is relevant to publicly-funded organisations. This reflects both the scales at which we work (national, regional and catchments) and the nature of our research. Increasingly, we are partnering with the Natural Resources Sector – a public sector collaboration led by the Chief Executives of MfE, MPI, MBIE, LINZ, DOC, TPK and the Department of Internal Affairs, supported by the Treasury, the Department of the Prime Minister and Cabinet, and the State Services Commission. We deliver relevant, high-quality, multi-disciplinary science that is trusted in supporting policy development and regulation, especially in regard to complex, intractable issues for which a range of societal values come into play.

Our research is increasingly relevant to primary sector organisations and sustainable business – managing business operations within environmental limits, supporting sustainability credentials and underpinning social licence to operate. While we also work with a number of businesses and industry sectors, our strategic engagement is mostly through sector bodies such as DairyNZ, FANZ, FAR, FOA and IrrigationNZ, and the Sustainable Business Council and BusinessNZ.

Landcare Research has a long history of working with iwi and Māori organisations. We are increasingly working to enhance economic development from Māori-owned and managed natural resources in ways that recognise the value of mātauranga Māori and deliver on Māori aspirations. We have a number of formalised strategic partnerships with iwi, some of which have been in place for over 20 years.

In developing proposals for the two National Science Challenges we are closely involved in (page 36), we have engaged with a wide range of our stakeholders to ensure their interests are captured.

Outcome Advisory Panel

This panel consists of senior representatives from key stakeholder organisations in central and local government, industry and business, the primary sector and iwi: Rob Phillips (Environment Southland; Chair), Scott Gallacher (MPI), Felicity Lawrence (DOC), William McCook (OSPRI New Zealand), Penny Nelson (Sustainable Business Council), James Palmer (MfE), Jim Doherty (Te Kotahi a Tūhoe) and Nick Pyke (FAR). The Panel meets with our Senior Leadership Team twice yearly and provides high-level strategic advice to the Landcare Research Board, as well as input into the review process for our Outcome investment strategies.

Formal meetings with the Outcome Advisory Panel provide an effective way for our key stakeholders to influence our science direction, priorities and delivery.

Steering groups and advisory groups

Steering groups are formed when a product or service requires specific advice on development, uptake, maintenance or implementation. Advisory groups provide planning and operational guidance to particular

projects. For example, development of the Land Cover Database (LCDB) 3rd and 4th editions were overseen by a steering group involving MBIE, MfE, MPI, DOC, LINZ, the NZ Fire Service and regional councils. An advisory group also guides the strategic priorities for the research relating to our biological Collections and Databases. A number of other advisory groups operate to guide and support key work programmes, reflecting the strong support of our end-users for our research.

Key performance indicators

(See Appendix 3, page 44)

- Percentage of relevant end-users who have adopted knowledge and/or technology from Landcare Research (*data provided from MBIE's biennial external client survey; the 2013 survey found 95% of respondents have adopted our knowledge or technology in the past three years; 97% in 2012*)
- Percentage of relevant funding partners and other end-users that have a high level of confidence in Landcare Research's ability to set research priorities, and the effectiveness of the collaboration or partnership (*data provided from MBIE's biennial external client survey – the 2013 survey found 78% were satisfied with the way we set research priorities; 83% in 2012*)
- Number of new or improved services, processes and products available to stakeholders
- Staff participation in stakeholder meetings and workshops
- Number of science presentations to stakeholder and community groups
- Revenue per FTE (*MBIE Indicator*)
- Revenue per FTE from commercial sources (*MBIE Indicator*)
- Commercial reports per scientist FTE (*MBIE Indicator*)

'The Lincoln Hub'

Achieving Government's target of increasing exports from 30% to 40% of GDP will depend largely on research and education supporting a major lift in agricultural productivity within environmental limits. Landcare Research is working with AgResearch, Plant & Food Research, Lincoln University and DairyNZ to develop a hub that will benefit stakeholders through collaborative research, education and industry development activity – centred at Lincoln but connected nationally and internationally.

'The Lincoln Hub' will stimulate innovation and entrepreneurial endeavour and build capability within the land-based and supporting industries by combining the intellectual power of over 900 research and industry professionals working in the region. The Hub will facilitate stakeholder and research collaboration and networking opportunities, provide work-ready graduates for the land-based sectors and transfer knowledge to raise the economic and environmental performance of the whole sector.

The vision is that the Hub will attract the most able minds internationally to study and undertake research at Lincoln. The ultimate goal is for shared developments in infrastructure and collaborative research and teaching activity to result in the better management of New Zealand's land and water resources. This will enable long-term sustainable growth while maintaining the integrity of our environment.

The Hub model will allow employees to discuss and develop collective plans, ideas and knowledge while based in their home organisations. We envisage teams will work together on priority areas, sharing facilities across organisations. The Hub will work with agribusiness industries to shape the research and educational initiatives and ensure their adoption and impact.

Landcare Research will bring significant resources to the Hub, both from its Lincoln-based facilities and its national network. We will contribute our expertise in spatial soil and land-use information, including nutrient and water management and greenhouse gas mitigation, biodiversity and biosecurity risk avoidance, integrated with social and economic dimensions including Māori traditional knowledge and community engagement.

Our Science Framework

Goal

Landcare Research's science framework is clear, effective and facilitates engagement with stakeholders who collaborate with us in achieving our National Outcomes.

Science framework and achieving National Outcomes

Our National Outcomes and Impacts represent the benefit to be derived from public investment in our science. With environmental science, some benefits are more readily quantified than others. For example, economic benefits from bovine-TB eradication can be more readily quantified than societal benefits from the conservation of iconic species or forests. Uptake of research findings into management and policy frameworks provides more immediate measures of our science influence. Research to deliver our National Outcomes is outlined in the following sections of this SCI.

This year we will review (and adjust if required) the key performance indicators for each of our Impacts to ensure they are aligned to evolving stakeholder priorities and any recommendations from the 4-year rolling review.

Our Outcome Investment Strategies, which are prepared in conjunction with our key stakeholders, have a set of science priorities to guide investment of Core funding. In the future, Core funding aligned to National Science Challenges (NSCs) will be influenced by the NSC research plans.

Core funding overview

Core funding represents approximately 80% of our total funding from MBIE and is subject to an annual performance agreement. Core funding for research is allocated on the basis of Outcome Investment Strategies, evaluation of achievements in the prior year and proposed new aims, consideration of Science Team Capability Plans and discussions with our Board and Outcome and Science Advisory Panels.

Core funding is divided into three categories as follows:

(i) Research (\$8.7m)

Core funding is used to support fundamental research (which may be relevant to one or several National Outcomes), applied research to support key stakeholder priorities including Vision Mātauranga priorities for Māori, knowledge and technology transfer, and development of strategic capability.

Key strategic changes in allocation in 2012/13 included shifting some funding from Outcome 1 (Biodiversity) to Outcome 4 (Development within Limits), and realigning some funding in Outcome 3 (Greenhouse Gases) to Outcome 2 (Land Resources); these shifts were made to strengthen the application of research to stakeholder needs. Future opportunities were reviewed again with our Outcome and Science Advisory Panels, with further realignment to Outcome 4. In 2014/15, we are not proposing any significant shifts but rather consolidating on the current direction and ensuring alignment with our *Strategy 2017*.

(ii) National Science Challenges (\$8.3m, estimated)

Our National Outcomes align closely with two of the National Science Challenges (page 36). Up to \$6.2m and \$2.1 million of Core funding may be aligned to *New Zealand's Biological Heritage* and *Our Land and Water* Challenges, respectively. The future direction of aligned funding will be strongly influenced by the NSC research plans. Three of our MBIE contestable programmes (\$1.5m) will be embedded in the *Biological Heritage* Challenge. A further MBIE programme (\$1.6m) will be embedded in the *Our Land and Water* Challenge.

(iii) Nationally significant databases and collections (\$7.4m)

Landcare Research is custodian of 7 of the 25 recognised nationally significant databases and collections (Appendix 1); these are important and irreplaceable science infrastructure assets that we manage on behalf of New Zealand. Our combined holdings are larger than for any other CRI, university or museum. The databases and collections, and associated information systems, span biosecurity and biological resources (plants, invertebrates, fungi, bacteria), soil resources and cultural knowledge. We also maintain a small number of other significant databases that are recognised as important to both New Zealand research and delivery of National Outcomes.

The biological collections and associated databases and information systems are used to provide authoritative identification and assessments of invasive species risks to New Zealand’s natural and productive landscapes and so are vital to the delivery of Outcomes 1 and 4. We have developed a new strategy for the five biological collections to ensure they maintain viability and relevance, and deliver greater impact and value to end-users. An important element of the new strategy is to increase digital access to high-priority data, images and associated information, barcode references and research.

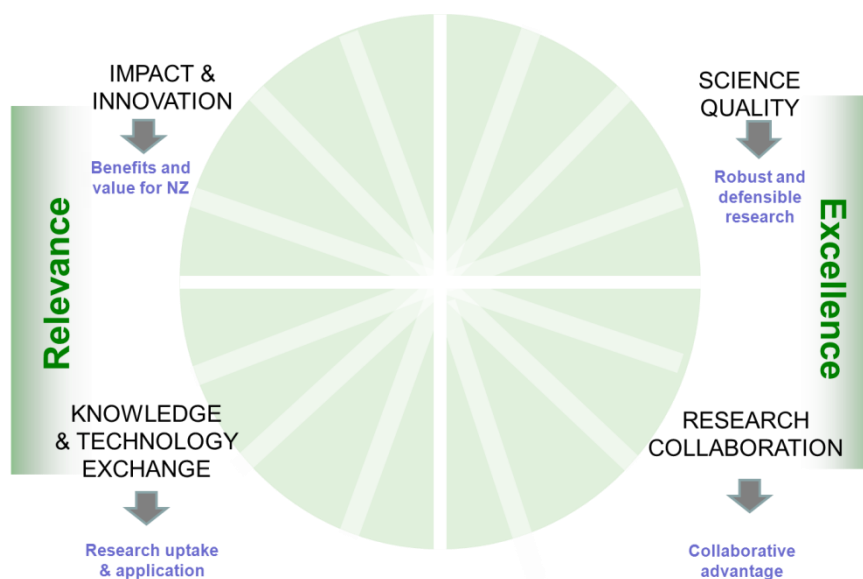
The National Soils Database (NSD) and New Zealand Land Resource Information System (LRIS) provide soils and land information to help inform land-use policy and resource management decision-making and so underpin Outcome 2. The annual amounts of Core funding in Outcomes 1, 2 and 4 related to the nationally significant databases and collections are \$5.6 million, \$1.2 million and \$0.6 million respectively.

Monitoring, reporting and evaluation

Our science initiatives are undertaken within ten Portfolios that produce Portfolio Plans detailing the proposed outputs (and hence contribution to Impacts and National Outcomes) for the next financial year. Progress on these outputs is reported monthly and quarterly to the Senior Leadership Team and Board of Directors; with quarterly reports also provided to MBIE. Each year, in accordance with our accountability to MBIE, we report value derived from Core-funding investments as an annex table in Part 2 of our Annual Report. This annex covers achievements by research priority area in each Portfolio, and shows how these align to our four Outcomes and which stakeholders will benefit from the knowledge.

More detailed Portfolio achievement reports are also prepared to evaluate achievements and whether revenue opportunities have been realised; whether Landcare Research and the Portfolio is deriving optimal benefits from links between Core funding and revenue from other sources; and to help plan future directions that build on achievements, and identify support/resources that will be required.

The Science General Managers use the following framework to evaluate Portfolio performance.

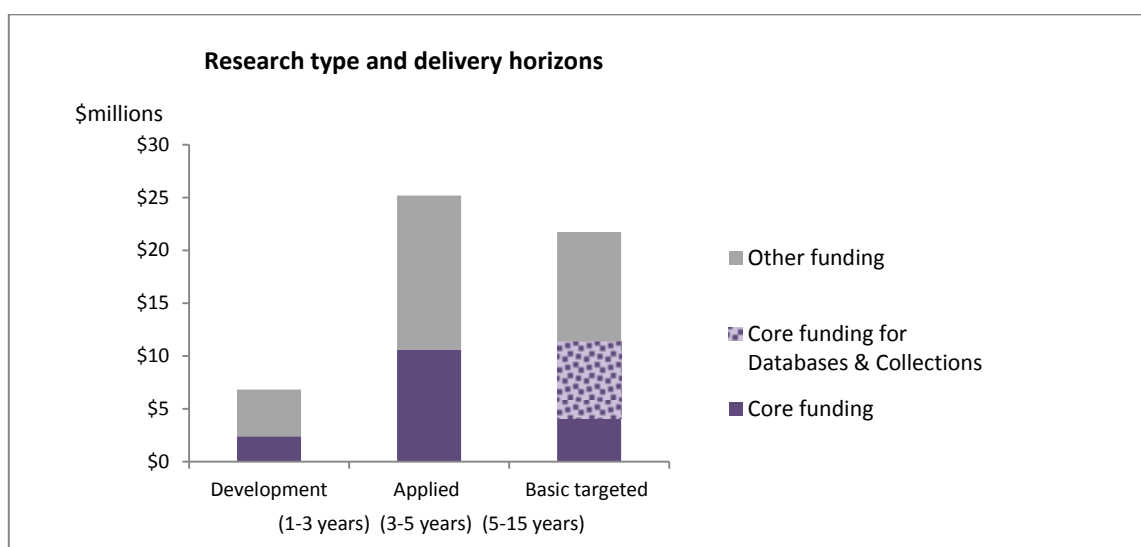


Our National Outcomes & Impacts

Our National Outcomes and Impacts, Outcome Investment Strategies and science priorities have all been developed with considerable input from our key stakeholders in central and regional government, industry and business sector groups, iwi partners, advisory panels and our Board.

Research type and delivery horizons

We undertake 'basic targeted' research (5–15 year time frames), and 'applied' research to deliver Impacts (3–5 year time frames). In addition, about 10% of our Core funding is invested in the 'development' of new products, processes and services across all four National Outcomes.



The scope of our Core Purpose, long-term nature of environmental processes and importance of our nationally significant biological collections necessitate strong investment in both underpinning (basic targeted) research and applied research, particularly in relation to our Biodiversity Outcome (Outcome 1). However, for our Land Resources Outcome (Outcome 2) and Development within Limits Outcome (Outcome 4), more emphasis is given to applied research with a 3- to 5-year delivery horizon.

Core-funded research is expected to span multiple delivery horizons. For example, through working with our nationally significant databases, collections expertise and infrastructure, and related information systems, we:

- Provide regular identification services and direct knowledge transfer to industry (e.g. agriculture, horticulture, viticulture, forestry, pharmaceutical, health), central and regional government agencies, and other research and education providers (day-to-day delivery)
- Develop and maintain online tools and services to make information more accessible for end-users as above (short-term delivery)
- Support end-users with applied research on a range of diverse issues including carbon sequestration rates, vegetation succession trends, precision agriculture, plant pathology, weeds and animal pests (short-term to medium-term delivery)
- Underpin basic targeted systematics research, including maintenance of the databases and collections

National Outcome 1: Improve measurement, management and protection of New Zealand's terrestrial biodiversity, including in the conservation estate

Key Performance Indicator: *The status and trend in national and regional biodiversity show an improvement in biodiversity in some environments, and a halt in the decline of representative examples of all others.*

Background

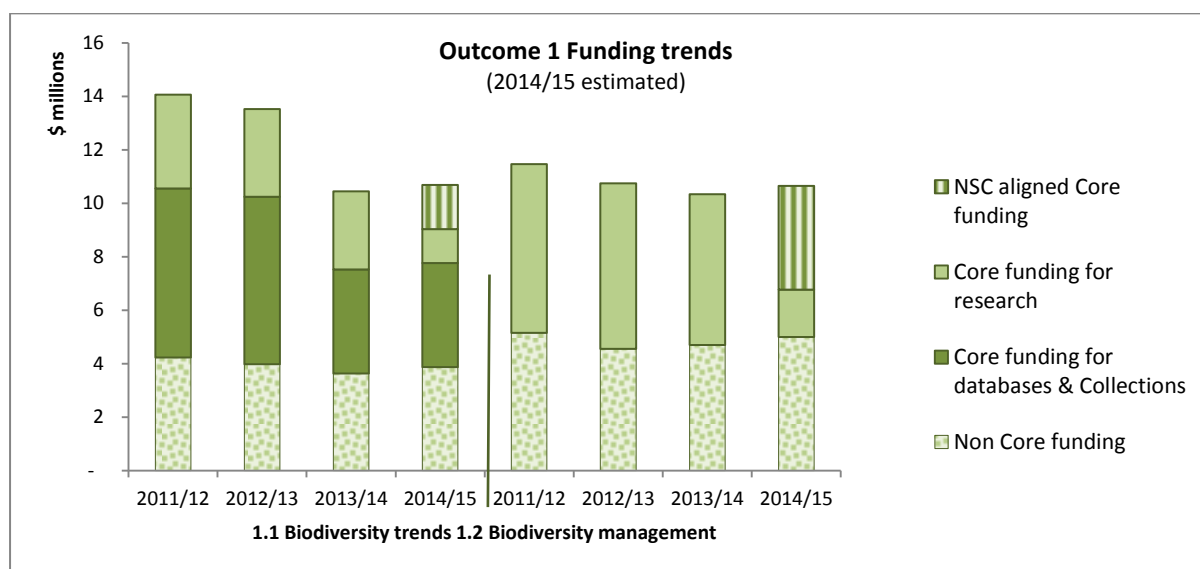
The integrity of our iconic natural heritage is central to New Zealanders' identity, lifestyle and the economy. Intergenerational responsibility for the management of indigenous ecosystems, expressed through kaitiakitanga, is also central to Māori aspirations.

Since human settlement of New Zealand, many ecosystems have declined extensively in area and function, often as the result of invasive species. Although one-third of New Zealand's land area is legally protected, there is a strong bias in these areas toward montane and alpine regions. Many of our naturally uncommon ecosystems occur outside protected areas. Lowland and dryland ecosystems continue to face increasing threat from agricultural intensification, conversion to plantation forestry, mining and urban development as well as invasive species.

On the other hand, native vegetation is naturally regenerating across large tracts of retired marginal land. Wildlife sanctuaries, largely driven by community groups, continue to enhance biodiversity across 56,000 ha of mainland New Zealand and near-shore islands. Coordinated community action, based on the best available science, will be critical to progress in the 'Predator-free New Zealand by 2050' initiative – locally, regionally and nationally.

The effective management of biodiversity requires a systematic approach to monitoring and measuring our biodiversity, including accurate knowledge of its composition and of changes in its state through time and in different ecosystems. Our work has identified the most threatened components of terrestrial biodiversity, and enhanced national understanding of risk. We continue to demonstrate how more effective management can be achieved, and where there are opportunities to improve the efficiency and effectiveness of biodiversity management and policy.

Funding trends



The relatively large allocation of Core funding to Outcome 1 reflects Landcare Research's custodianship of several nationally significant biological collections and databases (Appendix 1) and the infrastructure that maintains the collections and associated information systems; these are critical to the delivery of Impact 1 and support Impact 2. In 2013/14, some of this funding was realigned to Outcome 4 to better support biosecurity needs. For 2014/15, some of our research Core funding has been aligned to the New Zealand's Biological Heritage National Science Challenge.

Non-Core funding does not include subsidiary business or other income (e.g. rental from co-tenanted properties).

Impact 1.1: Trends in national and regional biodiversity on public and private land are known and understood, based on best available definitions and descriptions for species and indices of ecological integrity.

Key performance indicator: DOC and regional councils are using comparable metrics to measure status and trend and impacts of interventions on biodiversity within their jurisdictions.

Impact 1.2: Frameworks are in place to ensure the most threatened ecosystems, habitats and species are managed to reduce the risk of decline in native biodiversity.

Key performance indicator 1.2a: Consents related to landuse change under the RMA are informed by a scientifically-based set of criteria that take account of cumulative effects on habitat availability.

Key performance indicator 1.2b: Management decisions by DOC, MPI and regional councils, aimed at reducing threats to species and habitats, are based on robust risk models that reflect best available knowledge about the efficacy, cost and acceptability of management strategies and tools.

Stakeholder priorities:

Impacts	MPI	DOC	MfE	Industry	Local government	Māori
1.1 Biodiversity trends	Better identification and management of potential biosecurity risks	Definitions, status and trends data for key species, habitats and ecosystem services to meet New Zealand’s national and international reporting commitments (CBD, IPBES) National natural capital assessment	Improved data and analysis to support State of the Environment reporting National natural capital assessment	Tools to identify and measure biodiversity status and trends on private land	Comprehensive biodiversity monitoring systems that are supported by sound science	Mātauranga Māori integrated with science to support kaitiakitanga and management of terrestrial ecosystems
1.2 Biodiversity management	Reduction in weed, pest and disease threats to natural and managed ecosystems More sustainable use of New Zealand’s biological resources	Improved tools and practices to manage threatened species and ecosystems	Stronger evidence base to support environmental policy and regulation setting	Science-based business tools for biodiversity and ecosystem management	Biodiversity valuation in both productive and ecosystem-service landscapes	

Key research initiatives

Impact 1.1 Biodiversity description and trends

- Enhance our systematics knowledge by improving definitions, descriptions and understanding of key key organism groups of biodiversity and biosecurity relevance. This research area includes 'next generation sequencing' processes and analyses to characterise structure and functional form of biodiversity in environmental samples; improved techniques for whole genome analysis to better identify, understand and manage important native biota; and making new information available through rapid-access tools such as the portal GeneBank. Such research is essential to understanding the status of biodiversity and assessing natural capital and ecosystem services.
- Work with regional councils, DOC, private landowners and Māori on developing and implementing nationally-consistent indicators of biodiversity at local, landscape, regional and national scales. This is key to understanding trends in biodiversity and biodiversity patterns, essential to managing ecological integrity and ecosystem function, especially for biodiversity in production landscapes.
- Design and implement monitoring methods for evaluating extent and trends in invasive tree spread regionally and nationally and for assessing the efficacy of management by community groups and MPI.

Impact 1.2 Biodiversity management

- Provide the New Zealand Plant Conservation Network (NZPCN) with more than 3 million geo-referenced plant species occurrence records from the NVS databank for the NZPCN flora distribution mapping system. This will treble the number of records available through the NZPCN, significantly increasing its usefulness to biodiversity managers.
- Develop and implement appropriate tools (including genetic approaches) for evaluating and prioritising biodiversity protection and restoration options. Provide regional councils with case studies demonstrating the application of the IUCN Ecosystem Red List criteria to defined ecosystems, to facilitate uptake and use in policy plans.
- Determine the importance of New Zealand community-led sanctuaries for conservation of threatened species, which will enable biodiversity protection agencies and groups to assess the relevance of their partnerships for limiting biodiversity decline.

Key knowledge and technology transfer mechanisms

- Develop and support open-access, national and international information-sharing portals (e.g. the Virtual Herbarium of New Zealand, the New Zealand Organisms Register, the Global Biodiversity Information Facility)
- Publications – definitive systematic treatments of flora, fauna and fungi; scientific papers; newsletters targeted to various end-user groups
- Web-based user-friendly identification guides and information resources; authoritative names portals; and specialist identification services for specimens sent in to systematics staff
- Training workshops – e.g. training in plant identification for biosecurity officers
- Participation in technical advisory groups (e.g. for kauri PTA management) and the Regional Councils' Biodiversity Forum
- Staff secondments – e.g. to DOC to provide training in field assessment techniques
- Strong support for and participation in the Sanctuaries of New Zealand network, including sharing latest research and best practice from local to landscape scale
- Impartial expert evidence to support RMA decision processes, particularly in relation to the protection of naturally rare ecosystems and threatened species
- Postgraduate supervision through the Centre of Biodiversity and Biosecurity
- Public engagement – e.g. BioBlitz events; school visits; hosting RSNZ teacher fellowships; online educational resources such as for Adélie penguins; developing the online 'game' Play Ora and Possum Stomp app; and supporting Predator-free New Zealand

National Outcome 2: Achieve the sustainable use of land resources and their ecosystem services across catchments and sectors

Key Performance Indicator: New Zealand land use is matched within the land resource’s environmental limits and key ecosystem services are maintained or enhanced.

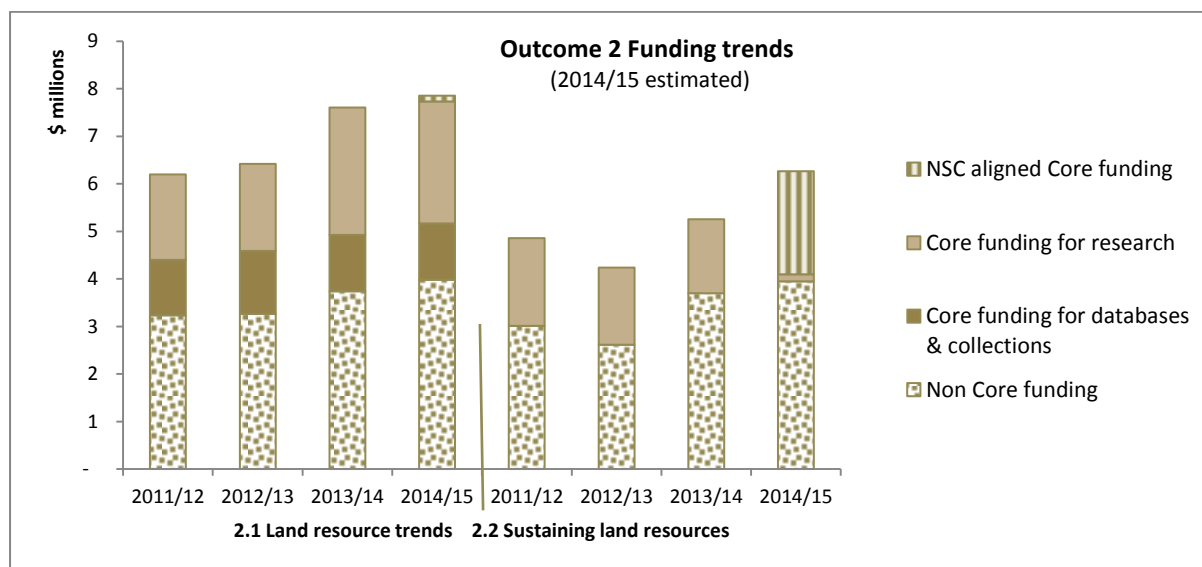
Background

Land resources include the soil’s dynamic physical, chemical and biological ‘systems’, and the land cover, topography and hydrology. Land resources sustain primary production, ecosystem services (e.g. clean water, fertile soils) and the aesthetic benefits upon which New Zealand’s economy, tourism, identity and brand are based.

Effective management of land resources requires improved knowledge of their variability and change over time and across catchments and landscapes (natural, managed and urban), their response to human impacts, and potential limits for land use intensification and other development. Such knowledge enhances the development of policy for sustainable land use and resource allocation; improves the economic and environmental performance of the primary sector; and supports government in meeting international reporting obligations. Our soil and land science capabilities are complemented by our informatics skills in integrating and analysing land information, and making this knowledge available through mapping, modelling and geospatial visualisations.

The Government’s target of increasing exports from 30% to 40% of GDP will depend largely on research to enable a major lift in primary productivity. Such economic development opportunities must be achieved within environmental limits – through sustainable management of our land and water resources. The collaborative National Land Resource Centre (page 37) and the ‘Lincoln Hub’ (page 6) have critical leadership roles to play in realising such opportunities and ensuring growth is ‘green growth.’

Funding trends



In 2013/14 and 2014/15, some Core funding was realigned from Outcome 3 to this Outcome to reinforce research on soil carbon and nitrogen. This realignment reflects reduced policy emphasis in Government on greenhouse gas mitigation and increased emphasis on the Business Growth Agenda and Natural Resources Sector. Some research Core funding has been aligned to the Our Land and Water National Science Challenge. Non-Core funding does not include subsidiary business or other income (e.g. rental from co-tenanted properties).

The following Core-funded databases and collections (Appendix 1) and associated infrastructure support the delivery of Outcome 2:

- Land Resource Information System (LRIS), including the New Zealand Land Resource Inventory (NZLRI)
- National Soils Database (NSD)

Impact 2.1

The status and trends of land resources and ecosystem services (including their interactions) are known and understood.

Key performance indicator: LCDB (Land Cover Database), LUDB (Land Use Database), S-map (soil) and ESDB (ecosystem services database) components of LRIS (Land Resource Information System) have been enriched and are being used under the New Zealand Government Open Access Licensing framework for web-services.

Impact 2.2

Opportunities and threats to land resources and ecosystem services are recognised and balanced to maintain or enhance the provision of ecosystem services.

Key performance indicator: Regional councils and the irrigation, pastoral and arable sectors are using knowledge of soil variability to improve the match between land use practices and land capability.

Impacts	MPI	DOC	MfE	Industry	Local government	Māori
2.1 Land resource trends	Improved definition of sustainable land use and the impacts of land use on ecosystem services at farm, catchment and sector scales	More robust science-based monitoring of the state and trend of New Zealand's land resources	Strengthened evidence base to support methodologies and targets for land and water monitoring National natural capital assessment	Better understanding of the value of land resources and the opportunities arising from matching land use to land capability	Greater understanding of ecosystem services and underpinning processes so that more sustainable use of land can be achieved	Tools and frameworks to manage Māori land assets to support cultural aspirations New opportunities for sustainable development
2.2 Sustaining land resources	Improved policies, based on sound science, to protect the integrity and resilience of ecosystem services	Greater definition of environmental limits, which will lead to enhanced ecosystem resilience and maintenance of ecosystem services	More effective management frameworks to improve the availability and quality of fresh water	Improved industry tools to increase resource-use efficiency (e.g. irrigation) and reduce environmental footprint	Specific measures sensitive to change in ecosystem services and understanding of the risks, costs and benefits	

Key research initiatives

Impact 2.1 Status and trends of land resources

- Develop a coordinated strategy for digital soil mapping and land form analysis across a range of scales (from paddock to catchment). This will be a significant step forward in assessing land resources and will allow regional councils, fertiliser companies, primary industries and other researchers to better match land use to inherent capability.
- Up-scale, integrate and synthesise data on the state and trend of ecosystem services at catchment to national scale to enable regional councils to explore the consequences of management decisions, and central government to report on the state of the environment.
- Enhance the utility and robustness of national land resource data assets by addressing infrastructure and thematic priorities to improve their utility; this includes the application of environmental data standards to the capture, integration and delivery of land resource data from multiple agencies. This research will include the development of techniques to infer land use from land cover (LCDB), satellite imagery and non-spatial data sources, which will enable government and regional councils to understand the state of land resources and monitor trends in land use change.

Impact 2.2 Sustaining land resources

- Enhance understanding of and develop new approaches for managing and mitigating environmental contaminants (e.g. cadmium associated with use of phosphate fertilisers, nitrogen leaching and microbial contaminant risk in groundwater) to support land managers, MPI and industry.
- Increase understanding of the effect that the rapid expansion of irrigation and agricultural intensification is having on soil processes, land and water quality, and assess the benefits of diverse pasture systems by evaluating soil functions and resource use efficiency (water, nitrogen).
- Contribute to the proposed national natural capital assessment by demonstrating the links between soil quality, land management and ecosystem services, and provide land use / land capability scenario modelling. This will provide a clear evidence base underpinning a consistent approach for natural resource management (land and water) by central government, regional councils, Māori and business.

Key knowledge and technology transfer mechanisms

- Work alongside the irrigation, fertiliser and precision agriculture industries to develop soil–water devices (e.g. lysimeters, soil moisture wireless sensor networks), increase water and energy-use efficiency, and reduce environmental contamination
- Work with regional councils to extend coverage of S-map; S-map Online interoperability with OVERSEER® so that farmers have accurate soil data for farm nutrient management plans; online video guides to using S-map; and S-map mobile apps to increase accessibility
- SINDI (soil indicators) open-access web-based tool to help users interpret soil quality and health
- Dissemination of information through:
 - The National Land Resource Centre – see page 37
 - The Clean Water, Productive Land programme with AgResearch and two other CRIs
 - The Sustainable Land Use Research Initiative (SLURI), which shares expertise across three CRIs to develop new tools for regulators and land managers
 - Integrated Research for Aquifer Protection (IRAP) involving four CRIs, DairyNZ, Lincoln Environmental, Aqualinc and ECan. IRAP works with an end-user group made up of regional and district councils, MPI, MfE, FAR, HortNZ, Ngāi Tahu and Federated Farmers
- ‘Road shows’ and workshops to government, local government and the primary sector
- Engaging with Māori and community groups in soil and land management, water quality management, and catchment planning and protection to complement RMA-driven council policy and consent processes

National Outcome 3: Improved measurement and mitigation of greenhouse gases from the terrestrial biosphere

Key Performance Indicator: *New Zealand is meeting its international reporting obligations and reducing net greenhouse gas emissions from the terrestrial biosphere.*

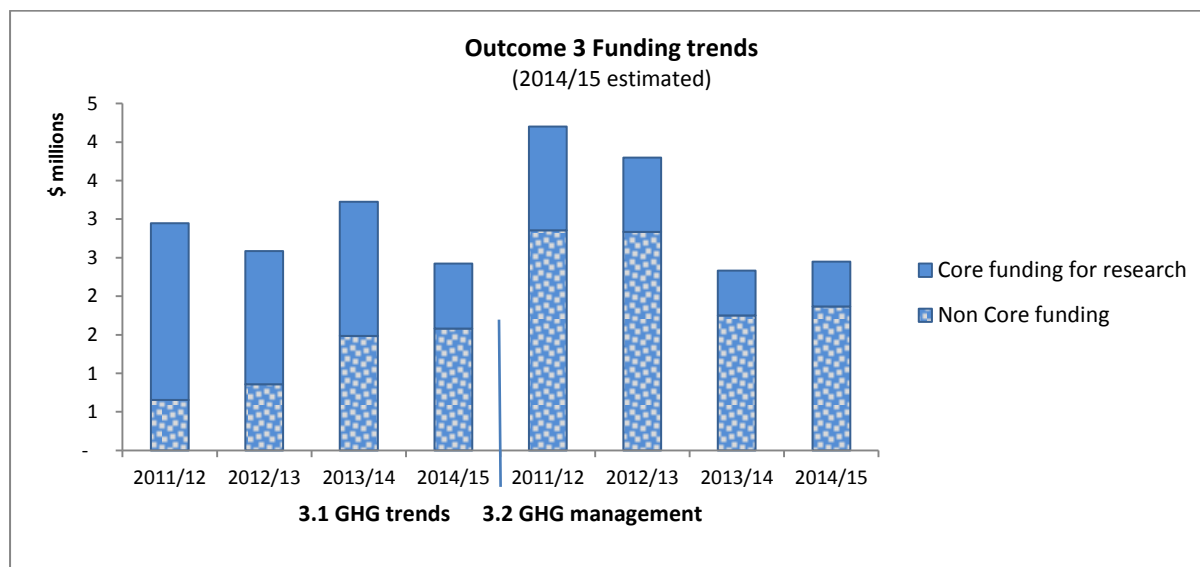
Background

New Zealand must meet its international greenhouse gas reporting obligations and decrease net emissions of greenhouse gases from terrestrial systems to below 'business as usual' levels. To achieve this, it is necessary to have (1) a robust inventory of net emissions and carbon storage and (2) effective mitigation options for reducing net emissions. Changes in emissions and carbon storage as a consequence of management, land use and global change can then be forecasted and appraised. New Zealand is required, under the UNFCCC (United Nations Framework Convention on Climate Change), to produce an annual inventory of greenhouse gas emissions.

While there has been a lot of research effort to estimate changes in above-ground carbon storage in vegetation with land-use management, much less is known about the effects on soil carbon storage. Although New Zealand's commitment to reduce net greenhouse gas emissions does not include changes in soil carbon storage, the Government is required to report such changes annually in relation to land management and land-use change.

Research is needed to improve methodologies for measuring soil carbon storage and for reducing uncertainty in estimating and scaling emissions, and quantifying changes in emissions as a consequence of key land-use and management change. This allows mitigation strategies to be developed and approaches for increasing carbon storage to be identified and adopted.

Funding trends



The downward trend in Core funding reflects a strategic realignment to better support related research in Outcome 2.

Although no Core funding for databases and collections sits within this Outcome, the research programmes draw on the Land Resource Information System (LRIS), the National Soils Database (NSD), and the National Vegetation Survey (NVS). (Refer to Appendix 1.)

Non-Core funding does not include subsidiary business or other income (e.g. rental from co-tenanted properties).

Impact 3.1

The status of terrestrial greenhouse gas emissions and removals are known, and changes in relation to management strategies, land use policies and global change are forecasted.

***Key performance indicator:** MPI and MfE are using verified estimates of greenhouse gas emissions and carbon storage to reduce uncertainty in national inventories*

Impact 3.2

Land use options, asset management and other methods that increase carbon storage and mitigate greenhouse gas emissions are understood and balanced for environmental, economic and social benefits.

***Key performance indicator:** Validated methodologies and land use practices to mitigate greenhouse gas emissions and increase carbon storage and adapt to likely climate change effects*

Impacts	MPI	DOC	MfE	Industry	Local government	Māori
3.1 Terrestrial greenhouse gas trends	Improved measurement of greenhouse gas sources and sinks	Climate change impacts on key ecosystems and species (including pests) are better understood and inform management decisions	New Zealand's reporting commitments (Kyoto) are met	A strengthened business case for industry to measure and mitigate greenhouse gases	Determine state and trend of regional and national net emissions	Business opportunities to mitigate greenhouse gas emissions through enhancing carbon sinks on Māori land
3.2 Terrestrial greenhouse gas mitigation	Reliable and economic greenhouse gas mitigation technologies	Greater definition of the ways in which conservation land benefits from (and contributes to) carbon accounting	New Zealand's greenhouse gas emissions are reduced to below 'business as usual' in a cost-effective way	New, practical means of greenhouse gas mitigation are underpinned by science and supported by a credible certification regime	Reliable and economic greenhouse gas mitigation technologies	

Key research initiatives

Impact 3.1 Trends in greenhouse gas emissions and removals

- Quantify emissions of nitrous oxide and soil carbon changes in hill-country pasture to account for differences in emission factors and nutrient transfer between slope classes. We will continue to work with New Zealand Beef & Lamb to provide improved estimates of hill-country nitrous oxide emissions from 1990 until 2012 for national inventory reporting.
- Develop up-scaling techniques incorporating improved models of greenhouse gas emissions, carbon stocks and nitrogen cycling to understand the impacts of land use change and intensification and hill-country topographic units on greenhouse emissions. This will enable us to provide MPI and the fertiliser industry with more accurate estimates of nitrous oxide emission factors (EF1) from urea fertiliser and farm dairy effluent applied to dairy-grazed pasture, and nitrous oxide emissions from hill-country steep slopes. The research will also improve the national inventory estimates of nitrous oxide emissions for UNFCCC reporting.
- Continue to refine global models and accounting methodologies to assess the importance of key assumptions and decisions on the relative importance of net emissions of carbon dioxide, nitrous oxide and methane.
- Improve estimates of carbon sequestration in regenerating shrubland for inclusion in Emissions Trading Scheme (ETS) look-up tables.

Impact 3.2 Management of emissions and carbon storage

- Strengthen our modelling work of water balances and evapotranspiration rates both to assess the impacts of climate change on future rates of water loss and to develop the modelling capability into a practical decision-making tool for irrigation scheduling.
- Continue the development of novel farm-scale soil techniques to estimate and map soil carbon stocks, and demonstrate the effect of plant functional richness on carbon sequestration. Refine a cost-effective sampling protocol and framework for future modelling of soil organic carbon stocks in hill country. These are important steps in managing carbon storage.
- Continue to develop and test floating biofilters to mitigate emissions of methane (ammonia and effluent odours) from a farm slurry pond.

Key knowledge and technology transfer mechanisms

- Regular dialogue with and reports to MPI, MfE, primary sector industry groups (DairyNZ, Fonterra, Synlait, New Zealand Beef and Lamb, and the piggery and poultry sectors) and the fertiliser industry
- Contributions to the Intergovernmental Panel for Climate Change (IPCC) working groups and reports
- Partnering with Synlait to establish and run a long-term research site to take in situ real-time measurements of greenhouse gas emissions on irrigated and unirrigated sites. This will enable Synlait to assess the impacts of various management changes
- Information sharing via the Global Research Alliance (GRA), the New Zealand Agricultural Gases Research Centre (NZAGRC), and the New Zealand Centre for Climate Change (NZCCC); and lead roles in NzOnet (a network of nitrous oxide researchers from four CRIs, two universities and DairyNZ); Methanet, a framework of methane researchers from four CRIs, two universities and DairyNZ; and CarbonNet, a network of soil carbon researchers from five CRIs and three universities
- Make information about carbon accumulation in woody species successions available to MfE, MPI, DOC, private landowners, forestry consultants and the Carbon Farming Group
- Lecturing, postgraduate student supervision and mentoring, particularly through our joint professorial role with Massey University, and hosting and mentoring postdoctoral researchers
- Hosting New Zealand Royal Society Teacher Fellowships

National Outcome 4: Increase the ability of New Zealand industries and organisations to develop within environmental limits and meet market and community requirements

Key Performance Indicator: *Integrated solutions add value in industry, international markets; meet and demonstrate compliance with regulatory and market requirements; reduce costs of production; and provide measurable benefits to local communities.*

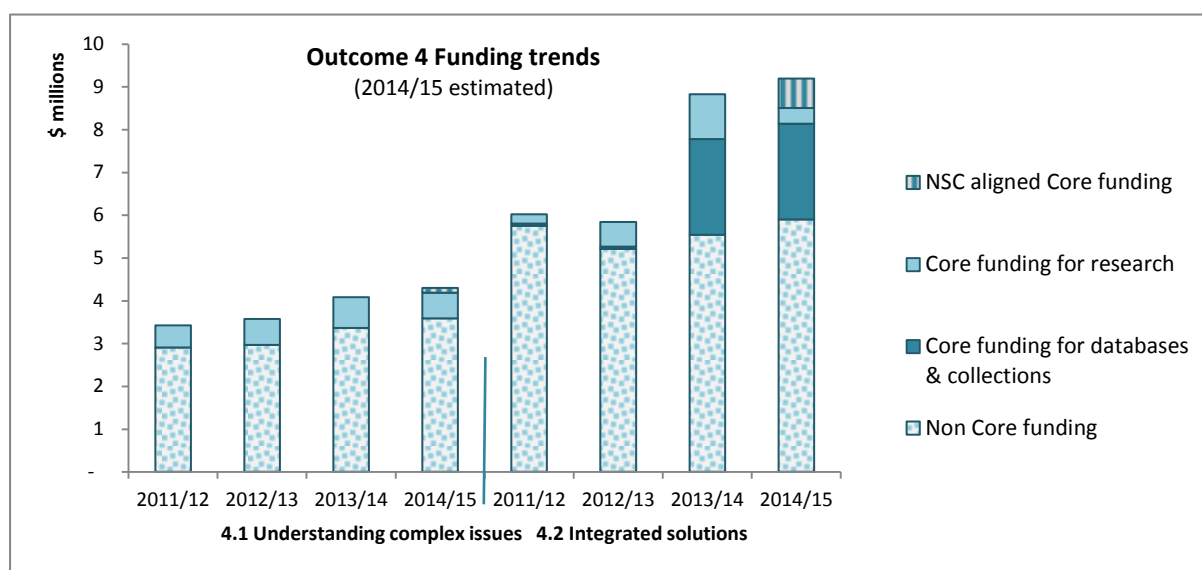
Background

To achieve sustainable economic development, New Zealand must work within environmental limits and be responsive to the often-diverse needs of multiple stakeholders across government, local communities, Māori, the private sector, and export markets. Development is becoming increasingly complex with no one ‘right answer’ for resolving multiple viewpoints relating to the management of New Zealand’s natural resources.

Research underpins effective environmental policy and provides the framework for sound resource management decisions spanning urban, rural and conservation landscapes and catchments, and the full range of ecosystem services and natural resources. Policy development processes are enhanced through (1) engagement across a wide range of stakeholders to understand preferences, values and governance options; (2) scientific information to support choices and decisions; and (3) adaptive management to evaluate and improve policy performance.

Primary production, trade and tourism are increasingly affected by community expectations and market demands for environmental responsibility and sustainable practices. Environmental integrity is a valuable part of the New Zealand brand.

Funding trends



The 2013/14 increase in Core funding for databases and collections in Impact 4.2 reflects strategic realignment of funding from Outcome 1 to better support the development of diagnostic tools for New Zealand biosecurity agencies and industry sectors (e.g. the kiwifruit industry). Non-Core funding does not include subsidiary business or other income (e.g. rental from co-tenanted properties).

The following Core-funded collections (and associated information systems, Appendix 1) support this work:

- The New Zealand Arthropod Collection (NZAC)
- New Zealand Fungal & Plant Disease Collection (PDD)
- International Collection of Micro-Organisms from Plants (ICMP)
- The Allan Herbarium (CHR)

Impact 4.1

Factors (including the form of institutions) required to resolve complex environmental issues, adapt to global change and reduce vulnerability to resource scarcity are understood and recognised.

Key performance indicator: Industry sectors, central and local government are making strategic use of research findings, associated indicators of performance, and new economic instruments to respond to complex environmental issues, global change processes and resource scarcity.

Impact 4.2

Best solutions that integrate economic, social, cultural and environmental initiatives maintain or enhance international competitiveness, market access and social license for business and industry to operate.

Key performance indicator: An industry sector (dairy, horticulture or energy) is using a framework for integrating economic, environmental, social and/or cultural drivers to meet community and/or market requirements.

Key performance indicator aligned to TBfree New Zealand's priorities: Bovine TB is eradicated from vector populations in two extensive and difficult forest areas.

Impacts	MPI	DOC	MfE	Industry (including TBfree New Zealand)	Local government	Māori
4.1 Understanding complex issues	Science support for farmers, forestry and pest managers needing to adapt to a changing climate	Quantification of links between biodiversity, ecosystems and prosperity Identification of community, Māori and business expectations for management decisions	Science support for New Zealand's negotiations in climate change action More robust understanding of environmental limits and how they can be applied to decision making	Improved definition and understanding of environmental limits and how they apply in the business context	Policies and strategies to improve prosperity within environmental limits	Mātauranga Māori and science are integrated to balance environmental, cultural, economic and social aspirations, and achieve competitive advantage in the global market
4.2 Integrated solutions	Prevention and reduction of harm to economic and cultural resources from pests and diseases The primary sectors use natural resources in an increasingly sustainable manner	Better definition of adaptive management strategies to mitigate climate change effects Identification of effective, alternative economic instruments	Decision frameworks to better manage environmental effects and resources allocation New Zealand is well positioned to respond to the global green growth agenda	Environmental performance integration with core business management and strategy Eradication of bovine TB from wild animal vector populations Effective, rapid identification and management of biosecurity threats	Improved decision making, policy and management tools, based on sound evidence, that incorporate community, regulatory, cultural and market needs	

Key research initiatives

Impact 4.1 Understanding complex issues

- Apply 'pathogen discovery' approaches to increase understanding of at least one wildlife disease of concern in public health.
- Complete host-range testing for at least one new weed biocontrol agent; and undertake a quantitative analysis of host range testing in weed biocontrol to determine whether we can improve on the current success rate of weed biocontrol agents.
- Develop tools and processes to enable government, industry and Māori organisations to respond effectively to climate change (within the context of irreducible uncertainty).
- Refine decision-support tools and engagement processes to enable regional councils and stakeholders to understand potential decision options in natural resource management. This work incorporates the use of indicators for farm, catchment and Māori cultural monitoring for freshwater management decisions and planning.
- Undertake a survey of New Zealanders to understand, through choice-modelling, how to prioritise biodiversity protection and enhancement expenditure by size, type and location to provide the value proposition for policy agencies and agri-businesses.

Impact 4.2 Integrated solutions

- Support biosecurity risk decisions and management by cataloguing high priority biota – e.g. the species and pathovar diversity within the *Pseudomonas syringae* group of plant pathogenic bacteria; and publishing an authoritative checklist of newly naturalised plant species in New Zealand.
- Characterise and quantify the responses of native biota to large-scale suppression of key pests (possums, rodents, feral cats, and mustelids) in production landscapes. This will inform development of environmental 'green' credentials for exported products, and also enable non-market valuation of the ancillary benefits of pest control to biodiversity.
- Monitor and analyse sustainability practices of New Zealand organisations in relation to market and regulatory requirements. This will enhance the ability of the primary sector to meet and proactively anticipate market requirements and operate within environmental limits.
- Increase the efficacy of rabbit control on rabbit-prone land, through improved applications of aerial 1080 and identification of more virulent strains of rabbit haemorrhagic disease.
- Demonstrate the feasibility and practicality of new surveillance theory in enabling the declaration of TB freedom to be achieved more quickly and cost-effectively. This will support OSPRI's goal of eradicating TB from 2.6 million hectares but well before the targeted date of 2026.

Key knowledge and technology transfer mechanisms

- Training seminars and workshops for end-users – e.g. weed biocontrol, 'Biosecurity Bonanza', Biosecurity Institute National Education Training Seminar (NETS) – and regular targeted newsletters for end-users
- Continue to work with National Pest Control Agencies (NPCA) and MPI toolbox committees to update best practice guidelines with new knowledge; work with DOC, TBfree New Zealand, MPI, regional councils, private contractors, and the dairy, beef and deer industries to encourage uptake of new knowledge, best practice and improved surveillance systems
- Work with the Sustainable Business Council and BusinessNZ on environmental practices and market requirements, particularly for the food and beverage sector.
- Publish Policy Notes as an evidence-base for decisions and recommendations by central government, regional council and industry for natural resource management
- Link Seminars to Wellington policy agencies highlighting where and how research can inform policy

Vision Mātauranga

Goal

Landcare Research is a key, preferred partner for Māori in enhancing the sustainable value of Aotearoa's land-based natural resources.

Background

For more than 20 years, Landcare Research has successfully partnered with a number of iwi to grow their science capability and to integrate mātauranga Māori into research programmes and resource management frameworks. Tūhoe continues to be a valued partner in a number of research areas, and as part of our Outcome Advisory Panel.

In 2013/14, we signed an MoU with Waikato-Tainui, which signifies a desire to work together on areas of mutual interest – especially in management of fresh water and wetlands.

Our strategy

Vision Mātauranga is central to the delivery of our National Outcomes. Iwi across New Zealand are at different stages in their Treaty of Waitangi settlement processes. Māori organisations are increasingly looking to science partnerships to help tackle a wide breadth of issues of local and national significance. Our Māori strategy, aligned to our overarching *Strategy 2017*, focuses on our role in partnerships with particular iwi and Māori businesses, and the best ways to support development and cultural aspirations:

- Identify opportunities and develop initiatives to help Māori play a greater lead role in science innovation and management of their land and freshwater resources, and hence expand their economic and social development.
- Work closely with Māori business, iwi/hapū, environmental agencies and central and local government to balance aspirations for economic development with imperatives to protect taonga and land and water resources. A key consideration is the translation of research into policy and practice that best serves Māori economic interests and community well-being.
- Continue to grow Māori capability in science research (e.g. through staff placements, page 23) and develop the competency of our staff in mātauranga Māori so they are better able to respond to specific needs of particular iwi, and Māori values and knowledge are integrated within our science practices.

Key areas of focus

- Work with iwi to develop culturally-relevant systems for biodiversity, land and water assessment; kaitiakitanga and sustainable harvest strategies for taonga species; and to support Māori biodiversity outcomes for special places.
- Continue to work with iwi partners to refine Māori cultural monitoring approaches and 'value' indicators; economic tools; and decision-making processes for more informed freshwater planning and management decisions by central and local government and industry stakeholders.
- Work with our partners to continue enhancement of the Māori Land Visualisation Tool and its utility in identifying land use opportunities.
- Continue our role as custodians of the Core-funded New Zealand National Flax Collection and the open-access Ngā Tipu Whakaoranga Ethnobotany Database (Appendix 1).
- Continue our programme of developing cultural competency training, including Te Reo Māori tuition and workshops to related to the Treaty of Waitangi, Wai 262 and general tikanga Māori.

Key performance indicator

- Number of positive strategic partnerships with iwi and Māori organisations in which we are linking science and mātauranga and which address Māori goals and aspirations.

Partnering with Ngāti Hikairo ki Tongariro

Ngāti Hikairo is a hapū whose rohe encompasses land around Tongariro, including farmland, forests and DOC-managed land near Taumarunui, National Park and Rangipo. Parts of the rohe are of high value as an internationally recognised ecological entity and a very popular tourist destination.

One of our pedologists will work with Ngāti Hikairo ki Tongariro, supported by MBIE's Te Pūnaha Hihiko Vision Mātauranga Capability Fund. Through the placement, mātauranga Māori concepts relating to spatial soil patterns and soil properties (Tiro Whenua) will be integrated with mainstream science. This will ensure scientific knowledge more accessible to a greater cross-section of the hapu and make mātauranga Māori more relevant to younger members of the hapu.

The process is expected to create a renewed sense of mana within the hapū, and lead to enhanced management of issues such as erosion from tourist foot traffic on the Tongariro Crossing, and nutrient runoff from farms in the rohe. This will benefit water quality, tourism, and the regional and national economy. Another flow-on benefit will be to encourage young Māori into careers in soil science and land management.

Science Excellence & Collaboration

Goal

Landcare Research is recognised nationally and internationally for excellent science and collaborative research with CRIs, universities and other organisations, including those overseas.

Background

Sustaining the research capabilities, essential for achieving our National Outcomes and maintaining our science excellence, against the background of flat or falling revenues from the public sector is challenging. We are taking a strategic approach for making new appointments in areas that are critical to maintaining national science capability relevant to our Core Purpose (page 2). This strategic approach will also enable growth into new, high priority areas.

Science Advisory Panel

Our Science Advisory Panel consists of Professors Jan Bebbington (St Andrews University, UK), Andrew Campbell (Darwin University, Australia), Mark Kibblewhite (formerly Cranfield University, UK), Basil Sharp (Auckland University) and the chair Dr Steve Goldson (AgResearch). All are active, internationally respected scientists who are able to provide a strategic overview, global perspective and have an appreciation of the New Zealand context. They are into the third year of their 3-year term.

The Panel meets in person with the Board once a year and by video or phone conference each mid-year. Their role is to help the Directors, Science General Managers, Portfolio and Science Team Leaders to evaluate capability, achievements and progress towards our Impacts and National Outcomes. The Panel provides assurance that Landcare Research is deriving optimal benefits from Core funding and related revenue from other sources. The Panel also provides advice to the Board on allocation of resources to priority areas.

We will continue to use our Science Advisory Panel to evaluate our capability and achievements (primarily in regard to science excellence and strategy) and to recommend areas for improvement.

International reputation for research excellence

Many of Landcare Research's scientists are recognised internationally for their skills and expertise, including the quality of scientific papers in high-impact peer-reviewed journals. The majority of our papers are published collaboratively with New Zealand and overseas colleagues from many countries. Such collaboration also grows the pool of skills and innovative thinking that we can access.

We will track the quality of our science performance against relevant national and international benchmarking sources. This will complement evaluation of our research impact and support ongoing monitoring of our science performance by MBIE, stakeholder partners and peer review.

Knowledge transfer

While science excellence per se is critical to our reputation and credibility, we benefit New Zealand by sharing this expertise with others. Knowledge transfer is an integral part of our research programmes and outputs. Our reputation and credibility also underpin knowledge transfer in other ways:

Expert panels, boards, advisory groups and working groups

A large number of our best scientists hold positions on editorial boards of international and national scientific journals. Similarly staff are invited or elected on to many important international and national panels, advisory boards and technical working groups – e.g. the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), the Open Geospatial Consortium's (OGC) new Standards Working Group (SWG) and the Oceania node of the Global Soil Map, which is a significant international project that will assist in addressing global issues such as food and water security, climate change and environmental degradation. There are significant synergies between the OGC SWG, the digital Global Soil Map and S-map (the digital soil map for all of New Zealand) that Landcare Research is developing.

Collaborative research centres, networks and consortia

Landcare Research is a partner in several collaborative research centres, networks and consortia (Appendix 2) that pool capability in science areas relevant to the scope of our operations as outlined in our Statement of Core Purpose. We have now joined the Lincoln-based B3 (Better Border Biosecurity) collaboration and the Palmerston North-based Agri-Food Innovation Cluster, Food HQ.

Links with universities

We are committed to increasing our links with universities in order to grow sector capabilities through the involvement of staff and graduates in collaborative research programmes and technology transfer. We are working with New Zealand universities to (1) develop more strategic opportunities for summer student placements within our research programmes; (2) develop specific, short courses for professionals; (3) supervision of postgraduate students working within our research programmes; (4) facilitate co-appointments and staff secondments in both directions.

In continuing our commitment to the Joint Graduate School with the University of Auckland, we have increased the number of joint appointments. Six of our staff hold Professorial or Associate Professorial part-time roles, and we have broadened the scope of our collaborative activities in biodiversity and biosecurity.

Another senior scientist has been appointed as an Honorary Professor at the University of Otago.

We continue to foster relationships with universities in Chile, India and China, promoting opportunities for collaborative research. One of our senior scientists at Palmerston North holds a Professorial Chair in Environmental Science, a joint appointment with Massey University that also comprises a tripartite agreement with the Punjab Agricultural University, India.

Opportunities for much closer collaboration with Lincoln University are emerging from plans for the 'Lincoln Hub', and we have established joint appointments for two researchers – one from Lincoln University and one of our staff.

Key performance indicators

- Percentage of relevant national and international research providers that have a high level of confidence in the Landcare Research's ability to form the best teams to deliver on its Outcomes (*data provided from MBIE's biennial external survey; the 2013 survey found 85% of respondents were confident in this regard; 91% in 2012*)
- Publications with collaborators (*MBIE indicator*)
- Impact of scientific publications (*MBIE indicator*)
- Total dollar value of revenue subcontracted out to other organisations and subcontracted in to Landcare Research
- Total number of awards, invitations to participate on international committees, and editorial boards for the CRI's published papers, per annum
- Number of postgraduate students being supervised and co-supervised by our staff

International Business

Goal

Growth in the value we generate for New Zealand from applying our science and technology to the environmental issues of other countries.

Background

Landcare Research engages in international 'business', aligned to our Core Purpose, where we seek revenue for overseas work or co-funding on mutually beneficial projects. These projects are expected to demonstrate the science excellence and similar financial return associated with our domestic activities.

Because of our reputation in pest management, we are an invited member of the Invasive Animals Cooperative Research Centre (CRC), an AU\$19.7 million programme spanning all aspects of terrestrial and freshwater vertebrate pest species. As Australia and New Zealand have many pest issues in common, shared expertise and collaborative research is benefiting both countries. Initial participation was supported through strategic investment but research is now funded from operational budgets; it is enabling significant new opportunities.

Science is increasingly being used to spearhead diplomacy in trade and to find solutions for global issues (e.g. the Strategic Research Alliance with China, under which we are working on developing an early-warning system for and sustainable management of rodent pests, with the China Agricultural University, Ministry of Agriculture, Chinese Academy of Agricultural Science and Beijing Longhua Xinye Sanitary Pesticide Co.).

In areas of our core capability, Landcare Research partners with New Zealand government agencies (e.g. MFAT, MBIE, Antarctica New Zealand (see page 27)) and international funders (private sector, philanthropists, NGOs, national governments and donors) on projects in several countries. Current projects with MFAT include enhancement of quarantine services in Indonesia and biocontrol of weeds in the Cook Islands.

Knowledge and technology transfer activities are an important, implicit part of all areas of work.

Key areas of focus

One area that our *Strategy 2017* focuses on is building business acumen (i.e. ensuring we work in ways that optimise impact and uptake from funding contracts), including enhancing our measurement of the value of impacts), and this principle also applies here:

- We will support New Zealand Government programmes in Pacific Island Countries, China and Indonesia through capacity-building projects, e.g. in natural resource management, biosecurity and biocontrol.
- We will seek out opportunities to underpin New Zealand's multilateral/bilateral environmental commitments (including Antarctica, next page), trade agreements and exporting businesses.
- We will also engage in international mutually-beneficial projects where we seek revenue or co-funding for overseas work.

Key performance indicator

- Percentage of total revenue from international sources per annum

Antarctica

Antarctica is part of our scope of operations under our Core Purpose.

The Antarctic Portal

Our informatics experts are developing the Antarctic Environments Portal in collaboration with Antarctica New Zealand plus researchers in Australia, Belgium and Norway, and the Scientific Committee on Antarctic Research (SCAR). The goal of the portal is to improve the links between Antarctic science undertaken by all countries and Antarctic policy by ensuring evidence-based information is immediately at the fingertips of decision makers (e.g. the Committee for Environmental Protection (CEP)).

The Portal will contain information based on peer-reviewed science drawn from a wide range of high quality research papers and reports summarising the state of knowledge on priority issues facing Antarctica. As well as resources and links of immediate relevance to policymakers, the Portal will also include areas for scientists to discuss and draw attention to emerging issues that require examination in more detail by CEP. Information will be open access, although there will be an authentication system for users wanting to interact with or comment on the information. The Portal is not intended to be a static resource; it will continue to evolve as priorities change and as the knowledge base to support the information grows.

In addition, the Portal will eventually provide a mapping interface through which a wider policy and science audience can explore the continent and new geospatial information.

The official launch date for the Portal is June 2015. The cost of establishing and operating the Portal will be borne by the New Zealand Government via Antarctic New Zealand and Landcare Research (Core-funding) until June 2016. Long-term funding is currently being sought from a variety of interested parties and private funders.

Stewardship of Ross Sea ecosystems: top predators and the effects of fishing for toothfish

The focus of the proposed Ross Sea Marine Protected Area is on enabling spatially-resolved research to understand and protect the integrity of the Ross Sea ecosystem in response to fishing and climate change. Adélie penguins are one of the species selected by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) as part of its Ecosystem Monitoring Program (CEMP) to potentially detect anthropogenic and climate effects on the marine ecosystem. The CCAMLR Working Group on Ecosystem Monitoring and Management (WG-EMM) will use our findings to understand the prey (krill and Antarctic silverfish) requirements of Adélie penguins on the northern slope and southern shelf ecosystems of the Ross Sea, and how potential changes to these stocks through exploitation and/or climate change affect Adélie penguins population dynamics and foraging strategies.

Mapping and characterising soils in the Ross Sea region

Antarctic soils are diverse, mainly due to differences in land-surface age (which ranges from a few thousand to millions of years), parent material, topographic position, and local climate variation. The prevailing soil conditions create a harsh environment for plant and animal life. Only a few plants and animals have managed to colonise and survive in ice-free regions.

Microbes, however, are distributed throughout soils of the Ross Sea region, with highest numbers detected in moist coastal areas compared with soils of the inland dry valley areas. Ice-free areas are the most biologically active terrestrial sites on the Antarctic Continent. They are also the focus of human activity and continue to attract scientists and increasing numbers of tourists. Many of these Antarctic soils are very fragile and highly vulnerable to disturbance (even from human foot traffic) and may take decades to recover, if at all. Mapping soil vulnerability aids the selection of walking routes, helicopter landing sites and camp sites; and hence is highly significant to maintaining the integrity of Antarctic environments while enabling tourism.

Information from both the penguin and soils research will be made available through the Antarctic Portal.

Digital Strategy & Informatics

Goal

Landcare Research's science knowledge, databases and collections, analyses and modelling are readily available and can be used efficiently and effectively.

Digital strategy

The digital strategy links our informatics research, information systems development and operational computer systems; as such it is aligned to our overarching *Strategy 2017*. The digital strategy aims to:

- Enable research collaboration across multiple sources and agencies, nationally and internationally, including those involved in the National Science Challenges.
- Ensure our research knowledge, databases and collections, remote sensing analyses and outputs from modelling are readily available and supported so they can be used efficiently and effectively by research collaborators and end-user stakeholders.
- Build 'digital literacy' among our research staff. Digital literacy includes the ability to integrate large, disparate datasets and undertake sophisticated modelling analyses, supported by specialised informatics capability.

Informatics strategy

Informatics is the design and development of information systems that can gather, manage and process digital data (often from distributed sources) and deliver fit-for-purpose information and data as and when needed. Landcare Research's informatics strategy aims to deliver both better services and better value from data. We undertake research in four informatics domains: biodiversity-informatics, geo-informatics, remote sensing and interoperability standards.

Open access

We continue to develop our web portals and online user-friendly Lucid keys and other identification tools underpinned by our nationally significant biological databases and collections (Appendix 1). Key underlying principles for web portals are that data are ethically-open (discoverable), conform to international data standards, and are in forms that are usable by humans and computers.

Two projects – *Research Data Management* and *Data Warehouse for Environmental Modelling* – have been essential components of processes designed to manage data integrity, ensure data are increasingly and continually accessible to end-users, advance our environmental modelling capability, and meet the needs for emerging policy and practices. The projects ensure we meet rapidly evolving global standards in data management, reduce risk exposure from data inaccuracies, and provide credibility for our contractual obligations when presenting data.

Cybersecurity

Society and government increasingly expect instant access to open data and information. While we fully endorse this, we are mindful of the consequential loss of control over subsequent use or misuse of that data. Quantifying the uncertainty associated with data helps clarify how appropriate is the data are for particular purposes and decision-making (page 30). Open access, shared access and system-to-system access to various parts of our IT systems do have some inherent cybersecurity issues (privacy, security of systems and intellectual property). We maintain best practice in regard to this and constantly monitor for potential issues.

Key focus areas

Research priorities for next year and following years are:

- *Computational models* – enable integration of disparate datasets for more sophisticated and rigorous modelling of complex environmental–economic–social scenarios. The ability to interpret data in this way enhances value to end-users, particularly in central and local government.
- *Capability and platforms* – develop and support technology services that support scientific research, digitisation of biological collections, and the development of information systems and web portals (e.g. for Antarctic New Zealand) and mobile ‘apps’ to enhance accessibility (e.g. for S-map Online).
- *New ways of working digitally* – implement new cross-organisational collaboration and communications tools; increase support for high performing multidisciplinary teams (virtual or otherwise). An area of increasing focus is the use of social media and citizen science (‘crowd sourcing’ and ‘gaming’) to encourage wider public participation in high-priority initiatives.

Key performance indicator

- Availability of data from Landcare Research’s Core-funded databases, collections and information systems (assessed and reported by a variety metrics appropriate to each)

Collection digitisation and biological distribution modelling

Strategic investment

Landcare Research will invest in a programme to ‘digitise’ high-priority insect, plant, fungal and bacterial specimens and associated information from our nationally significant biological collections. ‘Digitisation’ means putting information online in a searchable format, and includes high definition images, authoritative information on morphological and molecular characterisation, and accurate provenance and identification data. Drawing on our national leadership in bioinformatics research, we will also develop a real-time, species distribution modelling platform to aid biosecurity and biodiversity decision-making by policy, regulatory and on-the-ground management agencies in New Zealand.

This strategic investment will generate greater value from these important collections by making them more accessible, increasing their relevance to end-users and delivering greater impact and benefit from earlier Crown investment. Investment in the programme also strengthens our ability to generate new revenue through leveraging our unique assets, capabilities and research leadership.

The programme will directly support a number of end-users, particularly those involved in biosecurity incursion prediction and management and biodiversity risk-assessment and conservation. It will enhance the response capability for fundamental questions such as:

- What is this organism?
- How do we recognise it?
- Is this organism a threat or threatened?
- Where did it come from, when did it arrive, and where might it spread under various scenarios?

National e-Science Infrastructure (NeSI)

Continuing strategic investment

High Performance Computing (HPC) and related e-science infrastructure are now indispensable components of modern research. Landcare Research is a partner in the \$48 million National e-Science Infrastructure (NeSI) investment by Government, universities and CRIs to build and operate four High Performance Computing facilities.

NeSI enables us to carry out advanced modelling across all four of our National Outcome areas for applications such as land and ecosystem resource inventories, historical ecosystems, physical and economic climate change impacts, and invasive species. It also facilitates collaborations with researchers overseas. NeSI has opened up opportunities to undertake projects that previously would have been too time-consuming and expensive to undertake. Examples of such computationally-intense projects include:

- Processing single species and population genomics (benefitting biosecurity and conservation management)
- Simultaneously analysing clusters of 7000–19,000 vegetation plots recorded in NVS to develop a robust, impartial quantitative classification of New Zealand's plant communities
- Remote sensing data processing (e.g. cloud masking, satellite image mosaicking, image feature segmentation) for the Land Cover Database project, enabling LCDB3 to be completed in a compressed time-frame compared with previous iterations
- Pest population modelling at the national scale

The Uncertainty Pipeline

The Uncertainty Pipeline is a framework to: (1) determine and characterise uncertainty when data are collected, (2) assess and manage uncertainty in modelling and analyses, and (3) communicate the significance of the various sources of uncertainty to policymakers and other users of the data.

Landcare Research has invested capability funding in a project to characterise uncertainty in relation to land–soil–water data used at the farm scale and the catchment scale. Catchment-scale water balance models need to characterise model assumptions and structural error. At the farm scale, it is important to characterise uncertainty associated with soil property data, which is affected by resolution of spatial mapping, accuracy of horizon thickness and texture/stone content, soil classification, and other morphological properties that affect soil hydrology functions and hence the accuracy of models such as OVERSEER[®]. There are two dimensions to understanding uncertainty – assessing and characterising the imperfections in our soil–water-related data – and devising methods that focus on determining whether information is fit-for-purpose or not. ‘Fitness’ depends on the type of purpose or decision, the importance of the underlying drivers behind the decision, and the consequences of either getting the decision wrong or of not making the decision.

Some of the generic approaches and tools developed in this project will be applicable to other areas of research and decision making.

Commercialisation of Knowledge & Technology

Goal

Landcare Research adds value to the New Zealand economy through commercially viable products and services and their transfer to partners in the private sector.

Background

The traditional implementation route for our public good science is to make it widely available to stakeholders for developing policy and improving management practices. In some instances the impact of our science can be enhanced via a commercialisation route, generally by licensing a technology. CRIs are encouraged to transfer commercially-viable technology and knowledge to the private sector at an early stage. We mainly use the services of KiwiNet, of which we are a member, but can also draw on other resources (e.g. Callaghan Innovation) to get new technology applications market-ready. Building business acumen and commercialisation capability is one of the themes we have identified in our *Strategy 2017*.

Commercialisation strategy

- *Empowering scientists as entrepreneurs:* We have engaged a successful entrepreneur to mentor scientists and facilitate the innovation–commercialisation process. This will develop our scientists' skills enabling them to take a central, proactive role in commercialising their work.
- *Preferential focus:* We will give preference to projects where we have a unique strength and which have high potential for commercial revenue, mostly through commercialisation, grants or philanthropy. Two areas of future focus are (1) utilising our International Collection of Microorganisms from Plants, and (2) utilising our knowledge around soils and Geographic Information Systems.
- *Rapid, staged investments:* We will increasingly adopt a commercial investment approach, investing a small amount in the project idea initially but also making provision for additional investment as needed for rapid second-stage development.
- *Commercialisation facilitation team:* We will develop a small team to help facilitate visibility of our projects to assist in attracting funding, investors or donors.

Key areas of focus

- Work with our commercialisation mentor, KiwiNet and Auckland UniServices to develop the commercialisation potential of a new species-specific rodenticide and sterile *Agapanthus* varieties.
- Work with start-up company Varigate to develop our technology, which enables precision irrigation to be matched to soil variability at the paddock scale.
- Identify new opportunities and develop them through a staged process.

Key performance indicators

- Number of new and existing licensing deals of Landcare Research-derived IP (including technologies, products and services) with New Zealand and international partners per annum
- Percentage of relevant end-users who have adopted knowledge and/or technology from Landcare Research (*data provided from MBIE's biennial external client survey; the 2013 survey found 95% of respondents have adopted our knowledge or technology in the past three years; 97% in 2012*)

Enviro-Mark Solutions

Background

Our wholly-owned subsidiary company Enviro-Mark Solutions (formerly carboNZero Holdings) was formed on 1 July 2013. It provides a range of environmental certification services that are strongly aligned to our Core Purpose, particularly Outcome 4 (Development within Environmental Limits). Enviro-Mark Solutions offers the CEMARS®, carboNZeroCert™ and Enviro-Mark® certification programmes to clients in New Zealand. Enviro-Mark Solutions issues 97% of accredited greenhouse gas certificates in New Zealand and provides 41% of environmental management systems certification.

The CEMARS and carboNZero programmes are also offered overseas. Enviro-Mark Solutions has two major international collaborations: Achilles Information in the UK, and PE International in Germany. Achilles prequalifies and manages 93,000 suppliers across 11 sectors in 22 countries. Achilles offers CEMARS in the UK, under licence to Enviro-Mark Solutions. Enviro-Mark Solutions is the only certification body accredited for PAS 2050 (product carbon footprinting) outside the UK.

There is now opportunity for Enviro-Mark Solutions to develop a more coherent and enlarged set of services in New Zealand the UK and in new markets. Enviro-Mark Solutions is developing its new software platform with PE International in Germany and it has implemented CEMARS and carboNZero certification on the platform with its New Zealand clients.

While the subsidiary is a standalone company with separate premises in Auckland, it shares facilities and resources at our Lincoln and Wellington sites; it also follows the same accounting and general business, Good Employer and EEO practices and processes as the parent company.

The Landcare Research parent company is itself carboNZero certified, with processes and data verified by an independent third-party.

Key areas of focus

- Finalise external investment to grow the global business of Enviro-Mark Solutions.
- Continue to strengthen our relationship with our UK partner to enhance the CEMARS product and extend to new geographies.
- Continue to develop our integrated modular platform for environmental performance improvement to optimise our services to New Zealand businesses and enable programme customers to access green-growth opportunities through our science.
- Continue our strategy of seeking approval of our programmes from regulators and those who determine procurement and supply chain requirements.

People, Learning & Culture

Goal

Landcare Research has an organisational culture that is adaptive in the face of change, attracts high quality talent, produces great leaders and which is supported by effective systems and processes.

Background

Landcare Research is a knowledge organisation; talented scientists are essential to our success and vitality – our *Strategy 2017* recognises this. Because New Zealand salaries cannot compete with those paid by overseas research organisations, science excellence and workplace culture are important aspects of our ability to attract and retain science staff. Manaaki whenua – manaaki tangata (care for the land – care for the people) is our philosophy that has endured for 20 years.

Our third and most recent staff survey to assess organisational culture, employee engagement and leadership capability, was conducted in February 2014. Despite a difficult year, our engagement index remained constant and well above the CRI benchmark.

In a competitive market for talent, our international recruitment levels remain constant. Our accredited employer status with Immigration New Zealand makes this a much smoother and less complicated process. All our science teams have capability plans in place.

We continue to work closely with the other CRIs to establish greater effectiveness and efficiency through shared approaches, policies and systems. All of our support teams are using a CRI workforce planning tool developed by a pan-CRI working group.

Strategic focus

We will maintain our focus on the four elements of our people strategy:

Workplace culture

- We will increase our focus on strengthening our organisational culture. We have already appointed a staff committee (made up of science and support leaders) to progress five specific initiatives: (1) transformational leadership, (2) shared organisational values, (3) resilience at both organisation and individual levels, (4) improving line of sight to connect staff to the organisational vision and strategic plans, and (5) climate control to manage external influences and our own leadership values. These initiatives align with our *Strategy 2017*. We will measure the impacts of these initiatives through our biennial staff survey (to be conducted next in 2016), and via our quarterly Tier 2 and Tier 3 combined meetings.

Leadership

- We will continue to collaborate with the pan-CRI Human Resources group on leadership development opportunities for senior leaders. A programme will be implemented across the combined CRI senior leadership group in 2014/15.
- Landcare Research is also developing an internal leadership programme that is specifically tailored to each of the three top tiers of leadership. The programme is aligned to the pan-CRI leadership framework.

Talent

- Our joint platform for recruitment has been implemented and is enabling a much more seamless process for candidates and possible future talent to register their interest in a career with a CRI.
- Following the effectiveness of our new performance appraisal and development process within its first year of implementation, we will develop it into an online tool.

Compliance, systems and service

- We will develop a new reporting tool that will align our reporting systems and processes with the agreed pan-CRI people metrics, which will enable improved benchmarking and better identification of priority areas within and across CRIs.
- Focus for the pan-CRI group will move from Workforce Planning to Health & Safety with a number of collaborative initiatives being discussed and priorities being agreed.
- We maintain a strong focus on compliance with all human rights and good employer legislation. We are committed to best practice through continued:

- Membership of the EEO Trust
- Support for the Mainstream Programme for people with disabilities
- Tertiary (the highest) accreditation in ACC's Workplace Safety Management Practices (WSMP) programme (accreditation that we have maintained for 10 consecutive years).

Maintaining and developing science capability

The Chief Scientist and Science Team Leaders manage capability and capacity needed for work in the Portfolios. Where potential gaps are identified, we partner with other research providers in New Zealand and offshore (and enhance this using our inward and outward Fellowships); recruit new staff with the required expertise; and enable our staff to develop new capabilities in priority areas aligned to our *Strategy 2017* through training opportunities both nationally and internationally.

Succession planning is important for us with several of our highly experienced senior scientists approaching retirement in the next few years. We plan for the continuity of capability by appointing emerging scientists to work alongside more experienced mentors. Indications are that this is an effective way to capture knowledge and maintain the impact of our research.

To maintain key capabilities critical for our Core Purpose in the face of flat or falling government investment in some areas of environmental science, we invest a subset of our Core funding in capability-building science projects of 1- to 2-year duration. Such projects also develop talent and new research ideas, including those that will be needed to contribute to the National Science Challenges.

Key performance indicators

Culture and leadership

- Staff engagement index in survey evaluations of leadership, engagement and organisational culture.
- The percentage of staff in leadership positions completing the leadership development programme (and demonstrating improved leadership evaluations).

Talent management

- Turnover of key high performing / high potential science staff.
- Capability management and succession plans in place for all Science Teams.
- Individual performance and development plans in place for all staff.

Good employer

- 'Good employer' performance will be covered in comprehensive annual sustainability reporting on our website (www.landcareresearch.co.nz/sustainability).

Following our participation in the pilot project, we intend to adopt the pan-CRI framework of indicators to improve assessment of our performance and to benchmark this across CRIs.

Science Infrastructure & Collections

Our five largest sites are located on or near university campuses – an intentional strategy to facilitate research collaboration, lecturing and supervision of postgraduate students, and shared access to specialist infrastructure.

All of our sites are co-located with staff from other CRIs, aligned NGOs and/or end-user organisations, which encourages sharing of facilities, collaboration and communication. This long-standing commitment to collaboration and shared facilities and resources underpins virtual initiatives such as the National Land Resource Centre (page 37), research centres and consortia (Appendix 2, page 42) and the National Science Challenges. We are partners in the National e-Science Infrastructure (NeSI) investment by government, three universities and one other CRI to build and operate four High Performance Computing facilities.

An important theme of our *Strategy 2017* is to ensure we have fit-for-purpose organisational identity, smart systems and processes and the right facilities to deliver effective research and outcomes into the future.

We are continuing a programme to upgrade buildings and other assets at various sites. At Lincoln we are working closely with our partners in the Lincoln Hub (page 6) to ensure any infrastructure refurbishment projects are consistent with opportunities for shared infrastructure and access to specialist facilities.

Access to our nationally significant biological collections

We periodically review the collection vaults and infrastructure to ensure they are fit-for-purpose, meet the curatorial standards required to maintain these valuable assets in perpetuity, and support systematics science undertaken by our staff and other bone fide researchers. In recent years, strategic investments have been used to significantly enhance our collections infrastructure and protect these important national taonga on behalf of all New Zealand (e.g. investment in improved temperature and humidity control to meet international good practice standards).

Key performance indicator

- Specimen transactions, identification requests and visitors for our Core-funded biological collections and associated infrastructure.

Procurement

In procurement, we make significant use of All-of-Government contracts, pan-CRI contracts and syndicated contracts, plus we have made improvements in our own supply contracts. These improvements span both collaborative and general contracts, with emphasis (and best gains) on collaborative initiatives.

We collaborate with CRIs and government agencies to drive improvements in procurement and property management practices to reduce risk and increase business efficiency within our organisation and across a wide cross section of businesses in our supply chain.

Key performance indicator

- Improved supply contracts delivering measurable business benefits.

Reinvestment of surplus

Landcare Research has the approval of its shareholding Ministers to reinvest surplus funds in initiatives that support fulfilment of our Core Purpose through building staff capability and developing facilities that benefit New Zealand. The two key initiatives for 2014/15 are:

- Collection digitisation and the biological distribution modelling platform (page 29)
- National e-Science Initiative (NeSI) (page 30).

National Science Challenges

The Government has launched the National Science Challenges to address the most pressing of the complex issues facing New Zealand. The Challenges are to be mission-led, provide ‘additionality’ to existing collaborations and ways of working, and are intended to deliver significant science innovation.

As signalled in the Chair and Chief Executive’s Overview (page 3), Landcare Research is well positioned to play a role in integrating multidisciplinary science and infrastructure across providers, stakeholders and end-users. We can also contribute leadership in key research areas relevant to our Core Purpose. Of the ten challenges, Landcare Research is very closely involved with two – *New Zealand’s Biological Heritage* and *Our Land and Water*. We are also participating in *The Deep South* Challenge (relating to climate impacts on New Zealand).

New Zealand’s Biological Heritage – Ngā Koiora Tuku Iho

Landcare Research will be bidding as the host agency for the *New Zealand’s Biological Heritage* Challenge, having co-led the bidding process with Plant & Food Research, and engaging with key stakeholders at all levels of the work. MPI and DOC, as the lead agencies for New Zealand’s biosecurity and biodiversity policies and operational programmes, are part of the group making decisions on the proposal development. Similarly several Māori representatives are helping ensure Vision Mātauranga principles are deeply embedded in the Challenge proposal.

We are also engaging with key primary sector, regional council, Māori, conservation and other Natural Resource Sector stakeholders through a Stakeholder Reference Group that will ensure the Challenge proposal defines the right ‘mission’ for the Challenge and delivers high-impact, high-novelty, interdisciplinary research while meeting stakeholder needs.

Given the high levels of public interest in the *Biological Heritage* Challenge, we provide regular updates on the proposal development, research themes and goals through the open website www.biologicalheritage.org.nz/

The Challenge research themes are:

1. Discovery and Characterisation
2. Interdependencies and Resilience
3. Mitigation and Restoration
4. Detection, Measurement and Assessment
5. Social Partnerships and Licence

Our Land and Water – Toitū te Whenua, Toiora te Wai

The primary aim of *Our Land and Water* (with AgResearch bidding as the host agency) is to ‘enhance primary sector production and productivity while maintaining and improving our land and water quality for future generations’. The vision is that, by 2030, New Zealand will be a global leader in land-based sustainable production sectors. The Challenge will generate national, evidence-based monitoring and reporting systems that are integrated over all land uses and consider economic, environmental, social and cultural dimensions when measuring sustainability.

The proposal addresses four themes:

1. Defining and meeting social values – Ngā Ahuatanga Māori
2. Optimising primary and sector supply chains – Tuhonohono
3. Land and water management – Te Ao Turoa
4. Adaptable, responsive and resilient land-based primary production systems – Tikanga Whenua

Each theme will quantify the biophysical, economic, social and cultural resources available, assess how the resources respond to change at multiple spatial scales, identify new intervention practices to achieve the aim of the Challenge and demonstrate the success of the actions at appropriate scales. Outcomes for the Challenge are aligned with the Business Growth Agenda, Freshwater reforms, and aspirations for growth for Māori agribusiness.

National Land Resource Centre

The National Land Resource Centre (initiated by Landcare Research) is a collaborative partnership between Landcare Research, AgResearch, Scion, Plant & Food Research, GNS Science and ESR; with Landcare Research as the managing partner. The Centre operates across institutional boundaries to provide robust evidence and capability needed to enhance and unlock the 'land economy'. A key goal is to grow science translation skills making knowledge more relevant and readily available to those who will be using it. As such, the Centre has an important role to play as a conduit for information needed in the *Our Land and Water* Challenge and by the Lincoln Hub.

In determining priorities and undertaking relevant research, the Centre (NLRC) engages with a wide range of stakeholders to ensure that the science best meets their needs and is made available in a way that maximises uptake and impact. The NLRC website provides easy access to a wide range of soils and land-focused resources (maps, data and tools) from a wide range of organisations. Work this year with the universities will also focus on capability-building within sectors in relation to using science information.

The Centre is working with the *Our Land and Water* National Science Challenge process to engage with regional council and central government stakeholders and to ensure their priorities are included within the Challenge's research plan. The Centre's focus on increasing the uptake and impact of science is closely aligned to and complements the goals of the Challenge.

Financial Strategy

Goals

1. Financial viability and flexibility

Landcare Research continues to maintain financial viability and flexibility (including moving towards a return on equity that is in line with our shareholders' expectations), operates within our banking covenants, and invests for the future in both infrastructure and strategic initiatives.

2. Return on equity

Landcare Research achieves and maintains an adequate return on equity in its core science business. Surpluses may be used to support our commercialisation businesses and strategic initiatives to enhance our science. A tailored rate of return will be agreed during the annual planning process with our shareholding Ministers.

Context

Financial flexibility is important to enable Landcare Research to respond to changes in the external environment and pursue strategic opportunities. In determining an acceptable tailored rate of return we have adopted the following underlying principles:

- In the long term the rate of return on equity should equal the weighted average cost of capital.
- In the short term the Board is prepared to propose to shareholders a lower tailored return on equity to support strategic investment that will enhance science, provide benefit to New Zealand and underpin future returns, including the development of our commercial businesses.
- The targeted return on equity will be reviewed by the Board over the planning period as other strategic investment opportunities with long-term benefits are presented.

In the current fiscal situation we are conscious that it is unlikely there will be increases in MBIE funding for science research. The Core Funding Agreement provides a degree of certainty, but no recovery of inflation; and we expect strong competition in the science sector for other sources of government and private sector revenue. Our ability to ensure financial viability through a sustained period of fiscal pressure will be critical to the ongoing success of Landcare Research.

Financial Operating Plan 2015–19

The Operating Plan shows the continuous improvement in financial performance. The material assumptions underpinning the financial projects include:

- Annual increases in commercial revenue
- Efficiency gains to offset inflationary increases on operating costs.

The Board monitors progress in these areas and will take appropriate action if the projections appear unlikely.

Financial performance and position (consolidated group)

For the year ending 30 June:	2014		2015	2016	2017	2018	2019
	Target	Forecast	Target	Target	Target	Target	Target
Revenue	55.7	56.9	58.7	62.8	65.4	67.4	69.5
EBIT before Investment	2.2	2.3	2.7	2.6	2.9	3.3	3.7
Investment	0.7	0.7	0.7	0.4	0.3	0.2	0.2
EBIT	1.5	1.5	2.0	2.2	2.6	3.1	3.6
Total Assets	43.3	42.8	42.1	47.5	49.0	52.2	55.4
Capital Expenditure	2.4	3.7	3.7	6.2	6.0	4.2	3.9
Dividend	0	0	0	0	0	0	0
Equity ratio	65%	66%	72%	68%	69%	70%	70%
Gearing	0%	0%	0%	0%	0%	0%	0%

Explanatory notes to table:

EBIT: Earnings before interest, financial lease charges and tax, and after committed business development expenditure and technology service expenditure

Equity ratio: Average shareholders' funds ÷ Average total assets.

Gearing: Interest bearing debt ÷ Interest bearing debt + shareholders' funds, expressed as a percentage

Reinvestment of surplus

Landcare Research will continue with a number of identified strategic investment opportunities that will create future value. In determining the amount available for strategic investment, we have adopted the following principle:

- We are prepared to reinvest surpluses in strategic investment opportunities that will create long-term benefits provided we have both capacity to invest and Landcare Research's long-term rate of return at least equals our weighted average cost of capital.

During the planning period, we intend to reinvest surpluses with an EBIT impact of \$0.2 – \$0.7 million each year. This will be financed from both science research surplus and the performance of prior investments.

Strategic investments planned for 2014/15 comprise:

- Collection digitisation and the biological distribution modelling – new investment (page 29)
- NeSI – continuing (page 30)
- Commercial investments (page 31)

Financial strength and flexibility

Landcare Research's financial performance is projected to improve over the planning period, and a strong balance sheet continues to provide flexibility. Landcare Research aims to grow its revenues in the next five years to \$69.5 million and EBIT to \$3.5 million. Minor or modest increases are expected in science research revenues, and with higher growth anticipated in our commercial business revenues.

Landcare Research's tailored return on equity for 2014/15 is 5.0%, which has enabled strategic investment to continue in areas approved by the Board.

Key performance indicators (as specified by MBIE)

- Financial indicator – Landcare Research Group shows continuous improvement in efficiency, while maintaining growth, investment and appropriate levels of risk.

	Actual	Forecast	Business Plan				
For year ending 30 June:	2013	2014	2015	2016	2017	2018	2019
<i>Efficiency:</i>							
Operating margin	9.4%	10.0%	10.4%	10.0%	10.4%	10.5%	10.6%
Operating margin / FTE	\$14,860	\$16,622	\$18,265	\$18,874	\$20,377	\$21,251	\$21,973
<i>Risk:</i>							
Quick ratio	0.73	1.03	1.06	1.01	1.03	1.20	1.39
Interest coverage	80	148	117.3	NA	NA	NA	NA
Operating margin volatility	10.7%	9.9%	10.9%	7.9%	10.6%	9.1%	7.8%
Forecasting risk	-2.1%	-0.2%	-0.2%	-0.8%	-0.6%	0.1%	0.0%
<i>Tailored Rate of Return:</i>							
RoE before Investment & Restructure	5.9%	6.2%	7.3%	7.0%	6.8%	6.9%	7.3%
RoE before Investment	4.1%	5.9%	6.8%	6.3%	6.6%	6.9%	7.3%
RoE NPAT	2.1%	4.0%	5.0%	5.4%	6.0%	6.5%	7.0%
<i>Growth/Investment:</i>							
Revenue growth	-6.2%	3.2%	3.2%	6.9%	4.2%	3.0%	3.1%
Capital renewal	1.2	0.9	0.9	1.5	1.4	1.0	1.0

NA = not applicable

Explanatory notes to table:

Operating Margin: EBITDAF ÷ Revenue, expressed as a percentage and per FTE (*EBITDAF* is Earnings Before Income Tax before Depreciation, Amortisation and Fair value adjustments)

Quick ratio: (Current assets – Inventory - Prepayments) ÷ (Current liabilities – Revenue in advance)

Interest cover: EBITDAF ÷ Interest paid

Forecasting Risk: 5-year average of return on equity less forecast return on equity

Return on equity: NPAT ÷ average shareholders' funds, expressed as a percentage (*NPAT* is net profit after tax)

Shareholders' funds: Includes share capital and retained earnings

Capital renewal: Capital expenditure ÷ depreciation expense plus amortisation expense

Appendix 1: Nationally significant collections, databases & information systems

<p><i>Held in Auckland:</i></p> <p>New Zealand Arthropod Collection (NZAC)</p> <ul style="list-style-type: none"> • Largest collection of New Zealand land invertebrates, with many specimens also from the South Pacific; earliest collections date from 1880s • Contains over 1 million pinned specimens, and approximately 6 million stored in ethanol; over 2,500 primary type specimens • Includes the National Nematode Collection of New Zealand (NNCNZ) <p>http://nzac.landcareresearch.co.nz http://fnz.landcareresearch.co.nz http://www.landcareresearch.co.nz/resources/collections/nncnz http://nzinverts.landcareresearch.co.nz http://scd.landcareresearch.co.nz</p>	<p><i>Held in Auckland:</i></p> <p>New Zealand Fungal & Plant Disease Collection (PDD)</p> <ul style="list-style-type: none"> • Primary source of information on the fungi of New Zealand and of Pacific Island Countries • Contains 100,000 dried fungal specimens, including 2,000 type collections • Contains voucher specimens documenting most plant diseases recorded in New Zealand <p>http://nzfungi.landcareresearch.co.nz http://virtualmycota.landcareresearch.co.nz http://fungalguide.landcareresearch.co.nz http://scd.landcareresearch.co.nz</p> <p>International Collection of Micro-Organisms from Plants (ICMP)</p> <ul style="list-style-type: none"> • Living cultures of more than 16,000 strains of bacteria and fungi from plants and soil • Mostly stored in liquid nitrogen; others in freeze-dried ampoules <p>www.landcareresearch.co.nz/databases/icmp http://scd.landcareresearch.co.nz</p>
<p><i>Held in Lincoln:</i></p> <p>Allan Herbarium (CHR)</p> <ul style="list-style-type: none"> • The largest herbarium in New Zealand is housed at Lincoln; all plant groups are represented, plus lichens • Specialises in plants (native and introduced) of the New Zealand region, and also South Pacific • Specialist collections of seed, fruit, wood, plant leaf cuticle, liquid-preserved specimens, and microscope slides • Over 600,000 specimens with the oldest samples collected during Captain Cook's first voyage to New Zealand, 1769–1770 <p>www.landcareresearch.co.nz/allanherbarium http://nzflora.landcareresearch.co.nz www.landcareresearch.co.nz/floras_guides www.nzherbaria.org.nz http://scd.landcareresearch.co.nz</p>	<p><i>Held in Lincoln:</i></p> <p>National Vegetation Survey (NVS)</p> <ul style="list-style-type: none"> • A national repository at Lincoln for plot-based vegetation survey data collected throughout New Zealand • A physical archive and computer databank containing records from approx. 77,000 vegetation survey plots including over 19,000 permanent plots, with data spanning more than 50 years • Broad geographic coverage, with national coverage of data from Northland to Stewart Island, plus the Kermadec and Chatham islands • Survey data can be deposited with NVS for management and is also available by request <p>http://nvs.landcareresearch.co.nz/</p>
<p><i>Held in Lincoln:</i></p> <p>National New Zealand Flax Collection</p> <ul style="list-style-type: none"> • Living collection at Lincoln of over 160 provenances of <i>Phormium</i> species of cultural, economic and historical interest. It supports research on both traditional and new uses of <i>Phormium</i> <p>www.landcareresearch.co.nz/harakeke http://scd.landcareresearch.co.nz</p> <p>Ngā Tipu Whakaoranga Ethnobotany database</p> <ul style="list-style-type: none"> • A fully referenced web resource of detailed information on the traditional use by Māori of native plants and fungi, including Māori names for species <p>http://maoriplantuse.landcareresearch.co.nz/</p>	<p><i>Managed through Palmerston North and Lincoln:</i></p> <p>Land Resource Information System (LRIS), including New Zealand Land Resource Inventory (NZLRI)</p> <ul style="list-style-type: none"> • National database depicts general land characteristics (rock, soil, slope, erosion, and vegetation), a derivative general-purpose land evaluation (land use capability), and a range of environmental, climatic, management and production attributes <p>www.landcareresearch.co.nz/resources/data/lris https://lris.scinfo.org.nz</p> <p>National Soils Database (NSD)</p> <ul style="list-style-type: none"> • Physical collection of 1,500 soil profiles from 1,700 different locations throughout New Zealand, with site descriptions and chemical, physical, and mineralogical characterisations.

Appendix 2: Shared research capability & infrastructure through collaborative research centres, consortia & networks

We are part of several national and international initiatives to pool research capability and infrastructure that are relevant to our Core capability as outlined in the Statement of our Core Purpose (page 2).

Ecosystems and ecosystem services, terrestrial vertebrate pest control, biosecurity, integrated social and biophysical research:

- The **Centre for Biodiversity and Biosecurity (CBB)** with the University of Auckland, including the Joint Graduate School www.cbb.org.nz
- The **Regional Councils' Biodiversity Forum** that decides their priorities for biodiversity research
- The Australian-funded **Invasive Animals Cooperative Research Centre (CRC)**, which is Australia's largest integrated invasive animal research programme www.invasiveanimals.com
- The **Southern Temperate Ecosystems Research Network (STERN)**, with the Institute of Ecology and Biodiversity in Chile, which is initially focused on invasive species
- The **Global Biodiversity Information Facility (GBIF)**, which collates records from biological collections around the world, and **Species2000 Catalogue of Life**, which is creating a valid checklist of the world's species www.gbif.org www.sp2000.org
- The **B3 (Better Border Biosecurity)** consortium with four other CRIs, Lincoln University, MPI, DOC and the New Zealand Forest Owners Association. The members collaboratively research ways to reduce the entry and establishment of new pests in New Zealand <http://b3nz.org>

Carbon storage and greenhouse gas emissions, climate change adaptation and mitigation:

- The **New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC)** – a partnership of five CRIs, Massey and Lincoln universities, DairyNZ and the Pastoral Greenhouse Gas Research Consortium (PGgRC) www.nzagrc.org.nz
- The **New Zealand Climate Change Centre (NZCCC)** with Victoria University of Wellington, University of Canterbury, Massey University, and many of the CRIs www.nzclimatechangecentre.org
- The **Global Research Alliance** on agricultural greenhouse gases, which brings more than 30 countries together. It focuses on research, development and extension of technologies and practices that will help deliver ways to grow more food (and more climate-resilient food systems) without increasing greenhouse gas emissions www.globalresearchalliance.org

Land cover, land use, and spatial land information; land, soil and freshwater management; integrated social and biophysical research:

- **KiwiImage**, which was an All-of-Government project to acquire new higher resolution, multi-purpose satellite imagery for all of New Zealand and its subantarctic islands. Land Information New Zealand (LINZ) is now the custodian of the imagery, with Landcare Research part of the MoU and able to use KiwiImage products www.linz.govt.nz/topography/kiwiimage
- The **Sustainable Land Use Research Initiative (SLURI)** pools soil science expertise across three CRIs in a programme that develops new tools for regulators and land managers www.sluri.org.nz

Soil characterisation, processes and services; integrated social and biophysical research:

- The **Soil and Land Use (SLU)** research alliance between four CRIs for a more collaborative and integrated approach to research and capability development
- The **National Land Resource Centre (NLRC)**; page 37) provides a gateway to soil and land data, and has responsibility for coordinating capability development across SLU www.nlrc.org.nz
- The **Global Soil Map** is a global consortium to make a new digital soil map of the world using state-of-the-art and emerging technologies for soil mapping and predicting soil properties at fine resolution to assist better decisions in a range of global issues such as food production and hunger eradication,

climate change, and environmental degradation. We are the Scientific Coordinator of the Oceania Node and lead the Cyberinformatics working group www.globalsoilmap.net

Industry and business environmental performance, including verification:

- **Agri-Food Innovation Hub** with two other CRIs, Fonterra and Massey University. The Hub is based on the university's Manawatu campus.

Urban environments:

- The **New Zealand Centre for Sustainable Cities** with University of Otago and five other partners <http://sustainablecities.org.nz>

Antarctica:

- The **New Zealand Antarctic Research Institute**, an initiative led by Antarctic New Zealand to leverage overseas and philanthropic funding <http://nzari.aq>

General:

- The **Kiwi Innovation Network (KiwiNet)**, a consortium with WaikatoLink, Plant & Food Research, Otago Innovation Ltd, Lincoln University, AUT Enterprises, AgResearch, University of Canterbury, Callaghan Innovation, VicLink, Cawthron Institute, ESR and NIW; with principal support provided by MBIE www.kiwinet.org.nz
- The **New Zealand eScience Infrastructure (NeSI)**, with the University of Auckland, University of Canterbury, NIWA, Otago University and MBIE www.nesi.org.nz

Appendix 3: Summary of Key Non-Financial Performance and Pan-CRI indicators

Landcare Research Indicators			
SCI section	Indicator	2012/13 Actual	Target range 2014/15
Stakeholder Engagement	Percentage of relevant end-users who have adopted knowledge and/or technology from Landcare Research (<i>data provided from MBIE's biennial external client survey; next survey 2015/16</i>)	95%	90–100% [no survey in 2014/15]
	Percentage of relevant funding partners and other end-users that have a high level of confidence in Landcare Research's ability to set research priorities, and the effectiveness of the collaboration or partnership (<i>data provided from MBIE's biennial external client survey; next survey 2015/16</i>)	78%	80–100% [no survey in 2014/15]
Vision Mātauranga	Number of positive strategic partnerships with iwi and Māori organisations in which we are linking science and mātauranga and which address Māori goals and aspirations	23	18–23
Science Excellence & Collaboration	Percentage of relevant national and international research providers that have a high level of confidence in the Landcare Research's ability to form the best teams to deliver on its (<i>data provided from MBIE's biennial external client survey; next survey 2015/16</i>)	85%	80–90% [no survey in 2014/15]
Digital Strategy & Informatics	Availability of data from Landcare Research's Core-funded databases, collections and information systems (assessed by a variety of metrics appropriate to each)	Refer to previous annual report	Increase in availability and accessibility [metrics online]
Commercialisation	Number of new and existing licensing deals of Landcare Research-derived IP (including technologies, products and services) with New Zealand and international partners	8	5–10
People, Learning & Culture	Staff engagement in survey evaluations	71%	70–80%
	Turnover of key science staff	5.9% but different definition	3–5%
Infrastructure & Collections	Specimen transactions, identification requests and visitors for our Core-funded biological collections and associated infrastructure. Revised this year to focus on service delivery	Different definition previously	90–100% of requests responded to

MBIE generic indicators ¹ for all CRIs			
SCI section	Indicator	2012/13 Actual	Target/target range 2014/15
Stakeholder Engagement	Revenue per FTE (\$000s) parent	\$162.5	>\$166
	Revenue per FTE from commercial sources (\$000s)	\$49.9	>\$53
	Commercial reports per scientist FTE	0.61	0.55–0.65
Science Excellence & Collaboration	Publications with collaborators	Other NZ: 39%; Overseas: 61%	Other NZ: 30–40%; Overseas: 45–65%
	Impact of scientific publications (mean citation score)	2.9	2.9–3.3

1. Generic indicators are at the Landcare Research Group level

Appendix 4: Financial policies

Dividend policy

Principles adopted for determining annual dividend

In determining the amount of surplus funds, consideration will be given to:

- Shareholder policies on dividends and capital structure
- Providing for strategic and capital investment requirements (including equity investments) without recourse to the Crown for equity injections to the Company
- The Company's working capital requirements (including subsidiaries and businesses in which equity is held)
- Ongoing financial viability of the Company, including its ability to repay debt
- Extent of debt financing in relation to the prudent borrowing capacity of the Company
- Obligations of the Directors under the Companies Act 1993 and other statutory requirements

In a submission to shareholding Ministers, within four months of the end of each financial year, the Board will detail the:

- Amount of dividend (if any) recommended to be distributed to the shareholders
- Percentage of tax-paid profits that the dividend represents
- Rationale and analysis used to determine the amount of dividend

Estimate of the amount or proportion of annual tax-paid earnings

An estimate of the amount or proportion of annual tax-paid earnings (from both capital and revenue sources) that is recommended to be distributed to the Crown is provided below, taking into account the statutory requirement to remain financially viable and a going concern, and the following considerations:

- Shareholder policies on dividends and target levels of debt as expressed in the Operating Framework for CRIs
- The Company's peak debt level being within the acceptable range estimated in the Capital Structure Plan (independently assessed in May 2006 and reassessed internally in November 2010)
- The Company's three times interest cover covenant, which could be breached with increased borrowing required to fund a dividend
- The range of investment and technology service opportunities available to the Company as set out in its business plan and agreed with shareholding Ministers and the likely requirement to maintain borrowings to fund such projects
- The increased level of capital expenditure required to maintain the Company's science capability and achieve productivity gains through support services
- The Company's projected need for capital to enhance building and IT systems' infrastructure
- The Company's projected need for strategic investment to accelerate the creation of national benefit by increasing Landcare Research's science competitiveness and shortening lead times of new knowledge and technologies to market

Shareholder consent for significant transactions

The Board will obtain prior written consent from the shareholding Ministers for any transaction or series of transactions involving full or partial acquisition, disposal or modification of property (buildings, land and capital equipment) and other assets with a value equivalent to or greater than \$10 million or 20% of the Company's total assets (prior to the transaction), whichever is the lesser.

The Board will obtain the prior written consent of shareholding Ministers for any transaction or series of transactions with a value equivalent to or greater than \$5 million or 30% of the Company's total assets (prior to the transaction) involving:

- Acquisition, disposal or modification of an interest in a joint venture, partnership, or similar association

- Acquisition or disposal, in full or in part, of shares or interests in a subsidiary, external company or business unit
- Transactions that affect the Company's ownership of a subsidiary or a subsidiary's ownership of another entity
- Other transactions that fall outside the scope of the definition of the Company's core business or that may have a material effect on the Company's science capabilities

Intellectual property transactions, wherever possible in advance, will be notified in the quarterly reports to shareholding Ministers.

Appendix 5: Accounting policies

Reporting entity

Landcare Research New Zealand Limited is a Crown Research Institute governed by the Crown Research Institutes Act 1992 and Crown Entities Act 2004. The Landcare Research Group ('the Group') consists of Landcare Research New Zealand Limited and its 100% owned subsidiaries Enviro-Mark Solutions Limited and Landcare Research US Limited. Landcare Research New Zealand Limited and Enviro-Mark Solutions Limited are incorporated in New Zealand; Landcare Research US Limited is incorporated in the USA.

The Core Purpose of the Group is to drive innovation in New Zealand's management of terrestrial biodiversity and land resources in order to both protect and enhance the terrestrial environment and grow New Zealand's prosperity.

Basis of preparation

The financial statements of the Group have been prepared in accordance with the requirements of the Crown Entities Act 2004, which includes the requirement to comply with New Zealand generally accepted accounting practice (NZ GAAP). These financial statements comply with NZ IFRS, and other applicable financial reporting standards, as appropriate for profit-oriented entities.

The accounting policies set out below have been applied consistently to all periods presented in these financial statements.

The financial statements have been prepared on a historical cost basis modified by revaluation of certain financial instruments. The financial statements are presented in New Zealand dollars, the functional currency of the Group, and all values are rounded to the nearest thousand dollars (\$000).

Foreign currency transactions are translated into the functional currency using the exchange rates prevailing at the dates of the transactions. Foreign exchange gains and losses resulting from the settlement of such transactions are recognised in the surplus or deficit.

Standards, amendments and interpretations issued but not yet effective

There are no new standards, amendments and interpretations issued but not yet effective.

Subsidiaries

Where the Group has the capacity to control the financing and operating policies of an entity, so as to obtain benefits from its activities, all such entities are consolidated as subsidiaries within the Group financial statements. This power exists where the Group controls the majority voting power on the governing body, or where such policies have been irreversibly predetermined by the Group, or where the determination of such policies is unable to materially impact the level of potential ownership benefits that arise from the activities of the subsidiary.

The Group measures the cost of a business combination as the aggregate of the fair values, at the date of exchange, of assets given, liabilities incurred or assumed, in exchange for control of the subsidiary plus any costs directly attributable to the business combination. Any excess of the cost of the business combination over the Group's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities is recognised as goodwill. If the Group's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities recognised exceeds the cost of the business combination, the difference will be recognised immediately in the surplus or deficit.

Basis of consolidation

The purchase method is used to prepare the consolidated financial statements; this involves adding together like items of assets, liabilities, equity, income and expenses on a line-by-line basis. All significant intragroup balances, transactions, income and expenses are eliminated on consolidation.

Landcare Research New Zealand Limited's investment in its subsidiaries is carried at cost in its 'Parent entity' financial statements.

Revenue

Revenue is measured at the fair value of consideration received.

Revenue from the rendering of services is recognised by reference to the stage of completion of the transaction at balance date, based on the actual service provided as a percentage of the total services to be provided. Income received for goods and services that have not yet been supplied to customers has been recognised as Revenue in Advance. Sales of goods are recognised when a product is sold to the customer.

Core funding from the Ministry of Building, Innovation and Employment (MBIE), previously the Ministry of Science and Innovation (MSI), is treated as a government grant and generally recognised in the year of receipt. The only exception is where MBIE gives prior written consent to carry over to the next financial year any part of the Core funding that will be allocated to specified long-term or large-scale research activities that require the accumulation of funds over two or more financial years to fully fund those activities.

Interest income is recognised using the effective interest method, whereby the estimated future cash receipts are exactly discounted from the net carrying amounts through the expected life of the financial assets.

Dividends are recognised when the right to receive payment has been established.

Borrowing costs

Borrowing costs consist of interest and other costs that an entity incurs in connection with the borrowing of funds.

Borrowing costs directly attributable to the acquisition, construction or production of a qualifying asset (i.e. an asset that necessarily takes a substantial period of time to get ready for its intended use or sale) are capitalised as part of the cost of that asset in accordance with NZ IAS 23 Borrowing costs (revised). All other borrowing costs are expensed in the period they occur.

Income tax

Income tax expense in relation to the surplus or deficit for the period comprises current tax and deferred tax.

Current tax is the amount of income tax payable based on the taxable profit for the current year, plus any adjustments to income tax payable in respect of prior years. Current tax is calculated using rates that have been enacted or substantively enacted by balance date.

Deferred tax is the amount of income tax payable or recoverable in future periods in respect of temporary differences and unused tax losses. Temporary differences are differences between the carrying amount of assets and liabilities in the financial statements and the corresponding tax bases used in the computation of taxable profit. Deferred tax *liabilities* are generally recognised for all taxable temporary differences. Deferred tax *assets* are recognised to the extent that it is probable that taxable profits will be available against which the deductible temporary differences or tax losses can be utilised. Deferred tax is not recognised if the temporary difference arises from the initial recognition of goodwill, or from the initial recognition of an asset and liability in a transaction that is not a business combination, and at the time of the transaction affects neither accounting profit nor taxable profit. Deferred tax is recognised on taxable temporary differences arising on investments in subsidiaries and associates, and interests in joint ventures, except where the Company can control the reversal of the temporary difference and it is probable that the temporary difference will not reverse in the foreseeable future. Deferred tax is calculated at the tax rates that are expected to apply in the period when the liability is settled or the asset is realised, using tax rates that have been enacted or substantively enacted by balance date.

Current tax and deferred tax is recognised against the surplus or deficit, except to the extent that it relates to a business combination, or to transactions recognised in other comprehensive income or directly in equity.

Finance leases

A finance lease is a lease that substantially transfers to the lessee all risks and rewards incidental to ownership of an asset, whether or not title is eventually transferred.

At the commencement of the lease term, the Group recognises finance leases as assets and liabilities in the statement of financial position at the lower of the fair value of the leased item or the present value of the minimum lease payments. The amount recognised as an asset is depreciated over its useful life. If there is

no certainty as to whether the Group will obtain ownership at the end of the lease term, the asset is fully depreciated over the shorter of the lease term and its useful life.

Operating leases

An operating lease is a lease that does not substantially transfer all the risks and rewards incidental to ownership of an asset. Lease payments under an operating lease are recognised as an expense on a straight-line basis over the lease term. Lease incentives received are recognised evenly over the term of the lease as a reduction in rental expense.

Cash and cash equivalents

Cash and cash equivalents include cash in hand, deposits held at call with banks, other short-term highly liquid investments with original maturities of three months or less, and bank overdrafts. Bank overdrafts are shown within borrowings in current liabilities in the statement of financial position.

Trade and other receivables

Trade and other receivables are initially measured at fair value and subsequently measured at amortised cost using the effective interest method, less any provision for impairment.

Loans are initially recognised at the present value of their expected future cash flows, discounted at the current market rate of return for a similar asset/investment. They are subsequently measured at amortised cost using the effective interest method. The difference between the face value and present value of expected future cash flows of the loan is recognised in the statement of comprehensive income as a grant.

A provision for impairment of receivables is established when there is objective evidence that the Group will not be able to collect all amounts due according to the original terms of receivables. The amount of the provision is the difference between the asset's carrying amount and the present value of estimated future cash flows, discounted using the effective interest method.

Inventories

Inventories (such as spare parts and other items) held for distribution or consumption in the provision of services, which are not supplied on a commercial basis, are measured at the lower of cost and net realisable value. Inventories held for use in the production of goods and services on a commercial basis are valued at the lower of cost and net realisable value. The cost of purchased inventory is determined using the average cost method.

The write-down from cost to net realisable value is recognised in the surplus or deficit.

Financial assets

The Group classifies its financial assets into the following three categories: financial assets at fair value through profit or loss, loans and receivables, and financial assets at fair value through other comprehensive income. The classification depends on the purpose for which the investments were acquired. Management determines the classification of its investments at initial recognition and re-evaluates this designation at every reporting date.

Financial assets and liabilities are initially measured at fair value plus transaction costs unless they are carried at fair value through surplus or deficit, in which case the transaction costs are recognised in the surplus or deficit.

The fair value of financial instruments traded in active markets is based on quoted market prices at the balance sheet date. The quoted market price used is the current bid price. The fair value of financial instruments that are not traded in an active market is determined using valuation techniques. The Group uses a variety of methods and makes assumptions that are based on market conditions existing at each balance date. Quoted market prices or dealer quotes for similar instruments are used for long-term-debt instruments held. Other techniques, such as estimated discounted cash flows, are used to determine fair value for the remaining financial instruments.

The three categories of financial assets are:

Financial assets at fair value through surplus or deficit

This category has two sub-categories: financial assets held for trading, and those designated at fair value through surplus or deficit at inception. A financial asset is classified in this category if acquired principally

for the purpose of selling in the short term, or if designated as so by management. Derivatives are also categorised as held for trading unless they are designated as hedges. Assets in this category are classified as current assets if they are either held for trading or are expected to be realised within 12 months of the balance sheet date. After initial recognition they are measured at their fair values. Gains or losses on remeasurement are recognised in the surplus or deficit. Financial assets in this category include foreign currency forward contracts.

Loans and receivables

These are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market. After initial recognition they are measured at amortised cost using the effective interest method. Gains and losses when the asset is impaired or derecognised are recognised in the surplus or deficit. 'Trade and other receivables' are classified as loans and receivables in the statement of financial position.

Financial assets at fair value through other comprehensive income

Financial assets at fair value through other comprehensive income are those that are designated as fair value through other comprehensive income or are not classified in any of the other categories above. This category encompasses:

- Investments that the Group intends to hold long term but which may be realised before maturity
- Shareholdings that the Group holds for strategic purposes. The Parent's investments in its subsidiaries are not included in this category as they are held at cost (as allowed by NZ IAS 27 *Consolidated and Separate Financial Statements*) whereas this category is to be measured at fair value
- Investment in Kiwi Innovation Network Limited.

After initial recognition, these investments are measured at their fair value. Gains and losses are recognised directly in other comprehensive income except for impairment losses, which are recognised in the surplus or deficit. In the event of impairment, any cumulative losses previously recognised in other comprehensive income will be removed from other comprehensive income and recognised in the surplus or deficit even though the asset has not been derecognised. On derecognition, the cumulative gain or loss previously recognised in other comprehensive income is recognised in the surplus or deficit.

Impairment of financial assets

At each balance sheet date the Group assesses whether there is any objective evidence that a financial asset or group of financial assets is impaired. Any impairment losses are recognised in the surplus or deficit.

Accounting for derivative financial instruments and hedging activities

The Group uses derivative financial instruments to cover the risk on foreign exchange. In accordance with its treasury policy, the Group does not hold or issue derivative financial instruments for trading purposes.

Derivatives are initially recognised at fair value on the date a derivative contract is entered into and are subsequently remeasured at their value. The Group does not designate derivatives as a hedging instrument and therefore accounts for derivative instruments at fair value through profit or loss. Changes in the fair value of derivative instruments are recognised immediately in the surplus or deficit.

Non-current assets held for sale

Non-current assets held for sale are classified as held for sale if their carrying amount will be recovered principally through a sale transaction, not through continuing use. Non-current assets held for sale are measured at the lower of their carrying amount and fair value less costs to sell. Any impairment losses for write-downs of non-current assets held for sale are recognised in the surplus or deficit.

Any increases in fair value (less costs to sell) are recognised up to the level of any impairment losses that have been previously recognised. Non-current assets (including those that are part of a disposal group) are not depreciated or amortised while they are classified as held for sale. Interest and other expenses attributable to the liabilities of a disposal group classified as held for sale continue to be recognised.

Property, plant and equipment

Property, plant and equipment consist of:

- *Operational assets* – these include land, buildings, library books, plant and equipment, and motor vehicles.
- *Restricted assets* – these are collections and databases, held by the Group, that provide a benefit or service to the community and cannot be disposed of because of legal or other restrictions.
- *Capital work in progress* – this has been included within plant and equipment, and is not depreciated until ready for use.

Property, plant and equipment are shown at cost, less accumulated depreciation and impairment losses. Assets are not reported with a financial value in cases where they are not realistically able to be reproduced or replaced, and when they do not generate cash flows and where no market exists to provide a valuation.

Additions

The cost of an item of property, plant and equipment is recognised as an asset if, and only if, it is probable that future economic benefits or service potential associated with the item will flow to the Group and the cost of the item can be measured reliably. In most instances, an item of property, plant and equipment is recognised at its cost. Where an asset is acquired at no cost, or for a nominal cost, it is recognised at fair value as at the date of acquisition.

Disposals

Gains and losses are determined by comparing the proceeds with the carrying amount of the asset. Gains and losses on disposals are included in the surplus or deficit.

Subsequent costs

Costs incurred subsequent to initial acquisition are capitalised only when it is probable that future economic benefits or service potential associated with the item will flow to the Group and the cost of the item can be measured reliably.

Depreciation

Depreciation is provided on the Group's property, plant and equipment, other than land, at rates that will write off the cost of the assets to their estimated residual values over their useful lives. All Parent and Enviro-Mark Solutions company depreciable assets are depreciated on a straight-line (SL) basis. The residual value and useful life of an asset is reviewed, and adjusted if applicable, at each financial year end.

Depreciation rates	Parent and Enviro-Mark Solutions (SL)
Buildings	1.67–10%
Plant and equipment	4–33%
IT equipment	25%
Motor vehicles	25%
Furniture and fittings	6.67–10%
Office equipment	20%
Finance lease assets	20%
Library books and periodicals	20–50%
Rare books collections	1%

Intangible assets

Software acquisition and website development costs

Acquired computer software licences are capitalised on the basis of the costs incurred to acquire and bring to use the specific software. Costs associated with maintaining computer software and websites are recognised as an expense when incurred. Costs that are directly associated with the development of software and websites for internal use by the Group are recognised as an intangible asset. Direct costs include the software development employee costs and an appropriate portion of relevant overheads.

Patents and intellectual property

Patents and intellectual property are capitalised on the basis of costs incurred.

Amortisation

The carrying value of an intangible asset with a finite life is amortised on a straight-line basis over its useful life. Amortisation begins when the asset is available for use and ceases at the date that the asset is derecognised. The amortisation charge for each period is recognised in the surplus or deficit. The useful

lives and associated amortisation rates of major classes of intangible assets have been estimated as follows:

Computer software	4 years	25%
Intellectual property	3–20 years	5–35%

Impairment of non-financial assets

Non-financial assets that have an indefinite useful life are not subject to amortisation and are tested annually for impairment. Assets that have a finite useful life are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment loss is recognised for the amount by which the asset's carrying amount exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less costs to sell and value in use.

Value in use is depreciated replacement cost for an asset where the future economic benefits or service potential of the asset are not primarily dependent on the asset's ability to generate net cash inflows and where the entity would, if deprived of the asset, replace its remaining future economic benefits or service potential. The value in use for cash-generating assets is the present value of expected future cash flows.

If an asset's carrying amount exceeds its recoverable amount the asset is impaired and the carrying amount is written down to the recoverable amount. The total impairment loss is recognised in the surplus or deficit.

Employee benefits

Short-term benefits

Employee benefits that the Group expects to be settled within 12 months of balance date are measured at nominal values based on accrued entitlements at current rates of pay. These include salaries and wages accrued up to balance date, annual leave earned to but not yet taken at balance date, retiring and long service leave entitlements expected to be settled within 12 months, and sick leave.

The Group recognises a liability for sick leave to the extent that absences in the coming year are expected to be greater than the sick leave entitlements earned in the coming year. The amount is calculated based on the unused sick leave entitlement that can be carried forward at balance date, to the extent that the Group anticipates leave entitlements will be used by staff to cover those future absences.

The Group recognises a liability and an expense for bonuses where contractually obliged or where there is a past practice that has created a constructive obligation.

All actuarial gains and losses that arise subsequent to the transition date in calculating the Group's obligation with respect to long service leave, retirement gratuities and sick leave are recognised as an expense in the surplus or deficit.

Superannuation schemes

- *Defined contribution schemes*: obligations for contributions to defined contribution superannuation schemes are recognised as an expense in the surplus or deficit as incurred.
- *Defined benefit schemes*: the Group makes contributions to the Government Superannuation Fund, which is a multi-employer defined benefit scheme. Insufficient information is available to use defined benefit accounting, as it is not possible to determine from the terms of the scheme the extent to which the surplus/deficit will affect future contributions by individual employers, as there is no prescribed basis for allocation. The scheme is therefore accounted for as a defined contribution scheme.

Long service leave, retirement leave and sick leave

Entitlements that are payable beyond 12 months, such as long service leave, retirement leave and sick leave, have been calculated on an actuarial basis. The calculations are based on likely future entitlements accruing to staff, based on years of service, years to entitlement, payment history, the likelihood that staff will reach the point of entitlement, and contractual entitlements information.

Provisions

The Group recognises a provision for future expenditure of uncertain amount or timing when there is a present obligation (either legal or constructive), as a result of a past event, that probable expenditures will be required to settle the obligation, and a reliable estimate can be made of the amount of the obligation. Provisions are not recognised for future operating losses. Provisions are measured at the present value of the expenditures expected to be required to settle the obligation, using a pre-tax discount rate that reflects

current market assessments of the time value of money and the risks specific to the obligation. The increase in the provision due to the passage of time is recognised as an interest expense.

Borrowings

Borrowings are initially recognised at their fair value. After initial recognition, all borrowings are measured at amortised cost, using the effective interest method.

Goods and Service Tax (GST)

All items in the financial statements are stated exclusive of GST, except for receivables and payables, which are stated on a GST-inclusive basis. Where GST is not recoverable as input tax then it is recognised as part of the related asset or expense.

The net amount of GST recoverable from, or payable to, the Inland Revenue Department (IRD) is included as part of receivables or payables in the statement of financial position. The net GST paid to or received from the IRD, including the GST relating to investing and financing activities, is classified as an operating cash flow in the statement of cash flows.

Commitments and contingencies are disclosed exclusive of GST.

Critical accounting estimates and assumptions

In preparing these financial statements the Group has made estimates and assumptions concerning the future. These estimates and assumptions may differ from the subsequent actual results. Estimates and judgements are continually evaluated and are based on historical experience and other factors, including expectations or future events that are believed to be reasonable under the circumstances. The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are discussed below:

Revenue recognition

The Group uses the percentage-of-completion method in accounting for its fixed-price contracts to deliver research services. Use of the percentage-of-completion method requires the Group to estimate the services performed to date as a proportion of the total services to be performed.

Critical judgements in applying the Group's accounting policies

Management has exercised the following critical judgements in applying the Group's accounting policies for the half-year ended 31 December 2013.

Leases classification

Determining whether a lease agreement is a finance or an operating lease requires judgement as to whether the agreement transfers substantially all the risks and rewards of ownership to the Company.

Judgement is required on various aspects that include, but are not limited to, the fair value of the leased asset, the economic life of the leased asset, whether or not to include renewal options in the lease term and determining an appropriate discount rate to calculate the present value of the minimum lease payments. Classification as a finance lease means the asset is recognised in the statement of financial position as property, plant and equipment, whereas for an operating lease no such asset is recognised.

The Group has exercised its judgement on the appropriate classification of property and equipment leases and has determined that a number of lease arrangements are finance leases.

Changes in accounting policies

There were no changes in accounting policy during the period.

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Glossary & Jargon Buster

BusinessNZ	New Zealand's largest advocacy group for enterprise, and champions policies
Capex	Capital expenditure
CBD	Convention on Biological Diversity
CEMARS	Certified Emissions Management and Reduction Scheme
CoREs	Centres of Research Excellence
CRI	Crown Research Institute
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
DairyNZ	DairyNZ is the 'industry good' organisation, representing New Zealand's dairy farmers
DOC	Department of Conservation
Ecosystem services	The 'free' services that healthy ecosystems provide, e.g. clean water, fertile soil, stormwater retention, erosion prevention
Environmental limits	The point at which ecosystem services collapse, e.g. the soil's biological community is depleted to the extent that they can no longer replenish nutrients
End-user	Organisations, entities and people who apply the information and recommendations arising out of our research
FANZ	Fertiliser Association of New Zealand
FAR	Foundation for Arable Research
FOA	Forest Owners Association
GBIF	Global Biodiversity Information Facility
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
Kaitiakitanga	Traditional guardianship of natural resources
LCDB	Land Cover Database
LIDAR	Light Detection And Ranging (an optical remote sensing technology)
LINZ	Land Information New Zealand
LRIS	Land Resource Information System
LUDB	Land Use Database
Lysimeter	Device for measuring rate and volume of water filtering down through soil
Mātauranga	Traditional cultural knowledge
MBIE	Ministry of Business, Innovation and Employment (formed from a merger of the Ministry of Science and Innovation with other government departments)
MfE	Ministry for the Environment
MPI	Ministry for Primary Industries (previously Ministry of Agriculture and Forestry, and Ministry of Fisheries)
Natural capital	The elements of natural environment that produce value (directly and indirectly) to people
Natural Resources Sector	http://nrs.mfe.govt.nz
NeSI	National e-Science Infrastructure
NGO	Non-governmental organisation
NLRC	National Land Resource Centre
NZAGRC	New Zealand Agricultural Greenhouse Gas Research Consortium
NZLRI	New Zealand Land Resource Inventory
NZOR	New Zealand Organism Register
OSPRI	Operational Solutions for New Zealand Primary Industries; with two subsidiaries TBfree New Zealand and NAIT (National Animal Identification and Tracking)
PCE	Parliamentary Commissioner for the Environment
RMA	Resource Management Act
SBC	Sustainable Business Council
SLURI	Sustainable Land Use Research Initiative
S-map	Digital soil map for New Zealand
TB	Tuberculosis
TBfree New Zealand	TBfree New Zealand (previously Animal Health Board) is part of OSPRI New Zealand
Te Papa	Te Papa Tongarewa, the Museum of New Zealand
UNFCCC	United Nations Framework Convention on Climate Change
ZESPRI	Not an acronym but the name of the kiwifruit marketing authority