



New Zealand

New Ideas

An Introduction to the
New Zealand Research, Science
and Technology system



New Zealand | New Ideas

An Introduction to the New Zealand Research,
Science and Technology system

Introduction

New Zealand has a proud track record in research and innovation. World- changing developments as diverse as splitting the atom, developing new breeds of sheep, inventing earthquake shock absorbers and designing and building world beating motorboats and motorcycles were achieved by New Zealanders.

New Zealand's largest investor in research and innovation is the Government. Its objective is to shift New Zealand's economy and society towards a more knowledge-based and innovative future, and to create an environment that will result in a world's best small-country research, science and technology (RS&T) system.

The New Zealand Government is therefore actively promoting collaboration among New Zealand and international research organisations.

This brochure profiles New Zealand's RS&T strengths, our objectives, the key players and where you can go to get more information.



New Zealand RS&T

New Zealand shows real comparative advantage in biotechnology, geology, oceanography, meteorology, biology and clinical medicine. There are already many success stories in software, telecommunications, agricultural machinery and horticultural research and development. Commercialisation of developments in biotechnology, high temperature enzymes, ceramics and nanotechnology has already begun.

Biotechnology

During the past two decades New Zealand has built up significant strengths in many aspects of biotechnology on the back of more than 150 years of excellence in agriculture. New Zealand also has world-leading research groups in areas of biomedicine. As New Zealand increases its links to the global biotechnology marketplace, exciting new companies are forming out of our universities and Crown Research Institutes.

Health and Medicine

New Zealand's health research expertise extends from basic biomedical research to clinical and population health disciplines. New Zealand is leading research in selected areas of cardiovascular disease, diabetes, bone disease, asthma, cancer, neurosciences and public health research.

Key Government Objectives

The New Zealand Government is a major investor in RS&T. In the financial year from 1 July 2005 the New Zealand Government is investing approximately \$NZ632 million in RS&T. A further investment of some \$NZ200 million is made in the wider innovation system through bulk education funds and government departments. The Government's investment can be divided across four key areas:

Funds within each key area are allocated by funding agencies described over the page. The funds administered by these organisations are structured to:

- support basic and strategic research;
- support researcher-led innovation in new areas or applications;
- increase the rate of commercialisation and the ability of firms to commercialise; and
- support promising researchers, and environmental, social and health research.

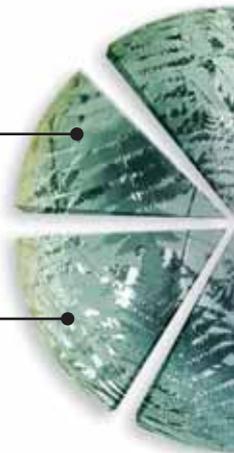
The Government expects the RS&T system to assist in transforming New Zealand. RS&T is critical to making this a great country where people want to live, learn, work and do business. Therefore the Government actively works to ensure that RS&T continues to support innovation as a key driver in transforming our economy and society – in caring for the environment, in fuelling economic growth, in enhancing New Zealanders' health and lifestyles and in improving the way we live and work.

Social

This builds our knowledge of factors that affect social well-being in New Zealand.

Environmental

This builds an understanding of New Zealand's environment in order to maintain and enhance our unique bio-systems.



Strengths

Food and Beverage

For decades, good food and wine has been produced in New Zealand. As global consumers have come to demand their food be more convenient and health-giving, New Zealand researchers have responded with a whole range of innovative products. Our dairy science and horticultural sectors are world-leading producers of innovative food ingredients for the global market.

Engineering

New Zealand has superior capability in high temperature superconductor ceramics, computer-integrated manufacturing, flexible automation, wireless technologies, earthquake engineering and food product design.

Environmental Science

New Zealand has the world's fourth-largest exclusive economic zone and is a base for research extending from the South Pacific islands to Antarctica. New Zealand scientists have pioneered techniques to identify changes in sources of greenhouse gases and our researchers play a leading role in global understanding of ozone depletion and variability in ultra-violet radiation. They have also developed world-leading understanding of invasive species and how to manage them.

Research Excellence

New Zealand also has seven centres of research excellence (CoREs) formed by our leading scientists in scientific areas including the biological sciences, mathematics and statistics, ecology and the development of Maori, New Zealand's indigenous people. See the section on CoREs for more information.

for RS&T



Knowledge

This ensures our RS&T system is well-funded to produce new knowledge, networks and qualified people.

Economic

This helps New Zealand enterprises to be more competitive through research and technology.

New Zealand's RS&T investment is informed by Government strategies such as the Growth and Innovation Framework (GIF), the Sustainable Development Programme of Action, the Biodiversity Strategy and climate change programmes.

A Strong Focus on Connecting Globally

Whilst New Zealand's research and development output is comparatively modest in a global context, our researchers are nevertheless well connected with international research efforts.

New Zealand's RS&T system spans the public and private sectors, and reaches beyond New Zealand by considering the relationships we have with other countries. The Ministry of Research, Science & Technology (MoRST) actively supports collaborative links with these countries by way of bilateral science arrangements, other government initiatives, and funding mechanisms such as the International Science and Technology (ISAT) Linkages Fund and the International Investment Opportunities Fund (IIOF).

New Zealand has appointed two Science and Technology Counsellors to Washington and Brussels to deepen our RS&T relationships with the USA and the European Union, respectively. Their role is to identify and facilitate partnering opportunities between New Zealand researchers and institutions and counterparts in the USA and EU.

New Zealand is an active participant in a number of OECD committees and APEC RS&T cooperation, including providing the Chair for the sub-group on commercialisation.

New Zealand Successes

World-leading Bioengineering Research

The University of Auckland's Bioengineering Institute is building simulated human organs to enable researchers to gauge the effectiveness of new drugs and possible side-effects. The simulated organs are constructed based on vast amounts of data gained from experiments at the gene, protein, cell, tissue and organ level as well as from whole body systems physiology. The work is part of the international Physiome Project whose goals are to use computational modelling to analyse the whole body and provide a system for hypothesis testing. The first organ to be mapped by the Auckland research team was the heart and work is now well advanced on mapping the lungs. Work is also going on to model the musculo-skeletal system. The Bioengineering Institute is associated with two Centres of Research Excellence in New Zealand – the Centre for Molecular Biodiscovery and the New Zealand Institute of Mathematics and its applications. Visit www.bioeng.auckland.ac.nz

Multi-disciplinary Biomedical Research

An international clinical trial has shown that a head-cooling device developed by researchers at the University of Auckland's Liggins Institute reduces brain damage in oxygen-deprived newborn babies. The Liggins Institute is a multi-disciplinary medical research institute that employs a range of technologies in its research including molecular biology, proteomics, systems biology, bioengineering, fetal physiology, epidemiology and clinical research and is at the forefront of the study of the developing brain. The CoolCap trial provides the first evidence in humans that birth asphyxia can be treated, allowing affected babies to develop normally. The Liggins Institute is the leading partner in the National Research Centre for Growth and Development (NRCGD) - a Centre of Research Excellence. Visit www.liggins.auckland.ac.nz

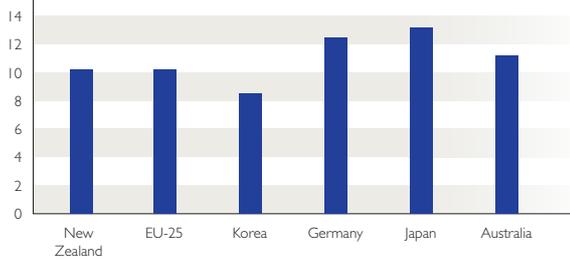
Research to Protect Our Natural Environment

New Zealand's natural environment is increasingly under threat from weeds, pests and diseases. A team of 65 scientists from 12 organisations, including universities, Crown Research Institutes and private companies are collaborating to develop new environmentally friendly technologies to protect New Zealand's primary industries. The project is coordinated by the National Centre for Advanced Bio-Protection Technologies at Lincoln University. By investigating ecologically friendly control methods, researchers can work towards providing sustainable pest and disease controls. Technologies already developed for the fruit and vegetable sectors are being adapted for use in forest nurseries and plantations to improve plant vigour and boost resistance. Visit www.bioprotection.org.nz

Research Adding Value to Wool

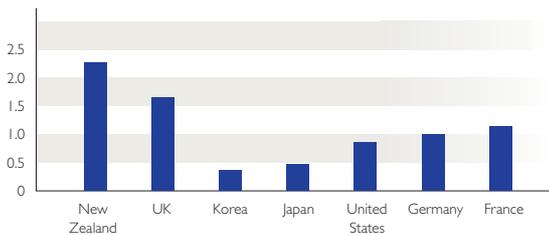
Canesis Network Ltd, in conjunction with Keratec Limited, is collaborating with research partners in New Zealand and overseas to extract and modify keratin proteins from wool. These natural protein products are less irritant, and more biodegradable and compatible with other natural products. These qualities mean they have the potential for use in the global cosmetics industry, for household products and in the biotechnology processing markets. Canesis has been at the forefront of keratin protein chemistry research for 40 years and has already achieved an international breakthrough by isolating the proteins whilst maintaining their best characteristics. Visit www.canesis.com

Total R&D personnel per thousand employment



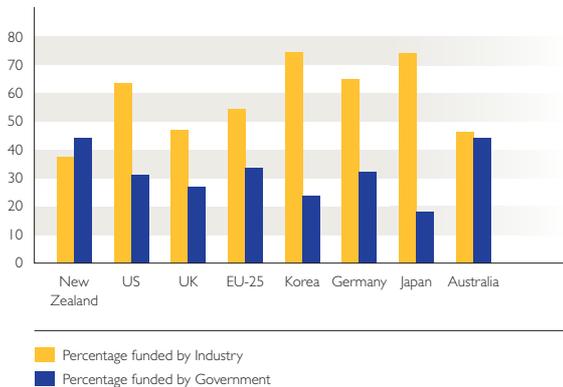
Source: OECD MSTI 2004

Publications (1996-1999) per Researcher (FTE)



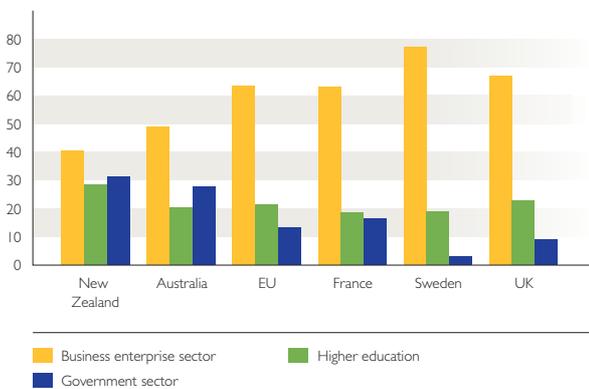
Source: Third European Report on S&T indicators 2003

Percentage of Gross expenditure of R&D funded



Source: OECD, R&D and MSTI databases, November 2004

Percentage of R&D performed by sector



Source: OECD, Main Science and Technology Indicators, November 2004.

New Zealand's RS&T Policy and

Ministry of Research, Science & Technology (MoRST)

MoRST oversees the Government's investment in RS&T and shapes the overall direction of the sector through the development of science and technology policy. The Ministry does not directly fund research and innovation projects but influences investment through policy advice on the Government's RS&T portfolio. It also works with other innovation/research-focused departments, Crown Research Institutes, universities and the private sector to ensure alignment across the system.

MoRST's Statement of Intent and International Linkages Strategy can be seen at www.morst.govt.nz

Foundation for Research, Science & Technology (FRST)

FRST is the Government's principal purchaser of RS&T and manager of RS&T funds. It plays a key role in stimulating economic growth through the innovation system – directly, through its investments, and indirectly, by supporting the scientists and technologists and the organisations in which they work. The Foundation's funds are managed through a number of investment programmes:

- Five 'public good' related science and technology research areas including health, social, environment, Maori knowledge and development, and strategic industry research.
- Technology New Zealand – encourages private firms to undertake research and development.
- New Economy Research Fund – supports basic research in science and technology in new and emerging sectors.
- A range of scholarships and fellowships.

More information on FRST's work and the programmes it funds can be found at www.frst.govt.nz

Health Research Council (HRC)

The HRC is a Government agency responsible for purchasing and co-ordinating health research and fostering the health research workforce in New Zealand. The Council purchases a range of health research, including biomedical, clinical, public health, health services, and Māori and Pacific health research. It also funds a range of health research career development awards.

More information on HRC's work programme can be found on www.hrc.govt.nz

Royal Society of New Zealand (RSNZ)

The RSNZ is a non-governmental association of nearly 20,000 members. It supports numerous scientific societies, promotes science and technology and international science links. On behalf of the Government, the RSNZ manages the Marsden Fund, New Zealand's premier source of basic research funding. The Society also manages a wide range of programmes, which support researcher-level international links.

More information on the Society's work and the programmes it funds can be found at www.rsnz.org

New Zealand Venture Investment Fund

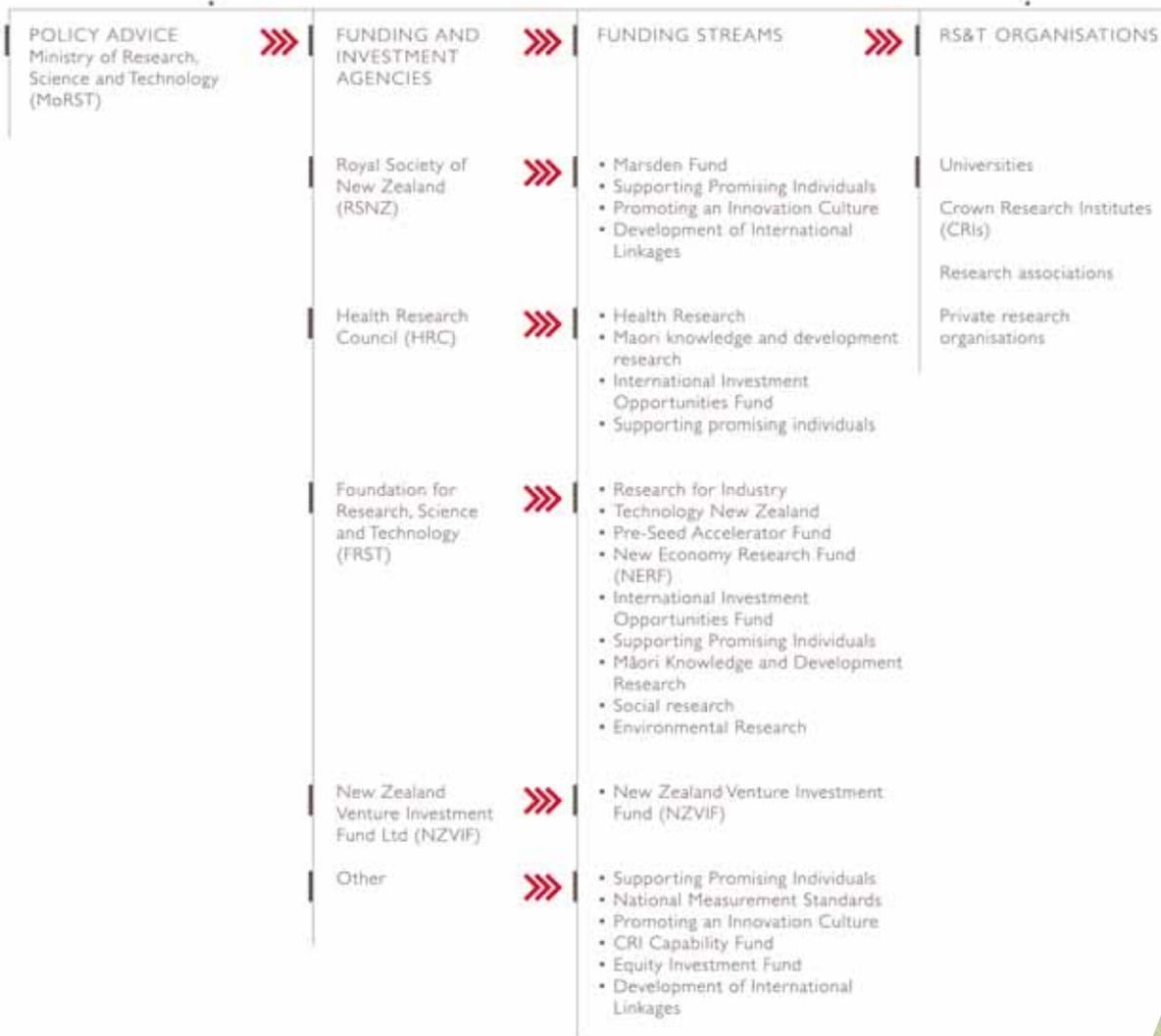
The Government set up the New Zealand Venture Investment Fund (NZVIF) in 2001 with NZ\$100 million capital to invest in early stage businesses. The VIF programme invests this venture capital through a series of individual investment funds (VIF Seed Funds) operated by private sector fund managers appointed by VIF. These funds include a two-to-one ratio of capital raised from the private sector.

For the latest developments including details of the individual investment funds see www.nzvif.com

Funding Agencies

GOAL SETTING and POLICY
New Zealand Government

RESULTS
Benefits in the lives, environments and enterprises of all New Zealanders



New Zealand Crown Research Institutes (CRIs)

Formed by the New Zealand Government in 1992, CRIs are the largest providers of science research in New Zealand. CRIs undertake basic and applied science, and technology research and development, in many instances from the idea through to the commercial outcome. Their clients/funders include both central and local government and private sector markets in New Zealand and abroad. The Association of Crown Research Institutes (ACRI www.acri.cri.nz) is the national organisation for CRIs. ACRI works on behalf of science, research and innovation with government, business and the wider community.

There are currently nine CRIs, as follows:

AgResearch (www.agresearch.co.nz)

A life sciences research organisation with an increasing emphasis on product development and commercialisation. Its expertise in modern biotechnologies is founded on a legacy in the biological sciences of agriculture.

Crop and Food Research (www.crop.cri.nz)

Provides scientific research to support the sustainable production of food and new biomaterials. Its areas of expertise include biotechnology, sustainable environmental management and food production, nutrition and

health, the production of innovative biomaterials, and advanced postharvest technology.

Institute of Environmental Science & Research Ltd (www.esr.cri.nz)

Provides specialist science solutions related to public health, environmental health and forensic science. Its particular capabilities are in chemical and microbiological contaminants, and surveillance of diseases and hazards.

Scion Research (www.scionresearch.co.nz)

Scion provides the next generation of biomaterials technology, research & development services. Formerly known as Forest Research, Scion has a legacy of expertise in forestry and biomaterials science. It offers technical and scientific capability to anyone in the business of producing materials or creating products using renewable plant resources. Scion's forestry R&D capability now resides in ensis, a joint venture between Scion and Australia's CSIRO Forestry and Forest Products.

Geological & Nuclear Sciences (www.gns.cri.nz)

An earth systems science enterprise whose focus includes geological hazards and tectonics, environment and land use, and earth and ocean resources for economic growth.

HortResearch (www.hortresearch.co.nz)

Creates new fruit varieties, technologies and products that add value. Its research expertise includes developments at a molecular level making it a world-class centre for plant-based biotechnology.

Industrial Research (www.ir.cri.nz)

Undertakes world-class science, development and technology commercialisation in areas of communication, information and electronic technologies, advanced materials and performance, intelligent devices and systems, biochemical technologies, energy technologies, complex measurement and analysis.

Landcare Research (www.landcareresearch.co.nz)

Research focuses on six areas: biodiversity and ecosystem processes, greenhouse gases and carbon storage, sustainable business and government, biosecurity and pest management, rural land use and urban environmental management.

National Institute of Water and Atmospheric Research (www.niwa.cri.nz)

Provides a scientific basis for the sustainable management and development of New Zealand's atmospheric, marine and freshwater systems and associated resources.

University research

New Zealand's eight universities all offer science-related studies and most of them cover various aspects of technology. The universities are also responsible for undertaking approximately 30 per cent of New Zealand's publicly funded R&D. The Performance-Based Research Fund (PBRF) allocates funding on the basis of peer review and indicator (qualitative and quantitative) measures, rather than on the basis of student numbers. More information on the PBRF is available on the Tertiary Education Commission website: www.tec.govt.nz

- University of Auckland (www.auckland.ac.nz)
- Auckland University of Technology (www.aut.ac.nz)
- University of Canterbury (www.canterbury.ac.nz)
- Lincoln University (www.lincoln.ac.nz)
- Massey University (www.massey.ac.nz)
- University of Otago (www.otago.ac.nz)
- Waikato University (www.waikato.ac.nz)
- Victoria University of Wellington (www.victoria.ac.nz)

Centres of Research Excellence (CoREs)

The Government established the Centres of Research Excellence Fund to promote and undertake world-class research that contributes to New Zealand's economic development and that incorporates knowledge transfer into training.

The centres are all physically hosted within universities, but they have various partnership

linkages with other institutions, particularly CRIs and other universities. Seven CoREs have been established. They are concerned with:

- Molecular ecology and evolution, at Massey University (awcmee.massey.ac.nz/)
- Molecular biodiversity, at the University of Auckland (cmb1.auckland.ac.nz/)
- Mathematics and its applications, at the University of Auckland (www.nzima.auckland.ac.nz/)
- Māori development and advancement, at the University of Auckland (www.maramatanga.ac.nz)
- Advanced materials and nanotechnology, at Victoria University of Wellington (www.macdiarmid.ac.nz/)
- Human and animal growth and development, at the University of Auckland (www.growthcentre.ac.nz/)
- Advanced bio-protection technologies, at Lincoln University (www.bioprotection.org.nz)

More information can be found on the Tertiary Education Commission website: www.tec.govt.nz

Research Associations are linked to and predominantly funded by industry. Some of them also receive government research funding.

Current Associations are:

- Building Research Organisation of New Zealand (www.branz.org.nz)
- Canesis Network Ltd (www.canesis.com) a research and technology partner for the wool and textile industry

- Cement and Concrete Research Association of New Zealand (www.cca.org.nz)
- Dexcel (www.dexcel.co.nz) and Fonterra Research Centre (www.fonterra.com) - both provide research for the dairy industry
- NZ Fertiliser Manufacturers' Research Association (www.fertresearch.org.nz)
- Heavy Engineering Research Association (www.hera.org.nz)
- NZ Leather and Shoe Research Association (www.lasra.co.nz)

Other non-government bodies with a research emphasis include:

- Cawthron Institute: Research and advice, including aquaculture, marine biosecurity, toxic micro-algae, coastal and estuarine ecology, and freshwater ecology. (www.cawthron.org.nz)
- Malaghan Institute of Medical Research: Conducts scientific research into the causes, nature and treatment of diseases. (www.malaghan.org.nz)

Polytechnics and Institutes of Technology

There are currently 21 such bodies in New Zealand, offering courses at various levels in a number of subjects that relate to science and technology.

The website of the Association of Polytechnics provides a link to these organisations: (www.apnz.ac.nz)

MINISTRY OF
RESEARCH
SCIENCE +
TECHNOLOGY

MORST
TE MANATŪ PŪTAIAO

Published by the New Zealand Ministry
of Research, Science & Technology, May 2005

Website: www.morst.govt.nz

Email: talk2us@morst.govt.nz