

**OECD SCIENCE, TECHNOLOGY AND INDUSTRY OUTLOOK 2004
COUNTRY RESPONSE TO POLICY QUESTIONNAIRE**

NEW ZEALAND

1. General framework and trends in science, technology, and innovation policy

Alignment with the Growth and Innovation Framework (GIF)

The government's Growth and Innovation Framework (GIF) focuses policy development on strengthening the innovation system. There is also a particular focus within GIF on three key areas: biotechnology, ICT and creative industries (see section 3.2). The full impact of this strategy will not be apparent for some years.

Use of funding instruments to raise business investment in RS&T (BERD)

New Zealand continues to have a significantly lower BERD as a proportion of GDP (~0.5%, 2002) than the OECD average (~1.6%, 2002). The government has introduced or strengthened a variety of funding instruments with the objective of raising the level of private sector investment. The main initiatives have been to make extra funding available on a contestable basis to support R&D by firms, government support for public-private research consortia (see section 4.2), and private co-funding of RS&T projects.

Increased commercialisation of RS&T

The transfer of technology from the laboratory into commercial development is being supported by new initiatives covering three stages of commercialisation: a pre-seed accelerator fund (laboratory to first prototype), an equity investment fund (developing new 'platform technologies' to the point of commercial feasibility), and a venture capital fund (to help launch start-up enterprises). (See sections 2.1, 3.1 and 4.2.)

Modifications to the contestable funding system

New arrangements for the contestable funding of RS&T have been developed and implemented by the Foundation for Research, Science and Technology (see section 3.1). Over the last 2-3 years the system has effectively become more accessible to a wider a range of organisations (in particular the universities) within the RS&T system.

Establishment of a centre for Social Research Evaluation and the Social Policy and Evaluation Research Committee (SPEaR)

SPEaR comprises a group of senior officials from various New Zealand agencies involved in social research and evaluation. It was set up in Nov 2001 to oversee the Government’s purchase of social policy research to ensure the spending is aligned with the Government’s social policy priorities. See <http://www.spear.govt.nz/about-spear/about-spear.shtml>

Major changes in the legislative, administrative, organisational, institutional, or budgetary framework for the formulation and implementation of science, technology, and innovation policies

As noted above, the most significant new feature in the innovation policy environment is the government’s *Growth and Innovation Framework* (GIF) and the associated *Growth and Innovation Advisory Board*. The government has actively encouraged a “whole-of-government” approach to policy development and the formation of new collaborations amongst stakeholders. A recent example is the emergence of the *Science Enterprises Group* (SEG) which represents a broad cross section of RS&T providers: Crown Research Institutes, universities, and industry Research Associations. See <http://www.acri.cri.nz/media/4fe13c0b202413ee5dde08eb13485b2d.html>

Future project or policy issues identified by technology foresight, forecasting or technology road mapping.

In February 2003, the Ministry of Research, Science and Technology (MoRST) launched the *i³ Challenge*: a major policy initiative focusing on three areas: defining national needs (*i₁*), strengthening long-term research capabilities (*i₂*), and extracting greater commercial value (*i₃*). (See full *i³ Challenge* document and subsequent updates on www.morst.govt.nz, and refer to MoRST 2002/2003 Annual Report <http://www.morst.govt.nz/uploadedfiles/Documents/Publications/Corporate%20reports/annualreport2002-03.pdf>.) The catalyst for this initiative was stakeholder consultation through the 2002 RS&T Directions Forum. The Forum is an annual event which provides a platform for a wide range of stakeholders to identify issues and suggest improvements to the RS&T system.

2. Public sector research and public research organisations

Total research and development (R&D) expenditure in New Zealand was estimated at NZ\$1,416.2 million in the 2002 reference year. This was an increase of 20 percent on the 2000 reference year, when employing the same population selection criteria used in 2000.

GERD by sector of performers

	NZ\$(million)						
	1994	1996	1998	2000	2002 ⁽¹⁾	2002 ⁽²⁾	2002 ⁽³⁾
Business	247.9	240.3	312.5	324.1	422.9	101.1	524.0
Government	343.4	375.7	391.3	393.0	449.6	6.8	456.4
Universities	233.5	273.4	403.6	374.1	435.8		435.8
Total	824.8	889.3	1,107.4	1,091.3	1,308.3	107.9	1,416.2

(1) 2002 R&D expenditure by firms selected according to the 2000 population selection criteria.

(2) 2002 R&D expenditure by firms selected according to the 2002 population selection criteria.

(3) Total R&D expenditure in 2002.

Government funding (central and local) of all New Zealand R&D, including general funding for university research of NZ\$101.5 million, amounted to NZ\$667 million in the 2002 reference year, equivalent to 0.54 percent of gross domestic product (GDP). Government funds continue to be a major source of R&D financing, accounting for 46 percent of total R&D funding in New Zealand in the 2002 year. This compared with government funding of all New Zealand R&D, including general university funds of NZ\$105.2 million, at NZ\$552, equivalent to 0.51 percent of GDP in the 2000 reference year (see Statistics NZ publication *R&D in New Zealand 2000*).

Funding of Research in New Zealand
2002 reference year

Source of funds	Funding to Sectors \$(million)			
	Government	Business	Universities	Total funding provided by source
NZ Government	355.7	47.1	264.2	667.0
NZ Business ⁽¹⁾	96.7	415.5	23.2	535.4
NZ Universities	1.8	0.1	113.2	115.1
Overseas	18.6	61.8	14.3	94.7
Other funding sources	1.2	4.5	20.9	26.6
Total source of funds provided for sector	474.0	529.0	435.8	1,438.8
Total R&D expenditure	456.4	524.0	435.8	1,416.2
Difference between source of funds and R&D expenditure	17.6	5.0	0.0	22.6
	Funding to Sectors (percent)			
NZ Government	75%	9%	61%	46%
NZ Business ⁽¹⁾	20%	79%	5%	37%
NZ Universities	0%	0%	26%	8%
Overseas	4%	12%	3%	7%
Other funding sources	0%	1%	5%	2%
Total source of funds provided for sector	100%	100%	100%	100%

(1) The NZ Business source includes State-owned enterprises.

(Please note: in some cases the source of funding for R&D does not equal the associated expenditure. One explanation is that the reference year does not always match the year that the activities were carried out.)

Policy changes related to R&D performed by public sector organisations (mainly universities and government laboratories)

Government laboratories R&D

The New Zealand government sector provided 75 percent (NZ\$355.7 million) of the funds for R&D in government laboratories (Crown Research Institutes or CRIs) in the 2002 reference year, compared with 77 percent in 2000. Fifty-six percent of the funds (NZ\$266 million) came from government funding agencies, including the Foundation for Research, Science and Technology (FRST). www.frst.govt.nz

CRIs continue to be the largest providers of R&D in the government sector accounting for 88 percent of government R&D activity in the 2002 reference year. This compared with 93 percent in the 2000 year.

CRI Provision by Source
Year ended 31 December 2002

	2000		2002	
	NZ\$(million)	Percent	NZ\$(million)	Percent
Local Government	3.07	0.8	5.7	1.4
NZ state owned enterprise	29.5	7.8	39.6	9.4
NZ Government	250.4	66.6	258.8	61.6
NZ business	78.6	20.9	93.5	22.2
Own funding	2.5	0.7	2.6	0.6
Tertiary Education	1.1	0.3	1.7	0.4
Overseas	11.01	2.9	18.3	4.4
Other	0.01	0.0	0.1	0.0
Total	376.2	100.0	420.5	100.0

Source of Funds for University R&D
Year ended 31 December 2002

	2000		2002	
	\$(million)	Percent	\$(million)	Percent
NZ general university funds (government)	105.2	28.1	101.5	23.3
NZ other internal funds (incl. student fees)	98.9	26.4	113.2	26.0
NZ research contracts (government)	114.7	30.7	162.7	37.3
NZ business	21.7	5.8	23.2	5.3
Overseas	18.3	4.9	14.3	3.3
Other	15.4	4.1	20.9	4.8
Higher education expenditure on R&D (HERD)	374.1	100.0	435.8	100.0

University R&D

Shifts in the allocation of funding across:

In the period 2002/03 to 2003/04 there have been significant shifts in funding between research providers, with both universities and other non-CRI organisations (such as research associations, research consortia, and private sector science companies) increasing their share of funding at the expense of CRIs. It is estimated that CRIs have reduced their share of funding by about 10%, which represents a decrease of NZ\$13.5 from NZ\$251 million pa to NZ\$238 million.

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 (3) Total R&D expenditure in 2002.

GERD by Type of Research
 2002 reference year

	NZ\$million	Percentage of Total R&D
Pure basic research	286.5	20.2
Strategic research	361.5	25.5
Applied research and experimental development	768.2	54.2
Total	1,416.2	100.0

The government has articulated three new priority directions in social research:

- Improving outcomes for children and young people
- Improving participation in work, earnings and quality of employment
- Enhancing wellbeing in an aging society.

Investments in the Social Research Output Class have been aligned with these directions through the FRST purchasing process.

Likewise investments in research for sustainable development have been aligned to the Government's Sustainable Development Programme of Action with NZ\$9.0 million pa invested in research relating to water quality and availability and NZ\$4.7 million pa in research into sustainable cities and settlements.

The government signalled its intention to increase research funding in three sectors: biotechnology, ICT and creative industries (see section 3.2.). Investment in 2002/3 increased in these high priority areas:

- NZ\$6.8 million pa in biotechnology using new Vote funds for the *New Economy Research Fund* (NERF)
- NZ\$2.5 million pa in research to understand the impact of biotechnology
- NZ\$2.0 million pa in ICT using new Vote funds for *Research Consortia* (see section 4.2).

Changes in the use of different types of funding instruments for financing R&D or the balance among them.

In the period 2002/3 approximately 90% of funds (with the exception of Non-Specific Output Funding) were allocated on a fully contestable basis. Proposals for funding under different schemes were assessed variously by FRST, the Health Research Council (HRC) and the Royal Society of New Zealand (RSNZ). <http://www.frst.govt.nz>; <http://www.hrc.govt.nz/>; <http://www.rsnz.govt.nz/>

As a consequence of the *i³ Challenge* (see section 1) this model is currently under review and, whilst the outcome will not be known until mid-2004, the potential exists for a significant growth in the non-contestable funding component.

Non-Specific Output Funding (NSOF) is a government funding instrument available to CRIs that supports public good science and technology independent of FRST priorities. This funding used to be set at 10% of the value of the FRST contracts awarded to CRIs. In 2003 the overall level of NSOF funding was frozen at around NZ\$28 million.

The 2003 Budget included a provision of NZ\$4.8 million for the new *Pre-seed accelerator fund* (PSAF) to help bridge the gap in publicly funded R&D between generating valuable new knowledge and producing a first prototype so that a commercial prospect is 'investor-ready'. The objective of the PSAF is to accelerate the commercialisation of new knowledge that arises from publicly funded research carried out by public sector research providers. The PSAF may contribute up to 33% of the full cost of approved projects. The other 67% may come from any suitable mix of research prioritisation, the provider's own funds or other external funds. In Dec 2003 the first ten grants were awarded to a cross-section of universities and CRIs. See <http://www.frst.govt.nz/research/preseed.cfm> and <http://www.frst.govt.nz/news/2003/PreSeedFund-Dec03.cfm>

Major initiatives to reform the organisation and governance of universities and public research organisations.

Universities

In the early 1990s, Government bulk grants (non-specific) were the main source of funding for university research. By the year 2000, most R&D funding was derived from EFTS ('equivalent full-time student' funding) and 'own funds' (from student fees etc). EFTS provided \$102 million in 2002. In 2003/04, this scheme was replaced by a Performance Based Research Fund (PBRF) with funding of \$130 million. The PBRF is a hybrid which combines elements of Australia's Institutional Grants Scheme with features of the British Research Assessment Exercise. The scheme will be phased in from 2004-2007, funding for the PBRF will rise to \$137 million by 2007.

The overall growth in university research expenditure in recent years (+16% in period 2000 to 2002) can be accounted for by an increase in student numbers, the introduction of new funds (e.g. NERF and CoRE), growth of existing funds (e.g. Marsden) and increased success in FRST contestable funding processes. The Centres of Research Excellence (CoRE) programme is the most significant recent development. These are multi-institutional, government funded research centres which are intended to support research excellence in areas of national interest. The first CoREs were established in 2002 and there are now seven of these organisations in existence. See <http://www.rsnz.govt.nz/funding/core/corefund.php>

Organisationally, these initiatives and others have had a number of consequences for universities including the need for:

- More extensive research management and research commercialisation capabilities;
- Greater alignment of university research activities to national RS&T priorities;
- Technology parks and multidisciplinary research centres;
- Institutional policies surrounding intellectual property capture and revenue allocation;
- Participation in public-private partnerships.

All of these developments are very recent with relatively little known at this point about their impacts at institutional and national levels.

Government Laboratories

There have been **no significant shifts** in the corporate governance of New Zealand's Crown-owned research institutes (CRI). The CRIs are private companies under the Companies Act and as such, they have the same basic governance structures and rules as any private New Zealand company. All companies are monitored by the Crown Company Monitoring and Advisory Unit (CCMAU) to meet an additional set of governance expectations, both in terms of other legislation (the Public Finance Act for instance) but also the expectations of shareholders (the Ministers of RS&T and CRIs).

Revised procedures for setting research priorities at the institutional level in universities and public research organisations (e.g. involvement of outside stakeholders).

FRST is currently engaged in determining research priorities with RS&T end-users as the basis for defining a set of target outcomes within a revised portfolio funding system.

Major policies and government-sponsored programmes to foster international collaboration among researchers in universities and public research organisations.

MoRST has recently launched an International Linkages Strategy [<http://www.morst.govt.nz/uploadedfiles/Documents/International/IntStrat.pdf>]. MoRST administers the *Julius von Haast Fellowship*. The purpose of the JvH Fellowship is to allow internationally recognised German researchers to spend time working collaboratively with their New Zealand colleagues, and to establish, or enhance, collaborative research of benefit to both countries. The *International S&T (ISAT) Linkages Fund*, administered by the RSNZ, is a funding programme designed to support international science and technology links between New Zealand and the world. The fund has recently been expanded to include more countries. <http://www.rsnz.govt.nz/funding/isat/media/brfp.pdf>. MoRST has expanded its network of RS&T representatives to include an S&T counsellor in EU (NZ Embassy Brussels), a NZ Coordinator for Japan, a NZ Coordinator for the NZ/Germany STC agreement and (in 2004) a Coordinator for USA.

3. Government support for private-sector R&D and innovation

3.1. Major policy changes in the individual instruments or in the mix of instruments used to provide public support for private sector R&D and innovation.

Tax treatment of business R&D.

While many OECD countries provide either tax credits or tax allowances for business R&D expenditures (that is, they allow a firm to deduct more from its taxable income than is actually spent on R&D), New Zealand has preferred to maintain its tax system as neutral as possible, using grants instead to support business R&D. New rules introduced in 2001 simplified the tax regime by bringing the definitions for tax purposes in line with those used for financial reporting. The objective was to clarify the capital-revenue boundary in R&D so as to provide greater clarity on the R&D items that qualified for immediate deduction. It was hoped that this would increase certainty for taxpayers.

A Private Sector Liaison Group, which consists of private sector representatives, was formed in 2003 to monitor the new rules and draw issues of concern to the government's attention. These issues include allowance for deductibility for "black hole" expenditures (some types of development expenditures that can neither be deducted nor give rise to depreciable assets). These issues are currently under active

consideration and the Minister of Finance has announced that he hopes to include “black hole” expenditure, like failed patent applications and failed management consent applications, for immediate deduction in the next tax bill.

Direct public funding of business R&D and innovation (e.g. grants, contracts, loans, etc.).

To increase the level of private-sector investment in R&D Grants for Private Sector R&D (GPSRD, now administered by Technology NZ/FRST) provides grant assistance primarily to small and medium-sized technology-aware firms to undertake R&D projects that have the potential to stretch a firm’s technological capability. From July 2002 to June 2003 a total of 231 grants were approved to a total value of NZ\$14.8 million. The vast majority of GPSRD applications from the ICT, engineering, manufacturing and automation sectors.

Public procurement policies, new contractual guidelines, more competitive selection processes, etc.

Over the last 3 years FRST has developed and applied a new investment decision process for the contestable funding of its component of public research expenditure. The new process is designed to be more transparent, fairer and more focused. www.frst.govt.nz/publications/papers/index.cfm

Efforts to attract R&D investment by foreign-owned firms.

FRST commissioned a report in Dec 2003 –*Feasibility Study in International Collaboration and Co-Investment in New Zealand’s public RS&T Base* - to examine the potential for attracting R&D investment by foreign-owned firms. Recommendations from this report are currently under consideration.

The Minister of Finance has announced changes to the taxation of special partnerships to encourage foreign investment in new ventures. These will be implemented April 2004. The changes will repeal the tax provisions that prevent resident special partners from offsetting partnership losses against other income. This will remove a tax barrier to resident partners investing alongside non-resident partners via a special partnership structure. The changes will also remove barriers to international venture capital investment by providing certain non-residents with an exemption on any tax that they face on the profits they derived from realising shares in small, unlisted New Zealand companies. <http://www.investnewzealand.govt.nz/>

Support for venture capital or other sources of private sector financing (e.g. foundations).

The New Zealand Venture Investment Fund Limited (VIF) is a state-owned company which was established on 1 July 2002. VIF is responsible for implementing the New Zealand government venture capital programme. VIF is a “Fund of Funds” which is investing NZ\$100 million alongside private sector co-investors (on a 1:2 basis) in a series - currently 5 - of privately managed venture capital investment funds (VIF Seed Funds). One example is the biotechnology seed fund (launched May 2003) which has NZ\$15 million to invest. www.nzvif.com

Changes in IPR regimes.

The Government has introduced guidelines for government departments to use when negotiating contracts for policy-related research. The guidelines make clear that intellectual property from these can be commercialised where it does not conflict with the needs of the department or contravene national interests or benefits.

Other forms of public support for innovation

Technology New Zealand provides technology consulting services through its *TechLink* programme. This scheme stimulates awareness of new technology and technical innovation in enterprises by providing a range of technology guidance, strategic planning and promotional services. Approved funds have grown from NZ\$4.09 million in 2001/02 to approximately (forecasted) NZ\$4.5 million in 2003/04.

The *TechNet Expert Access* programme provides access to technical experts in CRIs, Research Associations, and Tertiary education institutes. <http://www.frst.govt.nz/business/technet.cfm>

New Zealand Trade and Enterprise (NZTE) was established on 1 July 2003. It was formed from the integration of two existing crown entities: Trade NZ and Industry NZ. NZTE assists New Zealand businesses of all types and sizes to improve capability, international competitiveness and profitability. <http://www.nzte.govt.nz>

NZTE services cover specific aspects of trade, enterprise and innovation:

- Services for businesses starting up and at an early stage of development.
- Services for businesses seeking to grow and internationalise: including new exporters, high growth businesses and other exporters
- Investment services: specialised service for investors, providing New Zealand business information as well as extensive networks for investors seeking existing and start-up New Zealand-based ventures with excellent future potential.
- Business Partnerships: supporting companies working together in export networks and regional and national clusters to achieve higher growth.
- Industrial Capability Network: Providing access to government markets through a low cost, one port of call service
- Fostering an Enterprise Culture: encouraging New Zealanders to have a positive attitude towards business success.

3.2. Major changes in the balance and/or priority of public support of business R&D and innovation.

Through the release of the Growth and Innovation Framework (GIF) in Feb 2002 government has acknowledged that it has an important role to play in encouraging the adoption of more innovation throughout the New Zealand economy. It also recognises that its resources are limited and has therefore decided to concentrate on those areas which can achieve the biggest impact. In the first instance the government has chosen biotechnology, ICT and the creative industries as areas of particular emphasis. New Zealand Trade and Enterprise (NZTE) is coordinating the work of four taskforces (biotechnology, ICT, Design and Screen Production) to look at the best way developing these sectors. www.industrytaskforces.govt.nz

Biotechnology

A road map for biotechnology sector development has been produced by an industry-led Biotechnology Taskforce. This has been supported by new Government funding (2003/04 budget

initiatives) for a national industry body; growth in New Economy Research Funds (NERF) and Marsden funds which include biotechnology research; a programme to institute best practice in commercialising biotechnology and the development of a statistical framework to measure sector growth. An *Australia/New Zealand Biotechnology Partnerships fund* has been introduced in order to support stronger marketing and development alliances between New Zealand and Australian companies. Government has also created new general venture capital and proof of concept funds in order to bridge the gap between research discovery and identified commercial product. The developing partnership with the biotechnology industry has been assisted by Government initiatives to streamline its economic development and trade export services.

The biotechnology sector accounted for 5% of active *Technology for Business Growth* (TBG, see below) investments in 2002/03, and included 20 projects valued at NZ\$3.1 million.

Information and Communications Technologies (ICT)

A clear view is emerging that scientists and academics need a more easily accessible, high-capacity communications infrastructure. A number of related initiatives are in train:

- MoRST is currently advising the Minister of RS&T on a proposal for an advanced broadband network for New Zealand.
- NGI (Next Generation Internet)-NZ Society was established in June 2003 to provide a national and international high-speed network for research, education and innovation. In Jan 2004 the Tertiary Education Commission (TEC) *Innovation and Development Fund* gave the go-ahead for twenty-four projects to receive a total of almost NZ\$34 million to improve e-learning and foster innovative ideas in tertiary education. Out of this funding the NGI project received a grant of approximately NZ\$8m capital funding. <http://www.ngi.org.nz/about/>
- The Ministry of Education has launched project *PROBE* with the objective of providing access to high-speed broadband to all schools by 2004, and to achieve this in a way which optimises the opportunities for communities to get access to broadband. www.probe.govt.nz

In the year 2002/03 the largest number (32%) of active TBG contracts was in the ICT sector. These 132 projects were valued at NZ\$19.8 million. Areas of focus included: security, GPS navigation, electronic gaming, radio communications, wireless technologies, and 3-D animation techniques. Approximately NZ\$3.7 million was directly invested in small to medium ICT enterprises through the GPSRD scheme (refer section 3.1 above).

Creative Industries

This sector is currently the least developed of the three priority areas. The taskforce is currently funded to engage with the sector to determine a set of enabling initiatives. A request for proposals in FRST's current (2003/4) funding round includes a sector development component which invites proposals for research in creative industries (www.frst.govt.nz/publications/guides-forms/rfp-M&SIndustries.doc). It is also likely that one or more creative industries consortia will shortly be facilitated by NZTE. The creative industries sector yielded 7 TBG contracts valued at NZ\$0.7 million in 2002/3.

Programmes to support R&D and innovation in SMEs and new technology-based firms.

The Technology New Zealand *Technology for Business Growth* scheme provides a grants-based system (that requires 1:1 matching) for R&D projects to enable technological capable firms in developing

high-value, technology-based and export oriented products, processes or services. Funding approvals for this scheme have increased from NZ\$15.1 million in 2001/02 and to NZ\$25.8 million in 2002/03. <http://www.frst.govt.nz/business/tbg.cfm>

SmartStart is a programme designed to assist firms to overcome early stage barriers to R&D projects. [<http://www.frst.govt.nz/business/smartstart/smartstartoverview.cfm>]. See also *Technology Industry Fellowships*, *TechNet Expert Access* and *Techlink* schemes described in sections 4.2 and 3.1. Following a recommendation in the report, *Striking the Balance*, (www.med.govt.nz/buslt/compliance/balance/balance-25.html) a business portal (*BIZinfo*: <http://www.biz.org.nz>) was launched in 2003. The *BIZinfo* site provides business information on-line across a range of government agencies and departments.

4. Enhancing collaboration and networking among innovating organisations

Major initiatives to promote collaboration and networking among private firms.

GIF Taskforces

Four taskforces were established (see section 3.2) to formulate strategies for implementing the Growth and Innovation Framework (GIF). All of the taskforces highlighted the need for strengthened networks and clusters. These apply within each taskforce sector (e.g. biotechnology, ICT, design, and screen production), between sectors and government, between the sector and education providers; and in terms of better linkages nationally and internationally. Each of the taskforces proposed an industry-governed body to oversee the implementation of their sector growth strategies. These bodies will play an important role in developing coordination amongst firms in and between sectors.

Sector Strategies

The government, via various agencies, has also engaged with a variety of ‘non-GIF’ sectors to various extents such as wood processing, aquaculture, food and beverage, marine, agritech, education, and TCFC. The sectors have been engaged with due to:

- a belief that the sector has potential for high growth which could be unleashed through government action,
- perceptions that a sector lacks a strategy and coordination
- the existence of specific regulatory or infrastructural problems that the sector believes the government needs to address to unleash the potential of the sector
- to assist in transitioning the sector to higher value added products and services.

In all cases, the engagement with sectors has resulted in higher levels of collaboration and joint projects between firms in the sectors.

The Cluster Development Programme

New Zealand has a large number of clusters already, some embryonic and others that have already succeeded in establishing international reach. Studies also show that clusters in New Zealand tend to be in industries that are based upon New Zealand’s long history of commodity production (e.g. dairy forestry), or in sectors in which New Zealand’s natural attributes and strong local demand have played a major part in the industry development (e.g. wine, yachting, creative media, and film).

Initiatives are underway via NZTE to stimulate the existing clusters through cluster development and facilitation support. There are over 40 cluster development initiatives currently in progress in a range of areas, including biotechnology, optics, nutraceuticals, organics, software, film, and wool.

NZTE's Cluster Development Programme provides a total grant of up to NZ\$50,000, which must be matched by the applicant, is available to contract a cluster facilitator to significantly progress the cluster's development. <http://www.nzte.govt.nz/>

The Regional Partnership Programme

The Regional Partnerships Programme (RPP) works with regional stakeholders to put in place the foundations and preconditions for taking advantage of economic development opportunities in regions, and facilitates the building of regional economic development and leadership capability. Twenty-six regional partnerships have been facilitated through this programme. Industry NZ and NZTE have also aided the formation of Regional Centres of Excellence, such as the Waikato Technology Park, the Rotorua Forestry and Wood Processing Centre of Excellence, and an Oenology (wine) Laboratory in Blenheim. These Centres of Excellence have brought together key players in particular industries.

High-tech Networks

NZTE is in the process of assessing international models (e.g. "Connect" in San Francisco) for promoting collaboration amongst high-tech firms, and how aspects of these models might fit the New Zealand situation. The end product from this analysis will be a model for meeting the regional and national needs of New Zealand's high-tech industry.

Private sector firms have shown a great deal of support for establishing collaboration networks in their regions. Opportunities are being explored around how to best leverage off current high-tech initiatives and activities within each region.

Other Initiatives

- See section 3.1, "Efforts to attract R&D".
- Technology for Business Growth schemes and Research Consortia (section 4.2) are also designed to promote collaboration.

4.2. Major policy initiatives to promote stronger industry/science relations (i.e. linkages between industry and public research organisations).

Research Consortia

Research consortia are a relatively new investment model (established 2002/03) matching public funds with private sector investment. Research consortia are user-led partnerships between the private sector and public research organisations that are designed to:

- Increase private sector investment in R&D
- Building enduring relationships between public research providers and the private sector
- Increase the relevance of publicly funded research to users

- Increase the likelihood of that research being commercialised for the benefit of New Zealand.

The first five research consortia were contracted during 2002/03, including in dairy bioactives, meat bioactives, plant genomics, greenhouse gas mitigation and wood quality. Total funding of consortia has increased from NZ\$6.1 million in 2002/03 to \$18.5 million pa (6 consortia, 20 private firms) in 2003/04 (with NZ\$22.3 million from industry). Early stage evaluation shows that a substantial investment pipeline has been established including NZ\$8 million pa of investments in currently contracted work.

Technology Industry Fellowships (TIF)

The TIF scheme supports the placement of researchers or technologists in firms to build linkages and enhance understanding of technological innovation in a commercial R&D environment. This scheme operates on four levels – Undergraduate, Education, Expert and Strategic. Undergraduate and Education Fellows are characterised by the immersing of the Fellow within the commercial environment for a majority of the time. Experts bring a relevant new knowledge into the business and the expert must have demonstrability different expertise compared to the business's current technical capability. Under the Strategic component, high tech companies can get funding for multiple education projects to grow their R&D team. Funding approvals for this scheme have increased from NZ\$4.9 million in 2001/02 to NZ\$6.5 million in 2002/03.

Enterprise Scholarships

Enterprise Scholarships focus on research into areas that are likely to create the knowledge economy of the future and that are relevant to enterprises. They are aimed at creating linkages between companies and tertiary institutions. Enterprise Scholarships are administered by FRST on behalf of the Ministry of Education. These scholarships are a 50/50 funding arrangement between government and business. During 2002/3, 72 Enterprise scholarships were approved. Nearly half were for Masters study (NZ\$10,000 pa for 3 years), and balance for PhD, Honours and Senior undergraduate study. www.frst.govt.nz/publications/guides-forms/index.cfm

New modes of public/private partnerships for research and innovation.

Modifications to the rules governing the contestable funding process and the introduction of Research Consortia (see above) have resulted in an increase in the planned direct *co-funding*. Total planned direct co-funding increased in the period 2002/03 to 2003/04 by around NZ\$13 million pa to represent approximately 18% of FRST funds invested. www.frst.govt.nz/publications/guides-forms/index.cfm

Establish and develop venture capital funds and/or second-stage financing for the support of new technology-based firms or spin-offs from public research organisations.

See New Zealand *Venture Investment Fund* (VIF) described in section 3.1.

The *Equity Investment Fund* (EIF) is the working name for the initiative announced in the 2003 Budget as 'targeted equity investment'. The EIF is aimed at CRIs and Tertiary Education Institutes (TEI). It will provide capital to enable these organisations to develop new 'platform technologies' to the point where commercial feasibility can be demonstrated and private sector investors are prepared to put money in and, eventually, buy out the technology. <http://www.minedu.govt.nz/>

5. Human resources for S&T

Recent statistics on science and engineering graduates from universities, and efforts to increase numbers of university graduates with science and engineering degrees.

Formal Qualifications Completed at Public Tertiary Education Institutions During the 2002 Academic Year																						
Field of Study	Qualification Award Group																		Grand Total (excl doctorates)			
	Doctorate			Masters / Honours			Post-Grad. Dip./Cert.			Bachelors / Advanced Diploma			Diploma			Certificate						
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	
1. Natural and Physical Sciences	N/A	N/A	163	416	480	896	233	151	384	1,305	1,321	2,626	45	44	89	83	152	235	2,085	2,148	4,230	
2. Information Technology	N/A	N/A	13	21	11	32	59	30	89	454	199	653	401	188	589	1,138	1,349	2,487	2,073	1,777	3,850	
3. Engineering and Related Technologies	N/A	N/A	39	167	64	231	26	13	39	836	324	1,160	302	54	356	1,913	396	2,309	3,245	851	4,095	

Source: <http://www.minedu.govt.nz>. (Please note: these numbers must be regarded as approximate in the absence an explicit definition for each category.)

Improving public understanding of science.

The Royal Society of New Zealand (RSNZ) is a non-government organisation with a large membership (~1500) of researchers in science and technology (S&T). Under its Act of Parliament, the RSNZ aims to promote public awareness and understanding of S&T, advance S&T education, support the research community and provide expert advice on public issues relating to S&T.

The *Science Communicators Scheme* run by the RSNZ utilises S&T researchers (mainly members), who give talks to the public. This scheme trains scientists and technologists in communication skills and interaction with media, with particular emphasis on communication of technical topics to lay people. Speakers are provided for numerous public audiences, from young to elderly, in urban and rural areas, and across the whole length of the country. The RSNZ also promotes major S&T public events by sponsoring international visiting speakers using wide media coverage. The Communications unit in the RSNZ provides a portal for media interest in S&T, with the aim of improving public understanding through accurate reporting of technical stories.

Revising higher education curricula and expanding interdisciplinary training.

The RSNZ works with the Ministry of Education to improve creativity in the science and technology curricula (CREST scheme), through school projects performed in conjunction with external consultants who are practising researchers. These projects enable pupils of ages 10 to 18 to learn about a particular S&T area, become aware of the career possibilities in S&T, and these pupils are encouraged to continue in S&T at university. The CREST scheme raises public awareness of science through interaction of pupils, teachers and parents. The RSNZ has, for 27 years, run a National Science Fair, the winners of which have virtually all (98%) gone on to study S&T at university, and the winning projects are promoted annually in a public road show. <http://www.crest.org.nz/>

Reducing the gender gap in science education and enhancing incentives for PhD study and post-doctorate training.

New Zealand has no gender specific policies in science education.

New Leaders is a pilot FRST initiative aimed at nurturing new research leaders in the New Zealand RS&T system. This initiative builds on the other fellowship schemes described above and addresses a gap in which those individuals find it difficult to get ongoing funding as they develop and grow as researchers. <http://www.frst.govt.nz/Publications/guides-forms/NewLeaders-03.doc>

FRST have targeted approximately 5% available funds (NZ\$2.75 million) in the 2003/4 investment process to help emerging researchers establish small, new teams. These researchers may be New Zealand based or from overseas. This initiative builds on other schemes such as the FRST *NZ Science and Technology postdoctoral fellowships* (NZ\$50k stipend and NZ\$22.5k for research costs pa), *Top Achiever Doctoral Scholarships* (NZ\$25k stipend pa) and *Māori fellowships* (NZ\$25k stipend pa); the Health Research Council's (HRC) *Sir Charles Hercus Health Research fellowships* (NZ\$100k over 4 years), and the RSNZ's *Fast Start* (NZ\$50k pa). See <http://www.frst.govt.nz/Students/Awards-fellowships.cfm> ; http://www.rsnz/funding/marsden_fund/ ; <http://www.hrc.govt.nz/download/pdf/02hercus-nat.pdf>

Policy to address perceived shortages of scientists and engineers in particular fields

In 2003 a new scheme was launched by the Tertiary Education Commission (TEC) to support Enterprise training for emerging industries (biotechnology, ICT and design-related industries) – to build connections between tertiary education organisations and business within focus sectors; and knowledge sharing and entrepreneurship – to foster greater entrepreneurial skills in graduates. Funding of up to NZ\$4.8 million is available for these initiatives in the period 2004/05.

Policy changes related to the international migration and mobility of scientific and high-skilled personnel (inward or outward mobility)

New Zealand attracts and approves the entry of highly skilled migrants in accordance with the Government's Immigration Programme. The Priority Occupations List currently prioritises applications from IT professionals. <http://www.immigration.govt.nz/Migrate/>

The *New Leaders* initiative (section 5.1 above) is aimed at repatriating emerging researchers back to New Zealand.

Under reciprocal agreements with France (including French Dependencies), Germany, and Australia, students from these countries studying for a New Zealand postgraduate qualification pay New Zealand domestic fees.

6. Policies to boost innovation in the service sector

NZTE has a policy to foster increased innovation across the service sector: by promoting linkages with government research laboratories and universities. An important “enabler” is ICT, forming an integral component of every sector in the New Zealand economy. The significance of ICT to New Zealand is highlighted in section 3.2.

7. Policy evaluation

7.1 Recent changes in policies regarding the evaluation of innovation policy programmes or institutions.

Legislative or regulatory changes requiring evaluation.

These have been minimised by successive governments in order to maximise stability.

Requirements for evaluation of different elements of innovation policy: researchers, institutions, programmes, overall policy directions, innovation system.

All government agencies supporting national innovation policy are required to undertake evaluation (through output agreements) and these are subject to scrutiny by parliament (through select committee).

MoRST reviews the performance of the R&D investment on a 5 year rolling cycle. Currently the Ministry is evaluating the “Health Research” and “Environmental” Output Classes. Recommendations include advice on strategic direction, appropriate funding levels and target investment areas.

At a programme level the purchase agents (FRST, HRC, and RSNZ) evaluate the achievements and benefits arising from investment decisions. These are reported against Output Class in the agencies’ annual Performance and Achievement Reports (PAR).

The recent introduction of performance-based research funding (PBRF) into New Zealand tertiary institutions has required an extensive evaluation of the skills and capabilities residing in institutional departments. This is the first time such a comprehensive study has been completed in New Zealand. The Centre for Research on Work, Education and Business Limited (WEB Research) has been contracted by the Tertiary Education Commission (TEC) to undertake an independent evaluation of the first round implementation of the Performance Based Research Fund (PBRF). See http://www.webresearch.co.nz/projects/current_projects.asp

MoRST and Statistics NZ undertake a biennial *Innovation Survey* to determine the extent of innovation in the New Zealand community.

Methodologies employed in evaluations at different levels, e.g. qualitative vs. quantitative, international perspectives.

Mixed methods are, in New Zealand’s experience essential to provide a convergence of results. This includes qualitative methods (interviews, case studies) and quantitative (bibliometrics, outcome indicators, surveys). Their scope covers efficiency and process performance as well as effectiveness and impact evaluations (outcomes). Since 2001 FRST has undertaken extensive quantitative systematic evaluations at the Output Class level (e.g. NERF). A set of six indicators (proxy measures of performance) are compiled from information supplied by research providers. A description of the objectives, principles and methodology can be found at www.frst.govt.nz/evaluation.

MoRST is currently developing a set of key performance indicators for the Health Research Output Class.

Institutional mechanism by introducing new evaluation organisations, rules, or compulsory regular evaluation.

Evaluation objectives are enshrined in legislation governing RS&T management in New Zealand, such as the requirement in the Foundation for Research, Science and Technology Act, and Crown Research Institutes Act, for their respective funding and research activities to serve the national benefit.

Efforts to ensure that results of evaluations feedback into policy development.

The purchase agents’ evaluations (annual Performance and Achievements Reports) inform policy development at MoRST and other government agencies.

Information about the outcomes of recent major evaluations of R&D or innovation policies.

Please refer to:

- performance and achievement reports
 - <http://www.frst.govt.nz/publications/corporate/toC-PAR-02.cfm>
 - <http://www.rsnz.govt.nz/directory/yearbooks/year02/par2002.pdf>
 - <http://www.hrc.govt.nz/download/pdf/ProgressAchievements2002.pdf>
- bibliometrics surveys on MoRST website. <http://www.morst.govt.nz/?CHANNEL=STATISTICS+AND+EVALUATIONS&PAGE=Statistics+and+evaluations>
- survey of RS&T uptake in key sectors (surveys of manufacturing research and of ecosystems research). See <http://www.frst.govt.nz/Publications/papers/EcosystemResearchSurvey-Sep03.pdf>
- portfolio evaluation (HRC). See <http://www.hrc.govt.nz/stratprocess.htm>