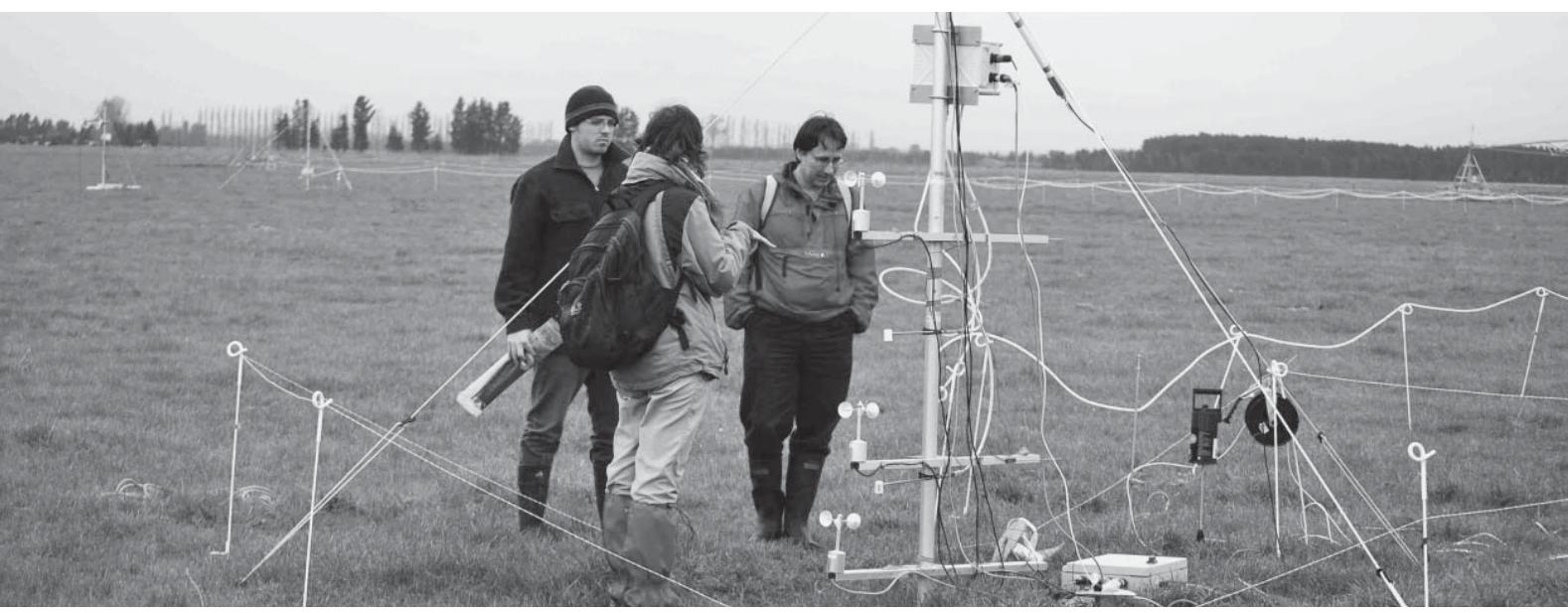
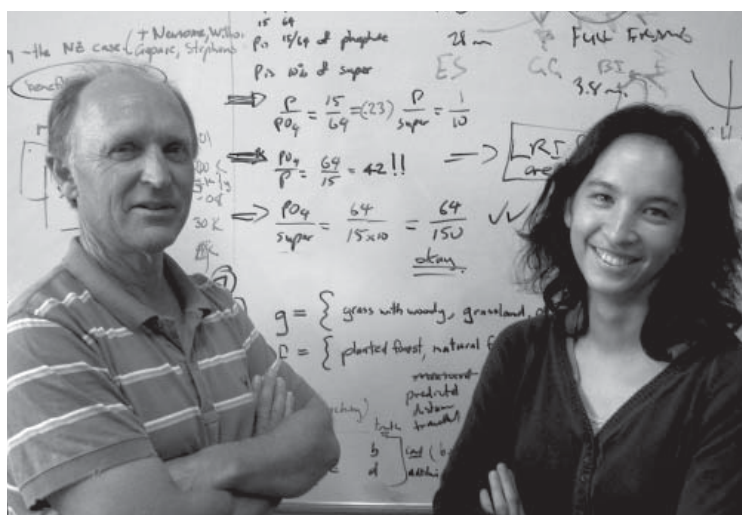




SCIENCE AND ENVIRONMENT FOR A BETTER NEW ZEALAND



STATEMENT OF CORPORATE INTENT: 2011-16



Landcare Research
Manaaki Whenua

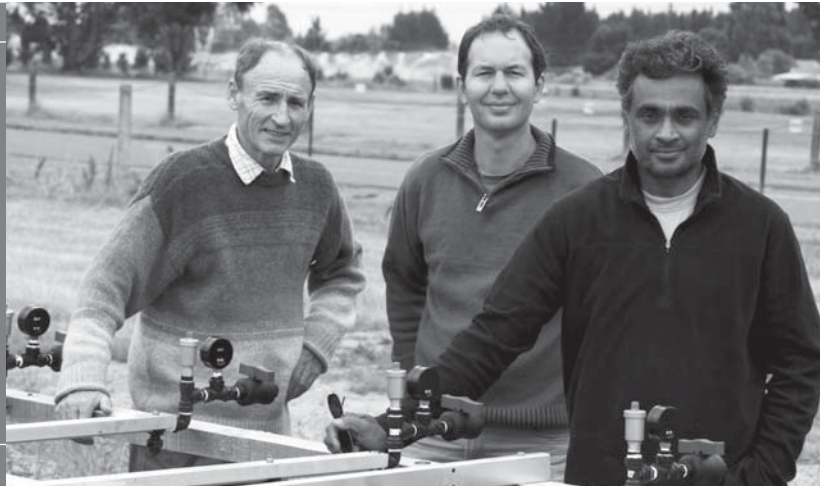
LANDCARE RESEARCH AT A GLANCE

OUR VISION

Science and environment for a better New Zealand

OUR CORE PURPOSE

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.



Soil Scientists Trevor Webb, Sam Carrick and Jagath Ekanayake working on an innovative new channel lysimeter for measuring soil drainage.

OUR KEY STAKEHOLDERS

We will fulfil our purpose through the provision of research and transfer of technology and knowledge in partnership with key stakeholders including industry, central and local government and Māori, to achieve four national outcomes.

NATIONAL OUTCOMES

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

OUR ORGANISATION

We are one of eight Crown research institutes (CRIs) formed in 1992. CRIs function as independent companies but are owned by, and accountable to, the New Zealand Government. Our shareholders are the Minister of Finance and Minister of Science and Innovation.

We have approximately 400 staff at ten locations across New Zealand, including our subsidiaries Sirtrack at Havelock North and carboNZero^{Cert}™ at Lincoln and Auckland. Landcare Research is committed to improving the sustainability of our operations across all sites; we report comprehensively on this at www.landcareresearch.co.nz/sustainability/

Our science revenue (approx NZ\$65 million per year) is derived primarily from contracts with the Ministry of Science & Innovation (MSI), Ministry for the Environment (MfE), Ministry of Agriculture and Forestry (MAF), Department of Conservation, (DOC), Animal Health Board (AHB), regional, city and district councils, private sector businesses and organisations and Māori organisations.

MANAAKI WHENUA – MANAAKI TANGATA (CARE FOR THE LAND – CARE FOR THE PEOPLE)

Our Māori name means to care for the land in all senses. Māori are tangata whenua, the indigenous people of Aotearoa New Zealand, with whom we consult and collaborate.

www.landcareresearch.co.nz

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CHAIR & CHIEF EXECUTIVE'S OVERVIEW



Chief Executive Richard Gordon and Board Chair Jo Brosnahan.

Tackling the challenging issues: Soil cores taken from the Mackenzie basin will be used to study how high country soils cope with dairy effluent.



We are proud to present our first Statement of Corporate Intent (SCI) to be produced following the Crown Research Institute (CRI) reforms of 2010. In it we set out our goals for the future of Landcare Research and the 5-year strategic initiatives that will take us there. It is an exciting future that combines the imperative of economic development and the challenges of increasingly complex environmental issues (biodiversity protection, climate change impacts, food security, natural resource scarcity, land and water interactions, and changing market and community expectations).

This future also holds opportunities presented by new technologies and 'green growth'. Industries are turning more to science for innovation and to support them in market access and competitiveness. Māori organisations also recognise the importance of science and innovation combined with mātauranga (traditional knowledge) in realising their development aspirations. Society is faced with finding new ways to address complex environmental issues in which there are high risks and much uncertainty but no 'right answer' amongst competing viewpoints. There is also an expectation that government policy-making will be more evidence-based – thus demanding trusted science.

Landcare Research is building on a foundation of steady growth over the past decade, good financial performance and partnerships that have seen advances in biodiversity, biosecurity, land resources and corporate sustainability. We do not underestimate the challenges for science but we are also optimistic about the role we can play. Landcare Research's intention is to be at the forefront of tackling those challenges

and realising opportunities through productive relationships with stakeholders in science, industry, Māori, central and local government and overseas. Throughout this SCI we highlight some of our future-focused initiatives to illustrate significant directions.

Our vision is *Science and environment for a better New Zealand*. In it we recognise the roles played by both science and the environment in New Zealand's future and the well-being of its people. This future extends beyond our shores and includes the contribution that science and the environment will play in growing exports and enhancing the reputation of New Zealand.

Our work with iwi and Māori organisations has developed over the last two decades and we value our many relationships and collaborative projects. Our research increasingly reflects the holistic world view of Māori and their aspirations and goals. Building our Māori science capacity is a challenge but also an opportunity.

Our approach makes us distinctive. We contribute to national prosperity not only through the environmental, but also the economic, social and cultural benefits of our outcomes. We are not strongly aligned to any individual sector (unlike our colleagues in other CRIs), and this gives us freedom to take an integrative and collaborative approach across public and private sectors, across science disciplines and mātauranga, and across the scale of issues (local, national and global). Our work on integrated catchment management exemplifies the integrated approach, and we are now investing in a

better understanding of adaptation to global change, which also covers environmental, economic and social dimensions across sectors and scales.

Excellence underpins our science. Our productivity, as measured by science publications in significant journals, is amongst the highest in New Zealand and Australia. We aim to attract the best scientists at all career levels and provide an excellent working environment. We are linked to some of the world's best institutes and teams. Multiple collaborations exist with other CRIs and New Zealand universities and help build national capability, e.g. through the Joint Graduate School in Biodiversity & Biosecurity with Auckland University. We are investing in new science facilities for greenhouse gas research and in achieving the efficiencies and new levels of information accessibility and collaboration that are offered by e-Research.

The Government's CRI reforms have mobilised us to develop a new framework for proactive and collaborative science. This demands an organisational culture that enhances leadership, genuine partnership, and understands the world through the eyes of our partners. We will invest in developing skills to foster relationships between science, business and government, and in achieving step-changes in the accessibility of knowledge from our programmes. We will engage with stakeholder partners throughout our entire science investment cycle, providing direction, transparency and accountability around our Board's investment in science.

The current fiscal situation in New Zealand will put pressure on all of government science; and so we project modest growth over the 5-year period. Our focus will be on other revenue sources and raising productivity so that outcomes are not compromised. We will also seek opportunities for greater efficiencies through collaboration in the science sector.

We already provide environmental certification services (carboNZero^{Cert}™, CEMARS®, EBEX21® and Enviro-Mark®) to several hundred New Zealand firms. We know there is much scope to partner with the private sector to enhance innovative economic development with environmental integrity – the 'green growth' concept.

We face the future with great respect for our partners and our own people, especially those who continue to face uncertainty during the earthquake aftershocks in Canterbury where our headquarters and 200 staff are based. We have determination to tackle the environmental issues facing New Zealand and the wider world, and an eagerness to be innovative in the science that we do and the ways that we engage with our partners to achieve national benefits. At the heart of our approach and priorities is people; and it is through strong relationships and courageous leadership that we believe we will contribute to making a difference.

Jo Brosnahan, Chair

Richard Gordon, Chief Executive

LANDCARE RESEARCH'S NICHE

OUR VISION

Science and environment for a better New Zealand

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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 KEY STAKEHOLDERS

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- 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

OUR APPROACH

We will:

- Focus on *growing the prosperity* of New Zealand across the dimensions of economy, society, culture and environment.
- Be proactive in developing *evidence-based solutions* to our stakeholders' present and future challenges.
- Use an *integrative approach* to creating solutions that bridge sectors, scientific disciplines, and mātauranga Māori, both across landscapes and timescales.
- Address *complex environmental problems* with appropriate techniques, while we are proactive about the evolving role of science in society.
- Achieve high standards of *science excellence and knowledge sharing* to cultivate New Zealand's critical science capability, through careful stewardship of our own capability and knowledge assets.

OPERATING ENVIRONMENT

GOAL

Landcare Research is at the leading edge of change in the role that science plays for government policy, industrial sector strategy and community conversations on the terrestrial environment.



KEY PERFORMANCE INDICATOR

Survey results from stakeholders show that they recognise Landcare Research is leading change in the role of science to meet their current and future needs (*Landcare Research's annual client survey*)

Andy Midwood of the Macaulay Land Use Research Institute, Scotland, working with Landcare Research colleagues to better understand how increasing soil temperatures will affect carbon loss through soil respiration.

CONTEXT

New Zealand economic development

The pressure for economic development, innovation and productivity is greater than ever in the aftermath of the global economic crisis and Canterbury earthquakes. Within economic development, the importance of the natural environment is increasingly recognised because it underpins primary production (through the resources it provides), market competitiveness, national identity, and New Zealand's contributions to global issues (biodiversity, climate change, etc.). Our challenge is to find solutions that enable New Zealand to develop economically but within environmental limits.

'Green growth' thinking emerged from the 2008 economic crisis and subsequent investment by governments and industry in green innovation and economic policies. The crisis provided the opportunity and imperative for a new kind of economic growth – one that responded to both the challenges and opportunities in the state of the global environment. In 2010 the New Zealand Government established a taskforce to recommend directions for green growth; we support this initiative as a stakeholder whose science has informed environmental policy and industrial sector strategies over the past decade.

Science, innovation and knowledge application

Science and innovation underpin New Zealand's economic future. To contribute effectively, we must be able to recognise both knowledge gaps and knowledge that could be applied; to invest our own resources where they can contribute most; and to work proactively in communities of organisations with complementary skills. Innovation demands effective and creative relationships between science thinkers and those who have the resources to apply knowledge. We have strong relationships with key stakeholders in central and local government, and we will work to enhance and extend our relationships where economic development will occur – with iwi, Māori organisations and the private sector. E-Research technologies now offer a step-change in the sharing of information and resources across boundaries. In our field we see the opportunity to enhance the quality and timeliness of information being used in land-use management.

Science's evolving role in society

The increasing complexity of environmental issues (e.g. climate change) and society's dependence on natural ecosystem services (e.g. healthy water, fertile soils, stable land) mean that scientists need to communicate beyond traditional boundaries to a wider stakeholder community. We must contribute to and lead national conversations on major issues, provide evidence on which government policy can be based, support strategic thinking by industry, and embrace other sources of knowledge (e.g. mātauranga Māori). This changing role extends to international diplomacy, where science and scientific collaboration are increasingly at the heart of global initiatives. However, we must also recognise

and overcome the ambivalence and scepticism that some of the public holds towards science.

Environmental governance

Government's initiatives relating to environmental governance have been extensive. Amendments to the Resource Management Act, the Emissions Trading Scheme, the establishment of the Environmental Protection Authority, development of National Policy Statements (fresh water, biodiversity, etc.), a new approach to State of Environment Reporting, a proposed National Environmental Standard for Forestry – all are demanding new science. We must anticipate and accommodate these national needs as well as science to underpin international commitments and obligations (e.g. the Kyoto Protocol).

Land and water integration

Science played a pivotal role in the Government's Land & Water Forum, which linked land use to water quality and availability, and brought central and local government together with industry and Māori to recommend pathways relating to water governance and regulation, technology, community engagement and landowner practice. Government's enabling investment in irrigation for agriculture and its National Policy Statement for Fresh water are significant developments that call for an integrative approach to land–water challenges. By merging 'green growth' thinking, which protects and enhances environmental assets, into the economic growth model, we will create new economic opportunities.

Treaty of Waitangi Settlements

Māori are entering a post-Treaty settlement phase as assets returned by the Crown are being developed. They are looking to science and innovation to support their aspirations, realise business opportunities and achieve sustainable management of natural resources. Increasingly, Māori and government expect national frameworks for resource management to reflect mātauranga principles and knowledge systems. There is an opportunity to build capability for supporting partnership with iwi and Māori organisations to meet their goals and aspirations.

Skills succession and competition for talent

Many countries rank science and innovation highly in their economic development strategies, thereby challenging New Zealand to be competitive in attracting scientists and innovators. We must invest in providing the right working environment, excellent research facilities, and personal development opportunities.

To maintain significant science and innovation capability we must have strong global networks and effective collaboration between New Zealand organisations. Capability also needs to be 'future-proofed' and it is an ongoing challenge to find talented staff to succeed aging experts with deep knowledge of their field. At the same time as planning for the succession of key staff, we must invest in informatics technologies (e.g. e-Research) that will enable us to connect more effectively with New Zealand and global science communities and our end-users. Increasingly, virtual technologies and informatics will enable scientists and innovators to work across national and organisational boundaries.

SCIENCE FRAMEWORK

GOAL

Landcare Research's science framework is clear, efficient and facilitates engagement with stakeholders who support our approach to achieving our Core Purpose and National Outcomes.

Carlos Rouco Zufiaurre with an anaesthetised possum as part of Central Otago research into possum behaviour.



KEY PERFORMANCE INDICATORS

- Percentage and number 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 (*MSI indicator with data provided from their external survey*)
- Percentage of relevant national and international research providers that have a high level of confidence in Landcare Research's ability to form the best teams to deliver on its outcomes (*MSI indicator with data provided from their external survey*)
- Stakeholders are satisfied with the clarity and effectiveness of our science framework at facilitating their engagement with our science (*Landcare Research Client Survey*)

CONTEXT

The CRI Taskforce sought clarity in the way CRIs connect their fundamental purpose (why they exist) to their science activities and impacts, and the long-term benefits and outcomes for New Zealand. To maximise our impact, science needs to be strongly aligned to the needs of key stakeholders. Considerable work with our key stakeholders has already gone into developing our science framework and achieving alignment between government and business priorities and the contributions of science, policy and innovation.

MSI has identified priorities for the allocation of Vote Science & Innovation (S&I) expenditure. Landcare Research receives 'core funding' (80% of our MSI revenue in 2011/12) in the Environment, CRI Capability and Science collections and infrastructure classes of Vote S&I. Our Statement of Core Purpose (summarised in section 1) sets out the four national outcomes to which government sees us contributing and also the scope of our contributions. The table below shows how our Core funding will be allocated to the Vote classes in 2011/12.

VOTE OUTPUT EXPENSE	NATIONAL OUTCOME	\$ VALUE IN 2011/12
ENVIRONMENTAL RESEARCH		
CLIMATE AND ATMOSPHERE	3	2,464,889
LAND AND FRESHWATER (INCLUDING TERRESTRIAL ECOSYSTEMS)	2	8,946,749
OTHER		
CRI CAPABILITY	1, 2, 3, 4	5,484,840
SCIENCE COLLECTIONS AND INFRASTRUCTURE	1, 2	7,308,834

FRAMEWORK

Our Science Framework shows the impacts that will be achieved through our science and innovation and the contribution they make to achieving national outcomes. Key performance indicators have been developed for the national outcomes (10–15 year time frame) and impacts (3–5 years). Outcomes and KPIs are shown in the figures on the following pages.

Impacts can be grouped by our ability to better (1) understand state, trends and challenges, and (2) identify and develop innovations and management or governance solutions.

Science programmes are aligned one-to-one with the eight impacts such that each programme has a clear focus and connection to a national outcome. Programmes will be funded by contributions from several sources including the CRI's Core Funding Agreement with MSI, key partners (Ministries and Departments, local government, industries and iwi) and, where appropriate, strategic investment by the Board in transformative initiatives.

Programmes will be of appropriate size and lifespan to be dynamic and make strong progress towards impacts. Quality and success will be measured against performance metrics and by international peer review.

Programme Leaders will prioritise, phase and manage science activity to support development of critical knowledge assets. They will develop and lead programme teams from Landcare Research and its collaborators.

Programme Coordinators will have a principal duty to represent the partner organisations. This is a new role intended to broker key stakeholders' involvement in developing research programmes and eventually in implementing the results.

PRIORITISING CONSERVATION MANAGEMENT USING THE VITAL SITES MODEL

Earlier work by Landcare Research proposed 'ecological integrity' as a way to measure progress towards the New Zealand Biodiversity Strategy goal of halting the decline of indigenous biodiversity. We have now developed an approach to modelling biodiversity and the threats to its viability in order to identify places ('Vital Sites') where conservation action will avert the most serious loss of ecological integrity.

The Vital Sites Model identifies significant sites and priority sites for conservation management by integrating distribution maps of native species with maps of weed and animal pest threats, and environmental and land cover information. The model's outputs include maps of biodiversity significance and of areas of high priority for conservation action. The model can also be used to report on the conservation gains achieved by management actions.

The Vital Sites Model is part of our ongoing work to support DOC's Natural Heritage Management System (NHMS). In addition, the work has considerable application to other uses, such as the design of biodiversity offsets, and we anticipate rapid development of this model over the next few years.

OUTCOMES & IMPACTS: EXPLANATORY FIGURES PAGES 10–15:

The figures on the following pages show our National Outcomes, the Impacts underpinning each Outcome, and the alignment of Impacts to our key stakeholders' priorities. The table is not meant to be comprehensive, but it is indicative of stakeholders' priorities in relation to Landcare Research's impacts.

Māori issues, needs and priorities will be met through integrated and holistic approaches across Landcare Research's key impact areas. These priorities will vary between Māori organisations such as iwi. However, most will give high priority to understanding Māori concepts and perspectives such as kaitiakitanga (guardianship of the natural environment), an underlying acknowledgement and inclusion of mātauranga Māori in all of our research, collaborative and strategic research partnerships, helping build Māori capacity, and recognition that Māori issues may be distinct from those of other stakeholder groups. Some Māori priorities require a unique and innovative approach to find solutions.

The four one-page tables in Section 4 provide further explanation of our National Outcomes, Science Impacts, Key Performance Indicators (KPIs) and significant initiatives to deliver the Impacts. These tables were developed in consultation with our key stakeholders.

ALIGNMENT OF LANDCARE RESEARCH'S OUTCOMES & IMPACTS TO PRIORITIES OF KEY STAKEHOLDER PARTNERS

OUTCOMES	IMPACTS	BUSINESS	MFE	MAF	DOC	LOCAL GOVERNMENT	MĀORI	
Biodiversity Improve measurement, management and protection of New Zealand's terrestrial ecosystems and biodiversity, including in the conservation estate	Biodiversity trends Trends in national and regional biodiversity on public and private land are known and understood, based on current definitions and descriptions	Stimulate private sector to measure & manage biodiversity		State of Environment reporting	Harm to biodiversity from pests and weeds is prevented or reduced	Status & trends for key species, habitats, ecosystems & ecosystem services; meeting national and international reporting commitments (CBD; IPBES)	Comprehensive terrestrial biodiversity monitoring	Mātauranga Māori and science to support kaitiakitanga and co-governance of terrestrial ecosystems
	Biodiversity management Integrated modelling of species & habitat persistence	Business tools for biodiversity & ecosystem management		Proposed National Policy Statement on Biodiversity	Protection and sustainable use of biological resources	Integrated modelling of species & habitat persistence	Indexing biodiversity value in productive landscapes	
Land resources Achieve the sustainable use of land resources and their ecosystem services across catchments and sectors	Land resource trends The status and trends of land resources and ecosystem services (including their interactions) are known and understood	Better understand value-add of land resources, well-being based and inter-generational assets		Understand land-use impacts on freshwater	Understanding sustainable use bottom lines and resilience at farm, catchment & sector levels	In situ real-time monitoring	Determine full range of ecosystem services & underpinning processes	Tools and services to sustainably manage key Māori land resources and ecosystems
	Sustaining land resources Opportunities and threats to land resources and ecosystem services are recognised and kept in balance, to maintain or enhance the provision of ecosystem services	Tools to increase resource-use efficiency & reduce environmental footprint		Credible decision-making processes available	Scope & scale of eco-services needed and policies to protect and enhance them	Enhanced ecosystem resilience, understanding thresholds, and the provision of ecosystem services	Develop specific measures sensitive to change in eco-services	
Terrestrial greenhouse gases (GHG) Improve measurement and mitigation of greenhouse gases from the terrestrial biosphere	GHG trends 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	Stimulate business reason to measure & mitigate GHGs		Meet NZ's reporting commitments (Kyoto Protocol)	Improved measurement of sources & sinks	Carbon accounting on Public Conservation Lands	Determine if we are stabilising and decreasing net emissions	Capturing business opportunities to mitigate GHG emissions and create carbon sinks
	GHG mitigation & sinks Land use options and other methodologies that increase carbon storage and mitigate greenhouse gas emissions are optimised for environmental, economic and social benefits	Promote practical means for GHG mitigation		NZ's emissions are managed through ETS	Reliable & economic mitigation technologies and sink enhancement	Options for carbon storage	Ensure links between carbon storage and biodiversity management	
Development within limits Increase the ability of New Zealand industries and organisations to develop within environmental limits and meet market and community requirements	Trends in complex environmental challenges The factors required to resolve complex environmental issues, adapt to global change and reduce vulnerability to resource scarcity are understood	Promote understanding of environmental limits as different from limits to growth		NZ's negotiations in climate change action are recognised	Adaptation to a changing climate (farmers, forestry & pest management)	Adaptive management needs ahead of climate change; pursuit of alternative economic instruments	Measure how production and consumption can be (are being) increased while their environmental footprint is decreased	Integrated approaches through mātauranga Māori and science to balance environmental, cultural, economic and social aspirations and achieve competitive advantage in the global market
	Integrated environmental solutions Integrated economic, social and environmental initiatives maintain or enhance international competitiveness, market access and social license for industry to operate	Integrating environmental performance to core business management strategy		Positioning NZ for global green growth agenda	Keeping pests & weeds out of NZ and managing those here	Weed & pest control technologies	Preventing pests & weeds from arriving or establishing in NZ and reducing the impact of those already here	

NATIONAL OUTCOME 1

Improve measurement, management and protection of New Zealand's terrestrial biodiversity, including in the conservation estate.

OUTCOME KPI

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.

OUTCOME RATIONALE

The integrity of our iconic natural places, and the biodiversity they support, is central to our identity, lifestyle and the economy. Intergenerational responsibility for the management of indigenous ecosystems, expressed through kaitiakitanga, is also central to Māori aspirations.

The effective management of biodiversity must be undertaken in the context of more complete knowledge of its composition and of changes in its state through time and in different ecosystems. This will allow the most threatened components of biodiversity to be identified and addressed through targeted research and effective management, and will highlight the most immediate opportunities to improve delivery efficiency and policy effectiveness.

Demonstrating improvements in biodiversity status at local, regional and national scales will enable us to protect our New Zealand lifestyle, facilitate appropriate development, and meet international obligations to care for our unique plants and animals.

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.

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.

IMPACT KPIS

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

IMPACT KPIS

1.2.1 Consents related to land-use change under the RMA are informed by a scientifically-based set of criteria that take account of cumulative effects on habitat availability.
1.2.2 Management decisions by DOC, MAF 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.

2011–16 INITIATIVES:

- Identify robust indicators of biodiversity condition, and develop measurement frameworks for these indicators for management (including RMA), policy and reporting needs (domestic and international).
- Explicitly link conservation management interventions at population, species, community and ecosystem levels to the risk of decline and extinction.
- Clearly articulate iwi targets for biodiversity protection and restoration, and identify governance arrangements that allow these targets to be met within broader policy and regulatory arrangements.
- Develop shared e-Science to manage and populate with data an authoritative single register of organisms (NZOR) in national collections and databases to benefit all contributing partners (Te Papa, universities, NIWA, DOC, MAF-Biosecurity and regional councils).
- Develop shared e-Science and e-Business services that integrate Landcare Research's land data and pest population models with AHB, DOC and regional council pest management planning and monitoring.

NATIONAL OUTCOME 2

Achieve the sustainable use of land resources and their ecosystem services across catchments and sectors.

OUTCOME KPI

New Zealand land use is matched within the land resource's environmental limits and key ecosystem services are maintained or enhanced.

OUTCOME RATIONALE

Land resources include the soil's dynamic physical, chemical and biological 'systems', and the land cover, topography and hydrology in which the soil is situated. Land resources sustain essential services such as primary production, ecosystem services (e.g. clean water, fertile soils) and aesthetic benefits upon which New Zealand's economy, identity and brand are based. Achieving the appropriate management of these resources is a major economic opportunity for New Zealand.

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 environmental limits. Improving knowledge assets will help ensure land and its ecosystem services are sustainably allocated and used by:

- Central and local government in policy development and operations
- Regional government in discharging responsibilities for environmental standards and protection
- Sectors in refining land use choices and practices for sustainable intensification
- Central government in meeting international reporting obligations

This is an area in which our soils and land science capabilities are complemented by our informatics skills in accessing and analysing land information, and making it accessible in appropriate ways. E-Research and e-Business technologies offer unprecedented opportunities to use such data to inform land-use practices through a variety of media.

IMPACT 2.1

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

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.

IMPACT KPIS

2.1.LCDB (land cover), LUDB (land use), S-map (soil) and ESDB (ecosystem services) 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 KPIS

2.2.Regional councils and the irrigation, pastoral, horticultural and arable sectors are using knowledge of soil variability to improve the match between land-use practices and land capability.

2011–16 INITIATIVES:

- Update and increase the value of our land resource databases and ecosystem services knowledge for decision-making, policy evaluation and reporting purposes, with MfE, MAF, regional councils and other science providers.
- Reduce erosion and overland flow of nutrients and develop approaches to improve irrigation efficiency, and to reduce drainage and leaching of nutrients and pathogens, with MAF, regional councils, primary production sectors and other CRIs.
- Enhance economic development and kaitiaki plans by enhancing land-use visualisation tools with TPK and iwi.
- Develop an environmental classification for monitoring, reporting on, and managing the terrestrial ecosystems of the Ross Sea region by working with AntarcticaNZ and universities.

NATIONAL OUTCOME 3

Improved measurement and mitigation of greenhouse gases from the terrestrial biosphere.

OUTCOME KPI

New Zealand is meeting its international reporting obligations and reducing net greenhouse gas emissions from the terrestrial biosphere.

OUTCOME RATIONALE

New Zealand must meet its international greenhouse gas reporting obligations and decrease net emissions of greenhouse gases from terrestrial systems below 'business as usual' levels. To achieve this, it is necessary to have: (i) a robust inventory of net emissions and carbon storage, and (ii) 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. Research is needed to develop new methodology for measuring soil carbon storage and for reducing uncertainty for estimating and scaling emissions, and quantifying changes in emissions as a consequence of key land-use and management change. This will allow mitigation strategies to be developed and approaches for increasing carbon storage to be identified and adopted.

This is an area in which the science challenges are substantial and we are developing new national and international collaborations to address them. We have a significant role to play and are acknowledged internationally for our expertise in carbon and nitrous oxide science.

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.

IMPACT KPIs

3.1. MAF 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.

IMPACT KPIs

3.2. Agricultural land managers and DOC are, where appropriate, using validated methodologies and land use practices to mitigate greenhouse gas emissions and increase carbon storage and adapt to likely climate change effects.

2011–16 INITIATIVES:

- Identify ways of protecting and enhancing soil carbon by developing more precise paddock measurements of environmental factors and land management on soil carbon dynamics, working with NZAGRC, MAF, MfE, DairyNZ, farmers and other land managers.
- Mitigate agricultural methane and nitrous oxide emissions in grazed pasture systems by developing new technologies and practicable management options with MAF and the agricultural industry.
- Develop more precise paddock-scale measurement techniques for agricultural greenhouse gas emissions, and improve and verify farm, regional and national estimates, by working with MAF, farmers and the agricultural industry.
- Develop whole-farm systems to improve emissions estimates and management strategies at catchment, regional and national scales. Work with MAF, farmers, other CRIs and the agricultural sector to facilitate uptake of these systems.
- Develop methods and quantify changes in carbon storage in vegetation and soil for indigenous ecosystems and forecast the impacts of climate change on carbon stocks.

NATIONAL OUTCOME 4

Increase the ability of New Zealand industries and organisations to develop within environmental limits and meet market and community requirements.

OUTCOME KPI

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

OUTCOME RATIONALE

To achieve sustainable economic development, New Zealand must work within environmental limits and be responsive to the needs of local communities (licence to operate), and commercial markets (licence to sell and being competitive) and the cultural context of the Māori world view.

The challenges bring together the community, the public sector as regulators and policy-makers, the private sector as the economic engine, and the science sector as the provider of trusted evidence and innovation on which policies, strategies and solutions may be built. These challenges are increasingly complex with no 'right answer' for resolving high risk and polarised viewpoints.

Research is needed to better understand the factors required to resolve complex environmental issues, adapt to global change and reduce vulnerability to resource scarcity. Solutions need to integrate economic, social, cultural and environmental dimensions; and they may be applied within communities, marketplaces, governance structures or individual organisations.

Our capability and collaborations have developed over the last decade in response to the changing role of science in society, and the growing interests of society in the global issues of climate change, food security, competition for natural resources, and biodiversity loss.

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.

IMPACT KPIs

4.1. 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.

IMPACT KPIs

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

4.2.2 Bovine TB is eradicated by the AHB from vector populations in two extensive forest areas in programmes responding to economic, social, cultural and environmental drivers.

2011–16 INITIATIVES:

- Develop publicly-acceptable, environmentally-safe, and economically-efficient possum and other small mammal pest control strategies and work with AHB, DOC and regional councils to evaluate and deploy them.
- Interpret overseas developments in corporate sustainability performance and reporting to better equip New Zealand exporters with tools to compete globally. Work with BusinessNZ and industry sectors to facilitate uptake of this knowledge
- Assess environmental, economic and social impacts in New Zealand of climate and land-use change at a range of scales, including the global impact of overseas' climate policies on agriculture and trade. Work with MAF, central and local government to interpret and facilitate uptake of this knowledge in government and industry.
- Develop catchment-wide sustainable land uses that address community mandate, cultural needs, market expectations and environmental limits in partnership with primary production sectors, CRIs and others.
- Develop a biodiversity offsetting system that will allow New Zealand to balance economic development initiatives within a framework of no net biodiversity loss, working with DOC, MAF, MfE, LINZ and MED.

ENGAGING OUR STAKEHOLDERS

GOAL

Landcare Research's partnership with central and local government, industry and Māori organisations is valued by them for improving the efficiency and effectiveness of science expenditure that leads to National Outcomes being achieved.

Bonnie Rowell of Environment Southland using a Landcare Research guide to monitor the quality of a wetland.



KEY PERFORMANCE INDICATORS

- Percentage and number of relevant funding partners and other stakeholders that have a high level of confidence in Landcare Research's ability to set research priorities and the effectiveness of the collaborative partnership (*MSI indicator with data provided from their external survey*)
- Total value of subcontracts to industry, government and Māori organisations per annum (*MSI indicator*)
- Percentage of relevant end-users who have adopted knowledge and/or technology from Landcare Research (*MSI indicator with data provided from their external survey*)
- Number of staff invited to participate in stakeholder meetings with industry, government and Māori end-user groups
- Number of technical presentations to New Zealand industry, government and Māori end-user groups
- Number of contract reports produced for New Zealand industry, government and Māori end-users groups

CONTEXT

Government is encouraging partnership between government, industry and science so that science better informs policy-making by government and underpins innovation by industry. An example of this type of partnership is the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) <http://www.nzagrc.org.nz/> in which we co-lead the science and collaborate with other science providers (CRIs and Universities), government and the private sector.

Increasingly, we are working directly with industry on specific issues that benefit from our science (e.g. greenhouse gas, water and biodiversity footprinting). Industry is a key stakeholder, particularly as Government expects it to invest more in science to create opportunities for sustainable economic growth.

Knowledge development and transfer are core activities of all CRIs, and our new science framework emphasises these. The structured arrangement in which advisory panels interact with Landcare Research at strategic and operational levels will have a major role in focusing our research on National Outcomes.

Our traditional stakeholder partners are DOC, MAF, MfE, AHB, local and regional government; but our scope is now broader. While we work with many businesses and industry sectors, strategic engagement is mostly through BusinessNZ, NZTE and MED. As tangata whenua, Māori are important stakeholders in our research – our engagement in Vision Mātauranga is explained in the next section (Section 6). The wider community is emerging as important group with a stake in complex environmental issues, and is increasingly demanding the right to be involved in planning and decision-making processes.

STRATEGIC INITIATIVES

Our partnership model

To ensure that our science achieves maximum impact and benefit to New Zealand, we will endeavour to partner with an increasing number of organisations in industry, central and local government and iwi. The effectiveness of these partnerships will depend on our ability to clearly understand their needs for knowledge relevant to our Core Purpose, then effectively target our science to address these needs. We will invest in the skills and experience necessary to actively enhance relationships and broker knowledge between researchers and stakeholders.

Knowledge stewardship

Knowledge stewardship refers to our responsibilities in relation to the accessibility and use of information from our research and databases.

We will work with partners to enhance knowledge stewardship, agree on the appropriate form and timing for transfer of new knowledge assets, and the incorporation of tacit stakeholder knowledge into those assets. The latter will be highly relevant to Māori whose traditional knowledge and unique world-view are of particular value to areas of our work.

We will invest in highly flexible systems for managing data, information and knowledge to meet a range of needs. In doing so, we expect a significant step change in stakeholder access to the knowledge Landcare Research holds, especially in our databases and collections (e.g. land resource information at www.scinfo.org.nz).

While our primary knowledge generation activities focus on the specific needs of our partners, we will identify ways of generalising this information to support our wider stakeholders, including the education sector and general public (e.g. ecological restoration information at www.OurFuture.net.nz). This will include presenting information in ways that will help our partners influence their key stakeholders (e.g. industry disseminating information to customers).

We will seek to understand the way in which the knowledge assets we generate are used by stakeholders in the increasingly open-access information environment. This will help us to enhance accessibility and to identify the implications (including uncertainty and risk) of widespread re-use of assets.

Co-commitment to our science

We want our partners to help drive our science investment decisions, prioritise programmes, co-invest in our science, and to align roles within their organisations to the uptake and implementation of research results. To ensure the desired level of partner commitment, we will engage with these organisations at appropriate levels, including a Strategic End-User Panel (CEOs from stakeholder partners) and a Strategic Science Panel (appointed by the Board) that will engage with Landcare Research's Board of Directors.

A Strategic Scoping Group of Stakeholder Senior Managers, Programme Coordinators and Programme Leaders will have input into *Outcome scanning* and *Programme scoping* at the National Outcome level. The Programme Planning Group, made up of stakeholder functional managers, Programme Coordinators, Programme Leaders and Science Team Leaders, will be engaged in *Programme planning and Performance Monitoring* at the Impact level.

STRATEGIC INVESTMENT

Centre for Land Resources Science

Soil and land resources provide major economic opportunities for New Zealand. However, the science that underpins this is fragmented across many science providers, each contributing different parts of the puzzle and each working with different end-users. We will invest to coordinate national research efforts, build national research capacity, create a national repository and data system for land resource information, and coordinate meaningful engagement with government, industry and Māori. Such coordination and capability-building are essential if New Zealand is to achieve sustainable intensification of primary production while managing environmental impacts, especially those on ground and surface fresh water. We will encourage a combined approach to managing land-use and water assets – using science and innovation to strengthen industry while meeting community and market requirements.

VISION MĀTAURANGA

GOAL

Landcare Research is invited into strategic partnerships with iwi and Māori organisations to address Māori needs, issues and aspirations.

Research Technician Katarina Tawiri (left) and Ethnobotanist Sue Scheele at the National New Zealand Flax Collection, which supports research into uses of Phormium.



KEY PERFORMANCE INDICATOR

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

Ecologist Colin Meurk discussing threatened native plants at a hikiwi on efforts to restore damaged environments.

CONTEXT

Landcare Research has a 20-year history of research projects with iwi. Initially projects focused on developing geographic information systems (GIS) to represent cultural values and interests, and on protecting taonga species. However, Māori are increasingly moving to a post-Treaty settlement phase where returned assets are being developed. They are looking for science and innovation to enable them to meet their aspirations, realise business opportunities, and achieve sustainable management of natural resources.

Māori contribution to the national economy (\$40bn assets and 7.9% of GDP in 2010) is concentrated in the primary sector (e.g. farming, forestry, fishing), which can expose Māori to global economic shocks. Entities such as Ngāi Tahu, central North Island iwi, and Waikato-Tainui are seeking to build resilience and environmental sustainability, and grow their asset base by expanding global business and export interests, markets and networks to accelerate sustainable Māori economic development.

Māori goals, principles and knowledge systems (mātauranga) are increasingly being employed in national frameworks for natural resource management. Māori, business and government acknowledge that to realise Vision Mātauranga, Māori must fully participate in the RS&T sector, and the process must recognise and reflect the holistic Māori world view.

STRATEGIC INITIATIVES

Landcare Research will increase its *integration of science and mātauranga Māori* in a way that increases society's appreciation of holistic relationships between the natural world, the economy and people. This integrated approach crosses and links all four of our National Outcomes, and will be reflected in a growing number of projects with Māori. These projects may lead to integrated knowledge services and tools (e.g. linking biodiversity, land use, greenhouse gas offsetting and business opportunities) that enable Māori to use our research, technology and information.

Landcare Research will build its core Māori *capacity and a strong bicultural ethos*, giving the wider organisation confidence to develop strategic partnerships with iwi and Māori organisations. We will continue to form *responsive, long-term relationships* with iwi and Māori organisations, as demonstrated through a suite of collaborative projects that attract Māori investment.

CLEVER VISUALISATION TOOLS IMPROVE ACCESS TO LAND RESOURCE INFORMATION

A new land visualisation tool has been developed to provide convenient access to extensive information about Māori land.

The tool has been designed and developed specifically for Māori land owners and land managers assessing their land blocks, and wanting to know about the land resource characteristics of the land and its potential. The tool, (<http://whenuaviz.landcareresearch.co.nz>) is available to everyone who has an interest in Māori land. It combines updated block (property and legal) data from the Ministry of Justice (Māori land online: <http://www.maorilandonline.govt.nz/gis/>) with environmental and land resource data from Landcare Research.

The tool can create a customised report of the environmental characteristics for any Māori land block in New Zealand, with land located by using either an interactive map or by searching for a block name or place name. The tool generates a series of resource maps, statistics, and descriptive information detailing land resources and presents this information to the user as an interactive webpage. The data is displayed over topographic maps, satellite imagery and aerial photographs. This will provide landowners with an idea of the potential of their land blocks, including a 'first cut' land assessment showing areas suitable for horticulture, cropping, pastoral farming, forestry and areas needing long-term protection.

There has been huge interest in the tool when we have demonstrated it at conferences and workshops around the country, especially from Māori land owners and Māori organisations such as trusts and incorporations, and many government departments. Māori have been waiting a long

time to gain better and easier access to land resource and environmental data of their blocks. In future Māori land data can be linked to relevant data from many other sources. Already we have linked the tool to the National Library's Digital NZ records, giving a wealth of historical and archival information for each Māori land block.

Development of the tool was funded by Te Puni Kōkiri (Ministry of Māori Development).

PAPAKĀINGA IN URBAN DEVELOPMENT

Poor understanding of Māori perspectives and knowledge (mātauranga Māori) in local government, limited resources in iwi and hapū, and lack of effective enabling practices have severely limited Māori participation in local government decision-making. An overwhelming proportion of the Māori population are urban dwellers, who increasingly want to re-establish traditional values through communal and cluster type settlements (papakāinga) incorporating cultural principles. These principles emphasise the inter-connectedness of communities, hospitality, spiritual and physical well-being, healthy water and land, and the inextricable links between healthy environments and healthy people.

We have been developing systems and processes to facilitate the integration of these traditional Māori values into modern urban design and development across single-unit dwellings, subdivisions, communities or town centres. Sustainability issues are also being considered e.g. alternative energy for self-sufficiency, eco-friendly materials with low embodied energy, and less dependence on reticulated water and stormwater systems.

SCIENCE COLLABORATION & EXCELLENCE

GOAL

Landcare Research-led teams are regarded as national 'best teams' that draw upon the complementary skills of CRIs, universities and other organisations, including those overseas, and deliver excellent science.

Social Scientist, Kathryn Scott (right) discussing environmental features of the Talbot Park subdivision, Glen Innes, with local residents.



KEY PERFORMANCE INDICATORS

Collaboration

- Percentage of relevant national and international research providers that have a high level of confidence in Landcare Research's ability to form the best teams to deliver on its outcomes (*MSI indicator with data provided from their external survey*)
- Total value of subcontracts to industry, government and Māori organisations per annum (*MSI indicator*)
- Number of joint scientific peer-reviewed publications with other New Zealand or international research institutions per annum (*MSI indicator*)

Science excellence

- Total number of international awards, invitations to participate on international committees, and number of staff on editorial boards for scientific publications per annum (*MSI indicator*)
- Proportion of published papers in the top 25 international journals relevant to the scope of Landcare Research (as outlined in the SCP) per annum (*MSI indicator*)
- Average number of citations per CRI published paper (*MSI indicator*)
- Citations for the ten most cited papers produced by Landcare Research staff over rolling 10 years

CONTEXT

The CRI Taskforce called for a significant behaviour change from the competitiveness of the FRST contestable-bidding era to a new culture of collaboration. Core funding gives CRIs greater stability to develop such models of collaboration.

The Statements of Core Purpose identify National Outcomes from the work of each CRI, and also a 'Scope of Operation' that helps identify each CRI's niche and relationship with others (see Section 1). Our focus on complex environmental issues across sectors and spatial scales complements the capabilities of the primary-sector CRIs (AgResearch, Scion and Plant & Food Research) that are principally focused on economic performance within their sectors. We collaborate with them on environmental issues of relevance to specific sectors (e.g. greenhouse gases in the dairy sector, and plant diseases in the kiwifruit sector).

Similarly, we complement other CRIs and universities with an interest in the natural environment (NIWA and GNS Science, especially). We collaborate with NIWA on issues linking land use to water quality and quantity, and with GNS Science on long-term land erosion issues. Landcare Research plays a key role in leading geo-informatics and data management across the CRIs and universities, most recently through NeSI.

We are also formal partners in several collaborative research centres and networks:

- The New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) that involves 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, and all the CRIs. www.nzclimatechangecentre.org
- The Centre for Biodiversity and Biosecurity (CBB) with the University of Auckland www.cbb.org.nz
- The Centre for Urban Ecosystem Sustainability (CUES) with the University of Auckland
- The Centre for Lifecycle Management with Massey University and three CRIs
- The New Zealand Centre for Sustainable Cities with University of Otago and five other partners <http://sustainablecities.org.nz/>
- NzOnet, a network of nitrous oxide researchers from four CRIs, Lincoln University and DairyNZ
- CarbonNet, a network of soil carbon researchers from five CRIs and three universities.

We aspire to excellence in science and innovation within our Core Purpose and in our relationships with others. A reputation for excellence enables us to attract high quality staff and collaborate with the world's best science teams. Our science programmes will be annually monitored, and reviewed in-depth towards the end of programmes by an international review panel. Our science publications and contract reports are assessed by independent peers and we have started to benchmark our publication rate and quality against past performance and sector leaders.

STRATEGIC INITIATIVES

Collaboration

Collaboration between science providers is an absolute necessity because science challenges are increasingly complex, requiring a broader range of skills and greater depth of resources than one institute or even one country can supply. There is a definite trend towards national and international teams pooling resources and mutual investment (including from government and industry where appropriate) to form collaborative research centres focused on specific issues. We are partners in a number of collaborative research centres (see above) and we are investing in a new Centre for Land Resources Science (page 17).

E-Research is at an early stage of development but represents the way of the future for future collaborations linking research groups and their data across New Zealand and overseas. We are investing in the behaviours and culture shift needed to exploit the enormous opportunities of e-Research (page 27).

We are committed to forming *Joint Graduate Schools* in partnership with universities to enhance the flow of top quality graduates through the science education system, and into research and technical roles in government, industry and science. For example, the newly-formed Joint Graduate School for Biodiversity and Biosecurity (page 31) is a partnership with Auckland University. Our five largest sites are located in or next to universities to facilitate collaborative research and supervision of students undertaking postgraduate degrees.

Science excellence

We will track the quality and impact of our science using a multidimensional *science footprint approach*. We will benchmark our performance (e.g. using H-index and SCImago SIR World Reports) against national and international equivalents. This will complement evaluation of our research impact and support ongoing monitoring of our science performance by MSI, Science Advisory Panel, Stakeholder partners and peer review. The SIR World Reports present quantitative data on citations and publications over a rolling 4-year period for some 3000 research institutions worldwide. (<http://www.scimagoir.com/>)

We will *collaborate with other science providers* in New Zealand and overseas with the specific intent of creating and, where appropriate, leading best teams. Collaboration may be supported through Core funding. We will continue to develop formal relationships with a number of international research teams, with the primary aim of accessing broader capabilities and facilities, targeting high quality recruits, and establishing training and mentoring opportunities for our emerging science talent.

We will use national and international experts to regularly evaluate our programmes, primarily in regard to science excellence and impact, and to recommend areas for improvement. *Annual programme monitoring* will be used to balance Core funding between programmes. *Major international peer reviews* will be conducted typically in the third year of a programme's 5-year lifespan.



ICM Programme Leader, Andrew Fenemor, at Motueka River.



Measuring nitrous oxide emissions from a pasture.

A BLUEPRINT FOR BETTER LAND-WATER MANAGEMENT

Landcare Research and its partners are taking a fresh approach to land and water research in New Zealand.

Water resources, their management and use are key issues that have direct relevance to New Zealand's economy. Why the connection with the land? Many of the provisioning services that land and soils provide have either an explicit or an implicit connection to water.

Soils buffer and filter many water-borne contaminants, they provide the necessary physical structure in which available water is stored and released, and when land is poorly used, or unstable it is often the water resource which is impacted. But good water management is also essential for sustainable land use since without water soils cannot provide the necessary engine that our primary land-based industries need. Sustainable use of land and water resources needs to be done in tandem.

Nationally there is an appetite for a new approach to the way land and water are managed, and the way underpinning research is framed. This appetite is evident in the Land & Water Forum recommendations, National Policy Statements and National Environmental Standards (environmental flows and forestry), national programmes such as 'Fresh Start for Fresh Water', 'Irrigation Accelerator Fund', and the focus of the recently announced 'Green Growth Taskforce'.

Accompanying this policy reform are calls from central government agencies and regional councils for a more integrative and collaborative research approach, with the MSI/FRENZ Freshwater Sandpit process in March 2011 a recent example.

So Landcare Research, along with its collaborators and partner stakeholders, is responding with a fresh blueprint for land and water research, in which the:

- Science connections across science institutes and with policy, industry and communities are incorporated within the research programme. This builds on the approach

of the recently completed ten-year Integrated Catchment Management (ICM) Programme focused on the Motueka River (Cawthron Institute, NIWA, IGNS, Tasman District Council, land users, and iwi)

- Physical connections between land and water are explored, including the flows and fluxes from ridgetops to the sea. This builds again on the ICM programme, as well as newer collaborative programmes with AgResearch, NIWA and ESR.
- Cultural and value-based connections with multiple stakeholders (e.g. principles of kaitiakitanga developed over generations of living as part of the natural environment) and knowledge frames (such as mātauranga Maori – traditional knowledge, and the connectivity provided by whakapapa – genealogy) are discussed and incorporated within the design of new policies and approaches. When opinions are polarised and stakeholders have entrenched views there are real benefits in helping all stakeholders see the big picture, i.e. the system within which they operate. This builds on several MSI-funded collaborative programmes including Old Problems, New Solutions, Te Tipu o te Wānanga, and Freshwater Values.
- Economic connections for efficient resource use are promoted, enabling market competitiveness for primary products. This requires working with industries and government to develop tools and approaches that manage resources such as water, soil and energy in the most effective way. This builds on our pioneering work on the use of electromagnetic mapping, S-map, pedometrics (soil modelling) and sensors to understand soil and water variability (both temporally and spatially). It also links to technologies that can improve irrigation and improve water-use efficiency and reduce leaching losses.

CLIMATE CHANGE SCIENCE – FROM LOCAL PADDOCKS TO GLOBAL ALLIANCE

Landcare Research's greenhouse gas (GHG) measurement and mitigation work spans the whole collaboration spectrum.

At the paddock scale, we are working with farmers on the design of a biofilter that could reduce methane emissions from effluent ponds by about 60%, and on research into farm management practices that will significantly limit nitrous oxide emissions.

We are in the process of setting up a new research platform that combines continuous measurement and modelling of all greenhouse gases, and changes in soil carbon with water and energy use, for adjacent dryland grazed and irrigated dairy farms in Canterbury.

At the national scale, our understanding of emissions and our ability to accurately map changes in land use between 1990 and 2008 continues to help MfE reduce uncertainty in New Zealand's national greenhouse gas inventory. Our findings were used to demonstrate that the area of post-1989 forest is sufficient to offset our increase in emissions and meet our Kyoto Protocol obligations for the first commitment period.

We have also been working with MAF to quantify the carbon stored in vegetation and soil in forests, shrublands and grasslands. We lead soil carbon research in the New Zealand Agricultural Greenhouse Gas Research Centre, which is striving to develop new mitigation technologies to reduce emissions without reducing agricultural output.

Internationally, New Zealand is a founding member of the Global Research Alliance where we are collaborating with colleagues to develop methodologies to improve soil carbon sequestration and develop new practices for reducing emissions in grasslands. The Alliance comprises 30 countries committed to collaboration in the difficult task of reducing greenhouse gas emissions from agriculture.

TWO-WAY KNOWLEDGE EXCHANGE FOR TACKLING WEEDS

Landcare Research is using effective international collaboration to address New Zealand's invasive weeds issues and help build the capacity of Pacific neighbours to meet their challenges.

New Zealand has a major problem with invasive weeds – plants that have become established in this country without the natural enemies, such as insects and diseases, which have evolved with these plants and help keep them in check in their countries of origin. Biocontrol – the use of these natural enemies – often is the only viable control option for widespread weeds outside of our most productive land environments.

Landcare Research scientists have built extensive networks with colleagues abroad to find and research the suitability of releasing these natural enemies as biocontrol agents here. Once ERMA has approved each control agent for use in this country, we breed sufficient numbers for widespread release.

Our biocontrol work has resulted in weeds such as ragwort and mist flower effectively being brought under control in New Zealand. We have also released agents that in time should help control a range of thistles, broom, tradescantia and woolly nightshade.

New Zealand has some of the highest rates of success in the introduction of biocontrol agents. The expertise we have developed is now being used to help Pacific Island nations, who are also battling significant weed problems, to build their capacity. We are sharing our expertise, knowledge and infrastructure (labs, collections and databases).

INTERNATIONAL ENGAGEMENT

GOAL

Landcare Research's science excellence is enhanced, and opportunities are realised for the benefit of New Zealand, by managing and leveraging international connections.

Soil monitoring equipment being installed in Antarctica as part of a climate change collaborative research project.



KEY PERFORMANCE INDICATORS

- Number and percentage of joint scientific peer-reviewed publications with international research institutions per annum (*MSI indicator*)
- Percentage of relevant international research providers that have a high level of confidence in Landcare Research's ability to form the best teams to deliver on its outcomes (*MSI indicator with data provided from their external survey*)
- Total number of partnering deals (including licensing agreements) for Landcare Research-derived IP (including technologies, products and services) with international partners per annum (*MSI indicator*)
- Total number of international awards, invitations to participate on international committees, and editorial boards for Landcare Research's published papers, per annum (*MSI indicator*)
- Percentage of total revenue from international sources per annum

CONTEXT

Landcare Research is actively engaging in research and networking with institutions globally in ways that support all our National Outcomes. Relationships are often established through staff presenting papers at international conferences and workshops. These relationships and our reputation help us attract world-class researchers to Landcare Research, as permanent employees, visitors and postdoctoral researchers.

Landcare Research, in partnership with our key stakeholders, is recognised as a world-leader in areas of biosecurity, pest management, agricultural greenhouse gases, geospatial and biodiversity informatics, and integrating multidisciplinary science to inform decision making.

New Zealand is increasingly using science to spearhead diplomacy in trade and find solutions for global issues (e.g. the Convention on Biological Diversity, the Antarctic Treaty). The demand for linked economic-environmental modelling of global change and trade is growing rapidly, and there is an acute need for international engagement and collaboration.

Landcare Research holds significant knowledge assets that make an integral contribution to global networks. Within these assets, there are significant collections and datasets that we hold in trust for Pacific Island Countries. We also have a role to play in helping these and other countries to build in-country capability for managing collections and their use in supporting biosecurity, biodiversity and economic development.

STRATEGIC INITIATIVES

We will continue to collaborate internationally to ensure *science and organisational excellence* through the two-way flow of knowledge and staff, and shared state-of-the-art technologies. Benchmarking against selected international research entities will help us stay at the forefront of research to support National Outcomes.

We will support New Zealand's *multilateral/bilateral environmental commitments, trade agreements and exporting businesses* by providing expert scientific input and perspective on global issues such as greenhouse gases and biodiversity. Similarly, we will have a foresight role interpreting overseas trends in environmental reporting, policies, standards and market expectations, and developing solutions for New Zealand.

We will grow our international revenue and services from both our science and our branded business units. The latter have a role in sourcing knowledge from overseas markets to help direct our science and commercial services for New Zealand's benefit. Our branded business units that have this role include Sirtrack, the CEMARS and carboNZero^{Cert}™ certification programme, Invasive Species International (ISI), and EcoGene® (page 33).

We will support New Zealand's Official Development Assistance in Pacific Island Countries through capacity-building projects in natural resource management, climate change science, biosecurity and management of national biological collections and their application for economic benefit.

In 2011/12 we will contribute to a New Zealand-led, four-way collaboration on sustainable agriculture science with Australia, Canada and the European Union as part of suite of collaborations under the European Commission's Knowledge-Based Bio-economy (KBBE) initiative. We will develop strategies for engagement in China and South America, in line with Government initiatives in those countries.

STRATEGIC INVESTMENT

Economic modelling capability for global change and trade

Policy-makers increasingly want economic models of how primary production and international trade should respond to climate change. However, technologies for large-scale modelling of production, emissions and responses in the primary sector are still in their infancy because they require particularly complex integration of economic and biophysical models.

In partnership with the University of Chicago and Argonne National Laboratory's Computation Institute, we will invest in developing and testing a new dynamic, spatially-detailed model. The collaboration builds on existing interdisciplinary synergies and complementary strengths. The investment will support a new 2-year research position divided between the University of Chicago and Landcare Research, and the co-development of the model. The USA collaborators will contribute significant modelling and computing resources to the project.

GLOBAL SOIL MAP

A global consortium has been formed to create a digital soil map of the world that will assist in addressing a range of global issues like food production and hunger eradication, water security, climate change, and environmental degradation.

Global Soil Map uses state-of-the-art technologies, including new high-resolution maps, supplemented by interpretation and functionality options. The project has support from the Bill & Melinda Gates Foundation. One of our senior soil scientists, Allan Hewitt (the architect of S-map, the digital soil map for New Zealand), was elected to lead the Oceania node (Australia, New Zealand, Pacific and associated territories).

'Let there be no mistake about the significance of this wonderful project,' said Kofi Annan, Secretary-General of the United Nations 1997-2006, and co-recipient of the 2001 Nobel Peace Prize.

INFORMATICS & BIOSYSTEMATICS

GOAL

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

Grace Hall, Curator of the New Zealand Arthropod Collection.



KEY PERFORMANCE INDICATORS

- Stakeholder surveys show satisfaction with accessibility to our Nationally Significant Databases and Collections and the value of the information assets contained in them
- Percentage change in the number of requests and enquiries for Landcare Research's publicly available collections (*MSI indicator*)

Laboratory Technician Paula Wilkie with specimens from the International Collection of Micro-Organisms from Plants (ICMP).

CONTEXT

Informatics is the science of designing information systems that can manage and process huge quantities of complex data and deliver the right information, to the right person in the right place, time, and format. It has the power to create new value and opportunities by integrating and interpreting data across multiple sources and agencies. The Government has strong expectations of the science sector in this respect. Policy and funding agencies increasingly depend on e-Research and robust integrative modelling across local, national and even global scales. Developments in technology, research practice, and e-Research all need to be well planned, and aligned with organisational and end-user strategies.

Informatics has typically been funded only to deliver services (e.g. web-portals within science programmes). These services are often 'orphaned' by lack of revenue to maintain service delivery when a programme finishes. There is a need for a transformational change to embed informatics into research programmes and the creation of knowledge-based solutions.

New Zealand scientists are becoming increasingly well-served both by high network speeds, such as the ultra-fast KAREN (Kiwi Advanced Research & Education Network), and by High Performance Computing facilities, such as those being built and managed by the National e-Science Infrastructure (NeSI) investment.

Biosystematics is the science of discovery and description of New Zealand's biodiversity, and of its ecological and evolutionary relationships. Landcare Research is custodian of and curates seven Nationally Significant Databases and Collections – the largest holding for any of the CRIs, and larger than equivalent collections held by museums in New Zealand. We receive

the largest amount of government funding for collections and databases that underpin science, primary production, biosecurity, conservation and environmental management. Increasingly, data from these collections are made freely available online to our stakeholders, along with interpretive services as required. A new direction is creating 'virtual' collections where identification-quality images and data can be shared within countries and across the world.

The land resource and soils databases underpin our economy, options for wise land use and potential to mitigate greenhouse gas emissions; and they play an essential role underpinning policy development at regional and national scales. We are leading the Pacific node in developing the Global Soil Map, and much of our methodology has been adopted by other partners.

STRATEGIC INITIATIVES

Landcare Research will work with government policy partners to progress an *open-licensing framework* for the management and public provision of data from our Nationally Significant Databases. In conjunction with this, we will be researching a new exemplary framework to manage data throughout their life cycle – from its acquisition through to analysis, publication and ongoing use. New approaches for addressing uncertainty, natural variability and communicating risk will improve environmental modelling.

We will work towards seamless access, *anywhere and anytime*, to all science data and data analysis processes. One of the first steps in this is contributing to the design, development and management of New Zealand's emerging informatics infrastructure, particularly NeSI (also see page 29)

We will ensure *international alignment* of our strategic initiatives with complementary strategies in other countries, e.g. the National Collaborative Research Infrastructure Strategy (NCRIS) in Australia. Our strategic investment in NeSI builds on phase 1 of NCRIS, and we expect to participate in proposals to implement phase 2 of NCRIS during 2013. Such alignment is essential to maintaining Landcare Research's international reputation as leading research in collaborative, shared biological and geospatial data, and modelling systems.

STRATEGIC INVESTMENTS

Landcare Research is *investing in NeSI*, and will recruit three new staff with required skills to *improve data management and access*, and establish a new NeSI-based environmental modelling platform. This additional new capability will enable large-scale computational synthesis of data to address a wide range of environmental issues confronting New Zealand and the Oceania region, and fast-track creation of new web-based visualisation and collaboration tools, e.g. the OurFuture website and the Māori land use visualisation tool (page 19).

We will also invest in *significant infrastructure* to upgrade the Allan Herbarium, which houses the Nationally Significant Collection of New Zealand plants and which includes significant holdings of plants from Pacific Island Countries.

NEW ZEALAND ORGANISMS REGISTER (NZOR)

Surprisingly, scientists understand how many stars are in the galaxy better than how many species exist on Earth – estimates vary from 2 million to 100 million, but fewer than 2 million have been named so far. A number of interlinked global projects are attempting to catalogue named biodiversity to support better information management. Work by Landcare Research underpins the New Zealand contribution of around 100,000 names of organisms of relevance to our research, conservation and biosecurity agencies.

We have been contracted by the Terrestrial and Freshwater Biodiversity Information System programme (TFBIS) to develop the informatics infrastructure for the New Zealand Organisms Register (NZOR), the first national digital 'catalogue of life'. The project is a partnership between key national data providers (initially Landcare Research, NIWA and the museum, Te Papa) and data consumers (initially MAF BiosecurityNZ, DOC, the Environmental Risk Management Authority (ERMA) and Environment Bay of Plenty).

The New Zealand Organisms Register (NZOR) is key to New Zealand being a regional hub in Species2000, a project currently funded through new €5.9m EU projects (4D4Life & i4Life) that are attempting to complete the global Catalogue of Life. We are a partner in those projects, and in the Global Biodiversity Information Facility (GBIF) and the Encyclopaedia of Life (EOL) project that is helping develop the Global Names Architecture (GNA) to provide the informatics 'glue' between globally distributed biodiversity databases.

NATIONALLY SIGNIFICANT DATABASES & COLLECTIONS

HELD IN AUCKLAND:

New Zealand Arthropod Collection (NZAC)

- Largest collection of New Zealand land invertebrates, with many specimens also from the South Pacific; earliest collections date from 1880s
- Housed at Auckland and 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)

<http://nzac.LandcareResearch.co.nz>
<http://fnz.LandcareResearch.co.nz>
www.bugz.org.nz/

New Zealand Fungal & Plant Disease Herbarium (PDD)

- Primary source of information on the fungi of New Zealand and of Pacific countries; holds important historical specimens collected on Captain Cook's first voyage to New Zealand
- Housed at Auckland and contains 100,000 dried fungal specimens, including 2,000 type collections
- Contains voucher specimens documenting most plant diseases recorded in New Zealand

<http://nzfungi.LandcareResearch.co.nz>
<http://virtualmycota.LandcareResearch.co.nz>
<http://fungalguide.LandcareResearch.co.nz>

International Collection of Micro-Organisms from Plants (ICMP)

- Living cultures of more than 15,000 strains of bacteria and fungi from plants and soil
- Mostly stored in liquid nitrogen; others in freeze-dried ampoules

www.LandcareResearch.co.nz/databases/icmp

MANAGED THROUGH PALMERSTON NORTH AND LINCOLN:

Land Resource Information System (LRIS), including New Zealand Land Resource Inventory (NZLRI)

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 management and production

<http://scinfo.org.nz>

National Soils Database (NSD)

1,500 soil profiles from 1,700 different locations throughout New Zealand, with site descriptions and chemical, physical, and mineralogical characterisations.

HELD IN LINCOLN:

Allan Herbarium (CHR)

- 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

www.LandcareResearch.co.nz/allanherbarium
<http://nzflora.LandcareResearch.co.nz/>
www.LandcareResearch.co.nz/floras_guides
www.nzherbaria.org.nz

National Vegetation Survey (NVS)

- 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

<http://nvs.LandcareResearch.co.nz/>

National New Zealand Flax Collection

- Living collection at Lincoln of over 160 provenances of Phormium species of cultural, economic and historical interest
- Supports research on both traditional and new uses of Phormium

www.LandcareResearch.co.nz/harakeke

Ngā Tipu Whakaoranga Ethnobotany database

A fully referenced web resource of detailed information on the traditional use by Māori of native plants and fungi, including Māori names for species

<http://maoriplantuse.LandcareResearch.co.nz/>

INFRASTRUCTURE

GOAL

Landcare Research's investments in science infrastructure are recognised by scientists as providing excellent science capacity and by Government shareholders as benefitting New Zealand.

KEY PERFORMANCE INDICATOR

Financial return on investments through science revenue and demonstrable benefit to New Zealand.

CONTEXT

There is a continuing need to invest in significant science infrastructure to support excellent research and to attract new graduates and internationally-regarded visiting researchers. These strategic investment projects are aligned to our science outcomes and have national benefit. Due to the high level of investment both Board and shareholding Ministers' approvals are required.

Researchers who will work in these facilities make significant contribution to the design of new facilities ensuring they are fit for purpose and future needs. Where possible, within the constraints of containment requirements, facilities comply with our sustainability principles, e.g. energy-efficiency and environmentally-friendly fit-out.

STRATEGIC INVESTMENTS

Major science infrastructure investments include:

Allan Herbarium upgrade at Lincoln: Investment includes designing and installing heating, ventilation and air-conditioning systems, consistent with international best practice standards, to protect the Nationally Significant Plant Collections. The oldest of over 600,000 specimens were collected by Sir Joseph Banks on Captain Cook's first voyage, 1769–70, and the oldest collections date back to the 1850s.

Plant Pathogen Facility at Auckland: Investment in a new facility will enable research on both incursions of unwanted plant pathogens that are readily able to penetrate biosecurity defences, and host-specific plant pathogens that have significant potential as biological control agents for an escalating weed problem in New Zealand. Currently there are no existing

facilities for plant pathogen research work under appropriate containment, so the investment has significant potential to benefit New Zealand.

National e-Science Infrastructure (NeSI): We are partners in the \$48 million investment by government, three universities and two other CRIs to build and operate four High Performance Computing facilities. NeSI will enable us to carry out advanced modelling of land and ecosystem resources, invasive species population dynamics, physical and economic climate change impacts, and whole genome analyses. It will also facilitate collaborations with researchers overseas and accelerate important science (e.g. understanding soil carbon dynamics).

Greenhouse Gas Research facilities at Lincoln: Investment includes extending and renovating laboratories and offices, and purchasing new instrumentation. The investment will strengthen Landcare Research's position as a leader in climate change research and as a major contributor to the NZAGRC and Global Research Alliance. The new facilities will support research for MAF and MfE to assist New Zealand in meeting its international obligations to reduce net greenhouse gas emissions.

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 is supported by effective systems and processes.

Senior Technician Duckchul Park doing DNA analysis with the Ecological Genetics Laboratory's advanced new genome sequencer.



KEY PERFORMANCE INDICATORS

Culture and Leadership

- Staff survey evaluations of leadership, engagement and organisational culture
- The number and percentage of staff in leadership positions completing the stage two leadership development programme and demonstrating improved leadership evaluations

Talent Management

- Turnover of key staff

Good Employer

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

CONTEXT

The external market for talented researchers is changing very rapidly, with top talent being globally mobile and highly sought after, particularly in the environmental sciences. The situation is exacerbated by the trans-Tasman remuneration gap, with Australian research institutions attracting many talented young New Zealand researchers. Our science facilities, culture and our philosophy of *manaaki whenua – manaaki tangata* play a vital role in attracting and retaining staff.

The CRI Taskforce Recommendations sought a significant improvement in technology transfer and business engagement activities. As they noted in the final section of their report, this will require 'a significant culture change within CRIs'. Landcare Research recognises the need to enhance our stakeholder-focus and knowledge-brokering capabilities, making them part of everyday business.

We use internal and external development programmes to build resilience in managerial expertise and leadership, and to further develop our bicultural capabilities. But these initiatives are insufficient to meet the transformational culture changes needed to achieve our Impacts and National Outcomes. We have already initiated significant engagement with key stakeholder partners at both strategic and operational levels, and believe that the new Programme Coordinator roles will further embed the required culture change into our science framework.

STRATEGIC INITIATIVES

In our People & Performance Strategy, our senior managers, directors and stakeholder partners have consistently identified four key priorities that affect both individual and organisational capability. Initiatives relating to workforce culture and leadership development will have the greatest impact on growing organisational capability. Initiatives relating to talent management and aligned information and knowledge management systems, efficient administration and advice have the greatest impact on growing individual capability. Targeted improvements in these four areas will be reflected in staff achievement, quality of stakeholder engagement and enhanced business performance.

The four priorities are:

Workplace culture: We will create a stronger alignment between our values, behaviours and strategies, and embed this in the organisation. Inherent within this is improved foresight activities with stakeholders, relationship management and customer focus. We have initiated, and will continue, an annual staff survey to assess the development of our organisational culture, employee engagement and leadership.

Leadership: We will shift leadership from a transactional to a transformational approach. This applies internally to coaching and mentoring staff, and externally to science leaders and relationship managers brokering knowledge. We will implement stage two of a leadership development programme to support staff with new leadership accountabilities, and to give them the skills to deliver on our science framework.

Talent: We will 'build, borrow or buy' resource to effectively manage talent for growth, innovation, collaboration, relationship management between teams and externally with stakeholders, and knowledge management and transfer. We will develop more structured workforce planning, especially for the cohort of scientists and technicians who will succeed key staff currently in senior roles. We will also support postgraduate students in the new Joint Graduate School with Auckland University (see box) and other targeted fellowships. This complements our extensive in-kind contributions to supervising students undertaking postgraduate degrees at other universities.

Systems and Administration: We will continually improve our systems, policies, processes and workplace. Although their impact is indirect and supportive in nature, these remain a necessary function and are an essential part of attracting and retaining top talent and improving productivity. Internal systems must be aligned to and support our organisational culture. We will purchase and develop new information and knowledge management systems that are aligned to, and can integrate with, other company systems. As well as helping streamline company processes, the new systems will support significant progress in enabling our staff to work anywhere in the world and be able to access systems on our intranet.

We will seek opportunities to align systems and achieve efficiencies with other CRIs.

JOINT GRADUATE SCHOOL WITH UNIVERSITY OF AUCKLAND

The number of postgraduate qualified candidates available for employment in science and policy agencies responsible for biodiversity and biosecurity outcomes in New Zealand will dramatically increase through the establishment of a new Joint Graduate School.

Formed by Landcare Research and the University of Auckland in February 2011, the school will focus on producing postgraduate students in biodiversity and biosecurity science, which represent areas of significant and complementary overlap between Landcare Research and the university.

The Graduate School will initially co-appoint five Landcare Research staff (three professors and two associate professors) to undertake principal supervision of up to 15 graduate students.

The school will provide direct alignment between the training opportunities for these students and research undertaken by Landcare Research. This will greatly enhance the 'job-readiness' of the students coming out of the school — something that has been warmly welcomed by key government agencies providing advice to the school.

We anticipate extending this model to other areas aligned with Landcare Research's Core Purpose through the establishment of similar arrangements with other New Zealand universities.

TECHNOLOGY DEVELOPMENT & TRANSFER

GOAL

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

Hawkes Bay lighting and furniture manufacturer David Trubridge Ltd has been taking part in a Landcare Research-led Life Cycle Management Project.



KEY PERFORMANCE INDICATOR

Partnering agreements (including licensing deals) with New Zealand industry, government and Māori end-user groups to develop and transfer products/services (*MSI indicator*)

DEVELOPING EFFECTIVE ENVIRONMENTAL SERVICES – AHEAD OF THE MARKET

At the forefront of environmental research, and interfacing with government and business, Landcare Research is uniquely placed to anticipate and develop credible environmental services.

With our science expertise and international connections, we can identify emerging trends and create solutions well ahead of market demand. For example, we recognised and responded to the need for credible GHG certification ten years ago, ahead of the market opportunity and the supply chain imperatives that face businesses today. Our carboNZero^{Cert™} programme is now one of two leading international providers of GHG certification. It was the first GHG scheme to achieve international accreditation.

The programme has enabled New Zealand exporters to supply to the UK market with credible carbon claims prior to UK retailers challenging suppliers for a response to the issue. The programme has been endorsed by the UK Government's environment regulator, meaning that businesses in the UK now have a choice between approved UK providers or our New Zealand-developed certification. The programme also now operates in Chile and Australia with plans to expand further.

With our EBEX21[®] programme we used our comprehensive understanding of native forest regeneration to create a credible commercial model for landowners to generate carbon credits from marginal farmland. This work also informed the indigenous forestry regeneration elements of the Emissions Trading Scheme (ETS) and the Permanent Forest Sink Initiative (PFSI).

We also anticipated the demand for DNA wildlife diagnostics and established EcoGene[®], the commercial arm of our Ecological Genetics Laboratory. This has provided leading genetic analysis in support of biodiversity management and in response to the recent outbreak of the PSA kiwifruit-vine-killing bacteria.

Our research is focused on exploring future solutions aligned to our core purpose, for example in biodiversity offsetting and ecosystem services markets.

CONTEXT

The CRI Taskforce emphasised the fundamental responsibility of CRIs in transferring technology and knowledge to the private sector, and at an early stage. This is preferred to CRI capital being committed to start-up businesses. CRIs are expected to draw on existing commercialisation capacity in New Zealand including use of the proposed National Network of Commercialisation Centres (NNCCs).

Over the last two decades Landcare Research has progressively developed its subsidiary business Sirtrack, which specialises in technologies for radio-tracking animals. Initially the company met the needs of wildlife researchers locally, then nationally, and now is a successful business exporting products all over the world.

The carboNZero^{Cert™} programme has evolved over many years to now be one of the world's most reputable certification schemes for reducing, managing and mitigating greenhouse gas emissions. Recent growth accelerated through licensing to international partners, means that carboNZero will be a fully-owned subsidiary mid-2011. We continue to develop the Enviro-Mark[®] environmental management and certification programme specifically to meet the needs of New Zealand businesses. It is in a managed growth phase as more firms recognise and respond to customer expectations and overseas market drivers.

The business incubation of EcoGene[®], Invasive Species International and EBEX21[®] has grown out of services derived from our research; and they now provide commercial revenue from services to external clients while adding value back to Landcare Research's science programmes.

There is major global investment in 'green technologies', the OECD is pushing strongly for implementation of Green Growth policies, and the New Zealand Government established a green growth taskforce. We know there is considerable scope for partnerships with the private sector to identify and develop green growth opportunities from our science and innovation (e.g. land information used to inform management decisions and improve natural resource use efficiency).

STRATEGIC INITIATIVES

Landcare Research will take a proactive approach to *developing products and services* in response to market pull for environmental solutions in New Zealand and overseas. We typically operate in emerging rather than the established markets generally addressed by the sector-based environmental consultants.

We will encourage staff to think laterally and creatively in *identifying the commercial potential* of products and services spinning off from their research. We will partner with early adopters to refine the prototype technologies.

We will *transfer commercially-viable products and services* to the private sector via the full range of commercialisation pathways including licensing, IP sale and use of start-up business.

We will regularly review *commercial business ownership, value and related risk issues*.

INVESTMENT FRAMEWORK

GOALS

Landcare Research's processes for investing in science and innovation are informed by key partner stakeholders and enable us to discharge our accountability to shareholding Ministers, partners and the New Zealand public.

CONTEXT

The recent CRI reforms have transferred significant accountability for investing in science and innovation to CRI Boards. In 2011/12, Landcare Research will have approx \$24 million of government money in a Core Funding Agreement from MSI; and the Landcare Research Board will be accountable to shareholding Ministers for the impacts and value achieved from investing this money in our science and innovation. This Core funding equates to approximately 40% of our total revenue.

The Board also has the option of deciding to reinvest operating surplus (strategic investment) in specific initiatives that support our National Outcomes, are strategically aligned to our Core Purpose, and will create national benefit. Such initiatives are subject to shareholding Ministers' approval. High value initiatives mostly consist of science infrastructure but may include significant, cutting-edge research programmes.

The Board is charged by the shareholding Ministers to take strategic advice from senior, independent scientists and key stakeholder partners (page 35).

INVESTMENT CYCLES

The Board is accountable for investment decisions and will exercise that accountability at specific times within the usual 5-year lifespan of science programmes. Directors and Senior Managers can invest from a range of revenue sources:

Core funding is approx 80% of our total MSI funding (in 2012) and subject to annual agreement with MSI.

Capability funding (a subset of Core funding), to support science capability and innovation, is typically in medium-sized (<\$200k/year) and 1–2-year projects within programmes.

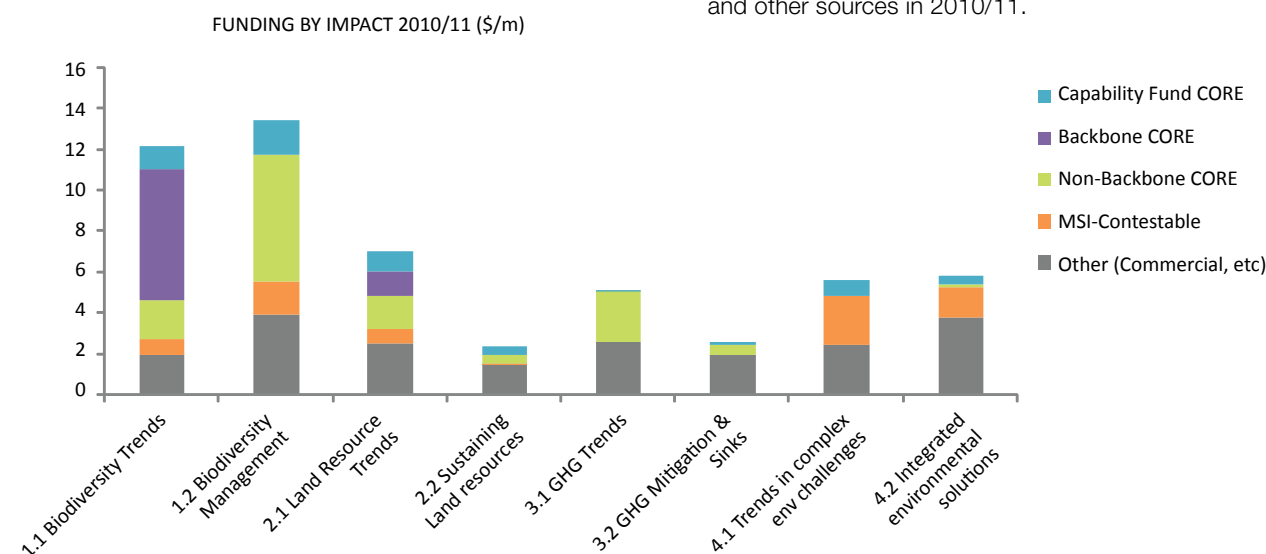
Retained earnings are applied typically to larger projects (>\$200k/year) that have a transformative nature (step-change in capability and/or science direction), and are subject to Ministerial approval.

Product and service development funding is applied to early-stage development of intellectual property with commercial potential.

Capital expenditure (Capex) is applied to physical assets (buildings, equipment, vehicles, etc.).

Additional sources of revenue from MSI and partner stakeholders (approximately 50% of total science revenue) are typically won by science teams through contestable processes. They include revenue from central and local government entities, industry sectors (e.g. DairyNZ, AHB) and businesses (e.g. State-Owned Enterprises), Māori organisations, and other CRIs, universities and agencies as subcontracts.

This figure shows the distribution of research revenue across the eight impacts (see section 4) from Core, Backbone (national databases and collections), MSI contestable, CRI Capability, and other sources in 2010/11.



KEY PERFORMANCE INDICATOR

Key stakeholders are satisfied with their engagement and influence on Landcare Research science investment and prioritisation setting (Landcare Research client survey)

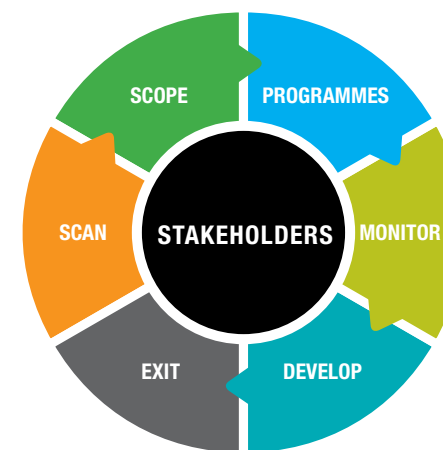
Steps in the Investment Cycle

Scanning will use a range of tools to identify emerging issues and direct innovation pathways. Technological and social foresight conversations with partners and other stakeholders will help provide a 10–20-year horizon to our science strategy.

Scoping will be used to analyse investment opportunities and inform investment decisions using criteria such as the scope for new science, fit with our core purpose, likely benefit to New Zealand, our capacity to make a significant contribution to the area, and the appetite of our stakeholders to invest.

Monitoring of programme performance will be against Outcome and Impact KPIs, contract deliverables, and other metrics set by Landcare Research and MSI. A range of tools including stakeholder surveys and international benchmarking will be used. Landcare Research and the other CRIs will be subject to a 5-yearly review by MSI. (See also Science Excellence in Section 7.)

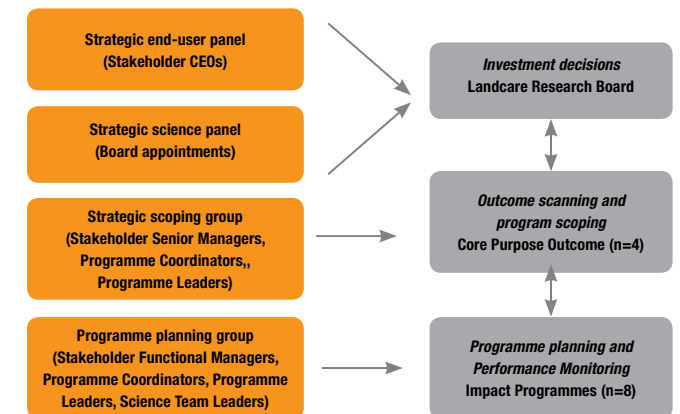
Development is a managed pathway for products and knowledge services deemed to have commercial potential. We will engage with the proposed National Network of Commercialisation Centres (NNCCs) and other market partners to identify market needs where our science and innovation can lead to viable



products and services; and then work with those partners to create pathways to market and commercial value to New Zealand. (See Section 12 for further information.)

Exit is a managed process at the end of a programme or major project within a programme, including a 'harvest' period focusing on knowledge stewardship.

Stakeholder engagement is not a single step in the cycle. Principal stakeholder partners are closely engaged throughout the investment framework; and they will help us make our investment decisions and also decide where they wish to co-invest in Impacts.



ADVISORY PANELS

The *Strategic End-User Panel*, made up of CEOs from stakeholder partners' organisations, will provide a strategic view, intimate knowledge of the New Zealand context, and understanding of the alignment needed between Landcare Research's science and their own organisation's contribution to National Outcomes.

The *Strategic Science Panel* (appointed by the Board) will engage with Landcare Research's Board of Directors. Panel members will be active, internationally respected scientists who are able to provide a strategic view, global perspective and have an appreciation of the New Zealand context. Their role will include supporting our strategic scanning and scoping processes, evaluation and development of science excellence.

A *Strategic Scoping Group* of Stakeholder Senior Managers, Programme Coordinators and Programme Leaders will have input into Outcome scanning and Programme scoping at the National Outcome level. We will make use of existing strategy groups where possible to avoid duplication.

A *Programme Planning Group*, made up of stakeholder functional managers, Programme Coordinators, Programme Leaders and Science Team Leaders, will be engaged in Programme planning and Performance Monitoring at the Impact level.

FINANCIAL STRATEGY AND METRICS

GOALS

Financial viability and flexibility

Landcare Research continues to maintain financial viability and flexibility, including meeting our shareholding Ministers' expectations on return on equity, operates within our banking covenants, and invests for the future in both infrastructure and strategic initiatives.

Return on equity

Achieve and maintain an acceptable return on equity, relative to our own cost of capital, in our 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 should equal the weighted average cost of capital.
- In the short term the Board is prepared to accept 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 developed.

In the *current fiscal situation* we are conscious that it is unlikely there will be significant increases in government funding for science research. The recent Core Funding Agreement provides a degree of certainty; however, we expect strong competition for other sources of government and private sector revenue.

Critical to the ongoing success of Landcare Research will be our ability to ensure financial viability through a period of fiscal pressure as a consequence of the Canterbury earthquakes and global economic downturn.

STRATEGIC INITIATIVES

We will develop a strategy to grow non-government revenue: Landcare Research seeks to reduce risk by decreasing reliance on government revenue streams.

We will develop a strategy to improve productivity: Landcare Research views improved productivity as necessary to achieve projected improvements in future financial performance.

Reinvestment of surplus: Landcare Research has 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 equals our weighted average cost of capital.

During the planning period we intend to reinvest surpluses with an EBIT impact of \$1-1.6 million per annum into strategic investments. This will be financed from both science research surplus and the performance of prior investments.

FINANCIAL OPERATING PLAN 2012-16

The Operating Plan shows the continuous improvement in financial performance.

For year ending 30 June:	2011		2012	2013	2014	2015	2016
	Target*	Forecast	Target	Target	Target	Target	Target
Revenue - Consolidated	64.3	62.8	65.9	68.3	70.8	73.5	76.3
EBIT before Investment - Consolidated	4.3	3.7	3.6	4.1	4.7	5.4	6.2
EBIT - Consolidated	3.0	3.0	2.1	2.4	3.1	3.3	4.1
Assets, \$m	46.0	48.0	49.2	50.5	53.3	55.0	57.0
Investment	1.2	0.7	1.5	1.7	1.7	2.1	2.1
Dividend \$m	0.7	0.7	1.1	0.7	0.8	1.0	1.1
Equity ratio	65.8%	56.0%	55.4%	55.7%	55.1%	55.6%	56.5%
Gearing	11.7%	12.9%	12.8%	12.4%	14.5%	14.3%	13.4%

Explanatory notes to table:

Revenue is projected to increase by 4.9% in 2012. Over the planning period, minor or modest increases are expected in science research revenues, and higher growth is anticipated in our commercial business revenues as our Sirtrack and carboNZero^{Cert}™ subsidiaries develop.

EBIT is projected to decline in 2012 due to an increase in reinvestment of surplus into strategic initiatives. (*EBIT*: Earnings before interest, financial lease charges and tax, and after committed business development expenditure and technology service expenditure)

Assets are projected to increase over the planning period as deferred building infrastructure issues are addressed.

Investments are projected to increase significantly over the planning period. These strategic investments will underpin future financial viability. (Strategic investments are listed below.)

The Board proposes to pay a *dividend* of up to \$1.1million in 2011/12 based on 50% of forecast net profit after tax for 2010/11. While the above criteria will guide the payment of dividends in 2011/12 and future years, the Board recommendation will be reassessed according to the shareholding Ministers' guidance and reinvestment opportunities. In all cases, payment of dividends is subject to the interest cover covenant being reliably met and operational and capital expenditure not being constrained by cash flow.

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

The debt *gearing* ratio over the planning period remains within the acceptable range identified in our recent capital structure review. (*Gearing* is Interest bearing debt ÷ Interest bearing debt + Shareholders' funds, expressed as a percentage.)

STRATEGIC INVESTMENTS

Strategic investment opportunities planned for 2011/12 include both:

- Initiatives committed to in 2010/11:
 - Centre of Land Resources Science (page 17)
 - The Greenhouse Gas Research Facility at Lincoln (page 29)
 - NeSI (page 29)
- New initiatives for 2011/12:
 - Informatics and science data management (page 26)
 - Economic modelling capability for global change and trade (page 25)
 - The Pathogen Facility in Auckland (page 29)
 - The Allan Herbarium upgrade at Lincoln (page 29)

KEY PERFORMANCE INDICATORS

Financial Indicators for the Landcare Research Group (as specified by MSI) show continuous improvement in efficiency, while maintaining growth, investment and appropriate levels of risk.

FINANCIAL VIABILITY AND FLEXIBILITY

Landcare Research's projected financial performance improves over the planning period, and a strong balance sheet provides flexibility. Our modelling of potential revenue shortfall has identified actions to minimise and mitigate the potential impacts. We are fully compliant with banking covenants.

RETURN ON EQUITY

Landcare Research meets the tailored return on equity target for 2011/12 as negotiated with shareholding Ministers, enabling strategic investment in areas approved by the Board of Directors and shareholders.

Explanatory notes to table:

Operating Margin: EBITDAF ÷ Revenue, expressed as a percentage. (EBITDAF is EBIT 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: net profit after tax.)

Shareholders' funds: Includes share capital and retained earnings.

Capital Renewal: Capital expenditure / Depreciation expense plus amortisation expense.

	Actual	Forecast	Business Plan				
	2010	2011	2012	2013	2014	2015	2016
For year ending 30 June							
Efficiency:							
Operating margin	9.9%	11.3%	9.5%	9.7%	10.5%	10.5%	11.2%
Operating margin per FTE	\$14,655	\$17,041	\$15,002	\$15,897	\$17,784	\$18,499	\$20,522
Risk:							
Quick ratio	1.19	1.27	0.98	0.81	0.77	0.82	0.93
Interest coverage	30.9	31.6	26.8	26.2	24.4	21.8	24.2
Operating margin volatility	14.2%	15.4%	11.5%	7.2%	8.3%	8.4%	12.4%
Forecasting risk	-1.9%	-2.2%	-1.8%	-1.6%	-2.4%	0.2%	0.0%
Tailored Rate of Return:							
ROE before Investment	7.0%	10.1%	9.4%	10.2%	11.3%	12.4%	13.7%
Return on equity (ROE)*	6.0%	8.3%	5.3%	5.8%	7.1%	7.3%	8.8%
Growth/Investment:							
Revenue growth	2.3%	1.9%	4.9%	3.6%	3.7%	3.7%	3.8%
Capital renewal	1.1	1.3	2.1	1.7	1.5	1.2	1.1

*Return on equity excludes impact of legislative change regarding depreciation on buildings and fair value gains/(losses)

RISK MANAGEMENT

GOAL

Landcare Research has identified key risks and proactively mitigated them through strategies and activities to minimise potential.



Landcare Research's risk management framework addresses strategic, financial, operational and legal compliance risks through the Senior Management Team and Board's Audit & Risk Committee.

As a Crown Research Institute we face the usual business risks of loss of a key person, customer contract, facilities or equipment, and of financial targets not being met. Landcare Research also faces a number of specific strategic risks that are identified and proactively mitigated through strategies and activities to minimise potential impact.

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

The Board will detail in a submission to shareholding Ministers, within four months of the end of each financial year, 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 (this was 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 duration and magnitude of the global financial crisis on research, science and technology expenditure
- 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 \$10m 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 \$5m 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.

ACCOUNTING POLICIES

Financial statements are prepared in accordance with generally accepted accounting practice and comply with relevant provisions in the Financial Reporting Act 1993. Details of the accounting policies and their application are below. The estimated impact relating to the implementation of International Financial Reporting Standards with effect from 1 July 2007 has been incorporated.

GENERAL ACCOUNTING POLICIES

The measurement and reporting of profit and financial position is based on historical cost.

Particular accounting policies

The following particular accounting policies, which materially affect the measurement of profit and financial position, have been consistently applied.

Accounting period

The consolidated financial statements are those of Landcare Research New Zealand Ltd, including its fully owned subsidiaries Sirtrack Ltd and Landcare Research International Ltd, for each financial year ended 30 June.

Statement of cash flows

The terms used in the statement of cash flows are defined as follows:

- (i) Cash means coins and notes, demand deposits and other highly liquid investments in which the Company has invested as part of its day to day cash management. Cash includes liabilities which are the negative form of the above, such as the bank overdraft. Cash does not include accounts receivable or payable, or any borrowing subject to a term facility.
- (ii) Investing activities are those activities relating to the acquisition, holding and disposal of fixed assets and of investments. Investments can include securities not falling within the definition of cash.
- (iii) Financing activities are those activities which result in changes in the size and composition of the capital structure of the Company and include the cost of servicing the equity capital.
- (iv) Operating activities include all transactions and other events that are not investing or financing activities. Interest and dividends received and interest paid are included in operating activities.

Revenue

Revenue shown in the Statement of Financial Performance comprises amounts earned by the Company for goods and services supplied to customers in the ordinary course of business.

Income received for goods and services which have not been supplied to customers is recognised as revenue in advance.

Current assets

- (i) Accounts receivable
Accounts receivable are valued at expected net realisable value.
- (ii) Stock
Stocks are valued at the lower of cost on a weighted average price of stock on hand, or net realisable values.

In the case of manufactured goods, cost includes direct materials, labour and production overheads.
- (iii) Work in progress
Costs incurred for the supply of goods and services but not billed against customers is recognised as work in progress.

Fixed assets

Completed buildings, plant, motor vehicles, furniture and tools are recorded at cost, less accumulated depreciation. Land and buildings under construction are recorded at cost.

National databases and reference collections

National databases are not valued. Reference collections are valued in accordance with FRS-3, and form part of the 'restricted equity' against which performance targets will not be measured.

Distinction between capital and revenue expenditure

Capital expenditure is defined as all expenditure on the creation of a fixed asset, and any expenditure which results in a significant improvement of the original function of a total asset. Revenue expenditure is defined as expenditure which restores an asset to its original condition and all expenditure incurred on maintaining and operating the Company.

Depreciation

After taking into account likely residual values, all depreciable assets are depreciated on a straight-line basis over their estimated economic lives.

CORPORATE SUSTAINABILITY

DEPRECIATION RATES

Buildings	1.67–10%
Plant and equipment	5–20%
IT equipment	25%
Motor vehicles	25%
Furniture and fittings	10%
Office equipment	20%
Finance lease assets	20%
Library books and periodicals	20–50%
Rare books collections	1%

Leased assets

The Company leases certain plant & equipment and land & buildings.

Finance leases, which effectively transfer to the entity all of the risks and benefits incidental to ownership of the leased item, are capitalised at the present value of the minimum lease payments. The leased assets and corresponding liabilities are disclosed and the leased assets are depreciated over the period the entity is expected to benefit from their use.

Operating lease payments, where the lessors effectively retain substantially all the risks and benefits of ownership of the leased item, are included in the determination of the operating profit in equal instalments over the lease term.

Research and development costs

Research and development costs are expensed in the period incurred. Development costs are deferred where future benefits are expected to exceed those costs. Deferred development costs are amortised over future periods in relation to expected future revenue.

Intellectual property

No value is ascribed in the Statement of Financial Position to intellectual property assets. Revenue received from the use of intellectual property assets is recognised when earned, and the costs incurred in the maintenance of intellectual property assets are expensed when incurred. Costs incurred in respect of protecting the value of intellectual property (by way of patents) will be capitalised and amortised over future periods in relation to expected future revenue.

Taxation

Taxation is provided in the financial statements on the basis of the estimated taxation payable on the taxable income by each member company of the Group, after taking advantage of all available deductions and concessions. Deferred taxation resulting from timing differences is recognised using the liability method on a comprehensive basis. A deferred tax benefit arising from timing differences is only recognised if there is a virtual certainty of realisation.

Foreign currency translation

Transactions denominated in a foreign currency will be recorded using the exchange rate at the settlement date, except for transactions subject to forward cover contracts, where the forward rates specified in those contracts will be used. Realised and unrealised gains or losses on foreign currency transactions are dealt with in the Statement of Financial Performance. Foreign currency balances are converted at the mid TT rate applying at balance date.

Financial instruments

Revenue and expenses in relation to all financial instruments are recognised in the Statement of Financial Performance. Financial instruments carried on the Statement of Financial Position include cash and bank balances, investments, receivables, trade creditors and borrowings. These instruments are, generally, carried at their estimated fair value.

Principle of consolidation

The consolidated financial statements include those of the holding company and its subsidiaries accounted for using the line-by-line consolidation method. All intercompany transactions, balances and unrealised profits and losses on transactions between group members have been eliminated.

Changes in accounting policies

Any changes in accounting policies and the effect on retained earnings will be disclosed.

GOAL

Landcare Research's corporate performance is exemplary, transparent and consistent with its Vision and Core Purpose.

Kathryn Hailes (left) and Ann Smith (right) of the carboNZero programme receiving an MfE Green Ribbon award from Amy Adams (centre), MP for Selwyn.



CONTEXT

Landcare Research has a decade-long reputation for corporate sustainability performance and transparent public reporting. We face similar challenges to other businesses in terms of our corporate performance in sustainability. Like them, we seek continuous improvement through targeted activities in areas such as resource use, greenhouse gas emissions, staff and good employer responsibilities, animal welfare, community licence to operate, cultural inclusiveness, economic efficiency and financial viability.

Landcare Research sells services branded as carboNZero^{Cert}™, CEMARS® (part of carboNZero), EnviroMark® and EBEX21® to approximately 400 New Zealand entities. Together with our science in life-cycle management, reporting indicators, soil, land and biodiversity protection and enhancement, these services make a significant contribution in the New Zealand market for corporate services in sustainable performance.

Industry and organisations in New Zealand are aware of the increasing public scrutiny of corporate performance in sustainability overseas and are using this as the incentive to question their own performance and motivation for change. The Green Growth Strategy of the OECD, due for release in June 2011, is anticipated to increase industry and government interest in 'green growth' opportunities globally. The New Zealand Government has established a Taskforce to report on such opportunities and Landcare Research is a stakeholder in that process.

STRATEGIC INITIATIVES

Integrated solutions focus

A major part of our corporate performance in sustainability is the impact that we have on and through our stakeholders, partners and clients. This year, as part of our new science framework, we have implemented a programme to develop integrated solutions for a range of issues facing industry and organisations such as regional councils. (An 'integrated' solution must provide at least two of the following: economic benefit, environmental benefit, social benefit, cultural benefit and with minimal trade-offs.) Complex environmental problems, from climate change to vertebrate pest control, need increasingly integrated and sophisticated solutions, and by creating these solutions, we contribute to the corporate performance in sustainability of our stakeholders.

Manage, minimise, mitigate and report our environmental impacts

We are committed to minimising and mitigating the adverse effects of our activities on the environment, and reporting openly via our sustainability webpages. We offset all of our carbon emissions, including those caused by occasional accidental release of refrigerant, and are externally certified as being carbon neutral; our environmental management system has been certified to the ISO14001 standard since 1998; and our good employer activities meet the tertiary (highest) level of ACC's Workplace Safety Management Programme.

KEY PERFORMANCE INDICATORS

- Self-assessment of our performance against the GRI Framework (application level A), and benchmark our performance against other members of BusinessNZ using the subset of indicators developed in collaboration with New Zealand's Sustainable Business Forum.

- Openly report on our sustainability performance via our web pages.
www.landcareresearch.co.nz/sustainability

Manaaki whenua - manaaki tangata

The 2010/11 Christchurch earthquakes affected many of our staff and their families and friends. The way in which staff helped each other and their communities reinforced the strong sense of manaaki tangata (caring for people) in our organisation. As we look to an uncertain seismic future in Canterbury, where our headquarters and 200 of our 400 staff are located, we recognise the need to reinforce this sense of manaaki tangata, and the connection between manaaki whenua (care for the land) and manaaki tangata.

In April 2011 we facilitated a workshop in Christchurch with over 100 urban researchers and professionals from a range of sectors to agree on the contribution that science and innovation could make in the city's recovery; and we look forward to implementing the findings of that workshop, which addressed manaaki whenua and manaaki tangata opportunities.

SUPPORTING CORPORATE SUSTAINABILITY REPORTING IN NEW ZEALAND

As an award-winning pioneer of sustainability reporting in New Zealand, Landcare Research has been constantly researching the latest developments and looking for ways to support other organisations on the sustainability reporting journey.

The Global Reporting Initiative (GRI) is a network-based organisation that pioneered what is now the world's most widely used sustainability reporting framework. The GRI has Data Partners around the world to keep track of sustainability reporting uptake and trends.

In New Zealand a new partnership of BusinessNZ and Landcare Research will act as the GRI's latest Data Partners, along with KPMG in Australia, the first Data Partners in Oceania. We will work with the GRI to monitor reporting in New Zealand.

This year the scope of data collection was expanded to cover all sustainability reports published, irrespective of whether they follow the GRI reporting framework or not. More than 30 organisations in New Zealand have used the GRI framework or are referencing it in their reporting.

By capturing and analysing such new sources of disclosure, the Data Partners improve their own access to data and are able to analyse it more accurately and reliably for their own purposes. Data Partners help contribute to the monthly updates of the GRI Reports List, which is available on the GRI's as well as Data Partners' websites.

Our association with BusinessNZ and the GRI is a positive step towards providing more timely and accurate information about sustainability reporting trends in New Zealand, and raising the visibility of New Zealand reporting organisations here and abroad. Ultimately, we hope that this initiative will inspire more New Zealand organisations to consider sustainability reporting and disclosure.

GLOSSARY & JARGON BUSTER

AHB	Animal Health Board
MfE	Ministry for the Environment
MSI	Ministry of Science and Innovation
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
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, storm water 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
ESDB	Ecosystem Services Database
ETS	Emissions trading scheme
FRST	Foundation for Research, Science & Technology (now part of MSI)
GHG	Greenhouse gases
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
kaitiakitanga	traditional guardianship of the land
KAREN	Kiwi Advanced Research and Education Network
KPI	Key Performance Indicator
LCDB	Land Cover Database
LINZ	Land Information New Zealand
LRIS	Land Resource Information System
LUDB	Land Use Database
MAF	Ministry of Agriculture and Forestry
Mātauranga	traditional cultural knowledge
MED	Ministry of Economic Development
NCRIS	National Collaborative Research Infrastructure Strategy
NeSI	National e-Science Infrastructure
NNCC	National Network of Commercialisation Centres
NZOR	New Zealand Organism Register
NZTE	New Zealand Trade & Enterprise
OSGeo	The Open Source Geospatial Foundation
Partners	Key stakeholders with whom we work directly, and who fund and use our research.
RMA	Resource Management Act
RS&T	Research, Science and Technology
S-map	Digital soil map of New Zealand
Stakeholders	The wider community indirectly affected or impacted by our work.
TPK	Te Puni Kōkiri

DIRECTORY

DIRECTORS

Jo A Brosnahan (Chair)
Graeme S Boyd (To 30 June 2011)
Prof. W Grant Guilford
Hon. M John F Luxton
Peter M Schuyt
Tania J Simpson
Victoria A Taylor

SENIOR MANAGEMENT TEAM

Dr Richard Gordon: Chief Executive
Carol Bellette: Chief Financial Officer & Company Secretary
Dr Dave Choquenot: General Manager Biological Systems
Vacant: General Manager Environment & Society
Katrina Direen: General Manager People & Performance
Mike Lee: General Manager Business

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AUDITORS: Audit New Zealand on behalf of the Auditor-General
SOLICITORS: Buddle Findlay

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Landcare Research
Manaaki Whenua