

Strengthen research, knowledge creation and uptake for our knowledge society

Objectives

- Excellent research performance is encouraged and rewarded.
- Stronger accountability and enhanced performance reporting for tertiary education research.
- Increased global connectedness and mobility.
- A more focused tertiary research investment through world-class clusters and networks of specialisation.
- Greater alignment of tertiary education research with national goals.
- Improved knowledge uptake through stronger links with those that apply new knowledge or commercialisation of knowledge products.
- Increased breadth of support for research students and emerging researchers, with a particular focus on the development of Māori researchers.

The role and purpose of research in the tertiary education system

Research undertaken in the tertiary education system has a significant contribution to make to New Zealand's knowledge development and innovation. New Zealand's international competitive advantage is linked to the speed of uptake of new knowledge generated from research. New Zealand's social development is just as dependent on development of new knowledge about New Zealand's people and society, which can inform debate about the social direction of the country. Both situations require continual improvement in research quality, improved international linkages and collaboration, greater focus on areas of national importance, improved research training and opportunities, and stronger networks with end users.

Research in the tertiary education system serves several different purposes:

Training of new researchers

through incorporation of research into degree programmes, and through research training in postgraduate qualifications.

Expansion of knowledge

particularly basic and some strategic research, where the main focus is on developing knowledge for its own sake rather than solving specific problems. While this type of research is a source of innovation over the long term, it is not possible to predict exactly what innovation will arise from it at the start. It can also be difficult to associate innovation with specific basic research in retrospect.

Application of knowledge

research which applies knowledge to the solution of specific problems and/or creates new and innovative approaches.

Transfer and commercialisation of knowledge

the process of taking new knowledge and, from that, creating information that can be communicated to industry or practitioners, and the process of developing a commercialisable package from research findings.



The expected change – 2002 to 2007

It is expected that TEOs involved with research will develop a more focused research effort based on networks of specialisation and a strong focus on quality and relevance to end users. Decisions about where to specialise will be critical to obtaining greatest value from the limited resources available for research in New Zealand.

It is expected that there will be stronger linkages between TEOs and end users to enable faster uptake of new knowledge and the application of knowledge to create value.

Tertiary education research will have a particular contribution to make to Māori development and advancement, and to cultural and social development. It will provide an evidence base for development and policy initiatives in these areas.

Tertiary education research staff are expected to develop stronger networks nationally and internationally. These networks should bring together expertise within the country from across various organisations. This should be happening within the context of greater research collaboration between all research agencies, including within the tertiary education system, and with Crown Research Institutes (CRIs) and independent research associations.

It is expected that TEOs provide increased support for research students and emerging researchers, with a particular focus on the development of Māori and Pasifika researchers. It is essential that new researchers are trained to meet future research needs, as well as being grounded in the disciplines and knowledge of their research areas.

While it is expected that there will be greater engagement with end users and a focus on knowledge uptake, it is expected that research in the tertiary education sector will continue to address all four purposes referred to above. The continued contribution of the tertiary education sector to basic, and long-term research will be essential. Increases in the amount of applied research undertaken within the tertiary education sector should be in addition to, rather than at the expense of, the current level of engagement in pure basic and strategic research.

The baseline picture in 2002

About one-third of New Zealand's research investment in 2002 was undertaken by the tertiary education sector. The tertiary education sector was the largest producer of research output (as measured through publications).

The tertiary education sector was an important contributor to pure basic and strategic research²⁰, with nearly 70 percent of the expenditure in the tertiary education sector being in this area.

Māori research (covering research by Māori, about Māori and/or for Māori) is an emerging field within the tertiary education sector that has considerable creative potential. It has been hampered by limited capacity, as well as by the diversion of experienced researchers into other activities, including management, mentoring and advice on Māori development. The establishment of Ngā Pae o te Māramatanga (the Māori CoRE) is an important initiative to build capacity in this area.

There are indicators that research from the New Zealand tertiary education sector is of good standard. Research papers from the New Zealand tertiary education sector received a similar level of citation to research papers internationally, given the journals that they are published in. Contract research earnings have increased, both in absolute terms and as a proportion of institutional income. Contract research is often won through competitive bidding and can be subject to rigorous peer review. The establishment of the new PBRF will provide a greater focus on the quality of research work.

The evidence from publications suggests that most research collaboration in the tertiary education sector is international, with much less collaboration taking place between tertiary education organisations within New Zealand.

The recent establishment of the CoREs will help strengthen research collaboration within New Zealand. All but one involve a range of universities and, in several cases, provide links between universities and CRIs.

Both enrolments and completions in PhDs have increased steadily over the last six years. However, Māori and Pasifika students continue to be under-represented at this level.

²⁰ See Technical and Data Definitions for further explanation of these terms.

Further development of monitoring

Future monitoring will focus on the strategic directions being taken by TEOs involved in research production. This will cover issues such as development of specialised research foci, improved networks and collaboration with end users and focus on quality and relevance.

Some information for this will come from charters and profiles. Data from the PBRF process will also provide quantitative measures of research spread, expertise and quality. The evaluations of the PBRF will provide information on the impacts of the new funding arrangements on research activity and quality, and are likely to provide insights on how research is organised within TEOs.

TEO support for research students will also be an area of focus in future monitoring, particularly in terms of increased participation of Māori and Pasifika students in research-based postgraduate degrees and also in terms of the support for research students to take up careers in research.

Nature and coverage of research

Universities are significant producers of research in New Zealand

The majority of research in the tertiary education sector takes place within universities. In 2002, universities were significant producers of research in New Zealand. According to the 2002 Statistics New Zealand Research and Development Survey, universities carried out \$435 million of research and development in 2002. This represented 31 percent of the total New Zealand investment in research and development.

Information from the annual reports of the universities showed that in 2002 a total of 16,686 university publications and other research outputs were reported, an increase of 13 percent from 1997.

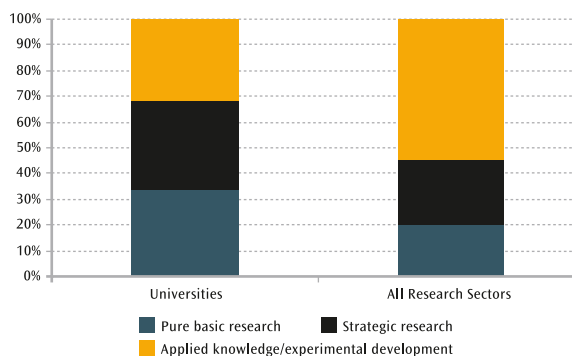
The Ministry of Research, Science and Technology, National Bibliometric Report 1997 to 2001, notes that the tertiary education sector is responsible for the largest share of the total research output of the country. The report states that in 2001, 47 percent of indexed scientific papers produced in New Zealand were produced by university researchers. This is consistent with the figure for 1997 (51 percent). By including all research outputs, not just scientific papers, the proportion of output from universities increases.

Two-thirds of university research expenditure is on pure basic and strategic research

The type of research conducted within the university sector is more directed towards pure basic and strategic research. In 2002, more than two-thirds of university research expenditure was spent in the pure basic and strategic areas, compared with 53 percent for government and 21 percent for business.

The 2002 Statistics New Zealand Research and Development Survey noted that, in terms of research expenditure, around half of the pure basic research and about 40 percent of the strategic research in New Zealand in 2002 was undertaken by universities²¹.

Figure 43: Types of research being undertaken by universities, 2002



Source: Statistics New Zealand, Research and Development Survey 2002

Māori research is an emerging area

Māori research is a unique area of research in New Zealand. Māori research includes research undertaken by Māori, research about Māori knowledge and tradition and research for the purposes of advancing Māori social and economic development. While some very significant research has been undertaken in this area, the development of Māori research has been hampered by the diversion of experienced researchers to a range of other activities, such as management, mentoring and advice to government.

The potential for growth in Māori research is signalled by the establishment of such initiatives as the National Institute of Research Excellence for Māori Development and Advancement – Ngā Pae o te Māramatanga. The establishment of the Institute, along with other initiatives, should help to develop critical capacity in Māori research.

²¹ See Technical and Data Definitions for further explanation of these terms.

Quality of research

There are a number of ways of assessing the overall quality of research from the tertiary education sector.

Tertiary education sector research papers cited at international levels

One aspect of quality is the impact of research on a body of knowledge. A common measure for this is citation rates—ie the number of times a research paper has been cited or referred to in subsequent research publications.

The National Bibliometric Report 1997 to 2001 reports on citation rates for recent New Zealand research publications. It found that tertiary education sector research publications that appeared in 1997 were cited during the period 1997 to 2001 on average 6.1 times. This is consistent with international citation rates, given the fields of research concerned and the journals used.

Increased patenting by New Zealand universities

Another aspect of quality is conversion of research knowledge into a commercialisable application. One measure of this is patents. Ministry of Research, Science and Technology data shows that the amount of patenting by New Zealand universities has increased, although their share of domestic patenting has been stable since 1992 at around two to three percent per annum. Between 1993 and 1997, Auckland Uniservices Ltd (a subsidiary of the University of Auckland that manages the university's research contracts) ranked second in the list of New Zealand's top patenting organisations. Most university patents were in biotechnology and scientific instruments.

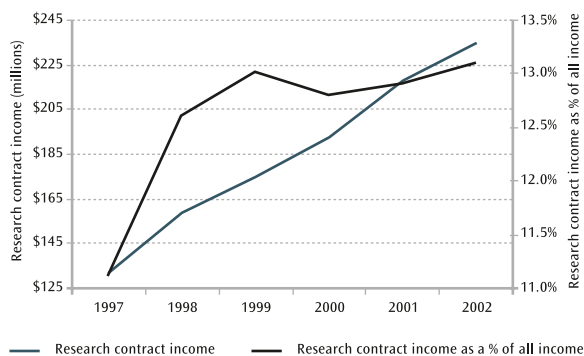
External research contracts increasing

Research contract funding also provides a good proxy measure of research quality as contracts are often won through competitive bidding and can be subject to rigorous peer review. Research contract income has grown substantially from 1997 to 2002, both in absolute terms and as a proportion of institutional income.

In 2002, research contracts in universities constituted \$235 million, compared with \$218 million in 2001 and \$193 million in 2000. This constituted a one-year rise of 7.6 percent. The figure for 1997 was \$131 million, meaning that, over the previous six years, research

contract income grew by 78.5 percent. Research contract income accounted for 13.1 percent of all university revenue in 2002, compared with 12.9 percent in 2001, 12.8 percent in 2000 and 11.1 percent in 1997.

Figure 44: University research contract income, 1997–2002



Greater focus on quality through new funding policy

The new PBRF has been established to provide a greater focus on the quality of research in the tertiary education sector. The purpose of the PBRF, which is being phased in over 2003 to 2007, is to encourage TEOs to improve research performance at all levels in the system. By aligning the allocation of the funding for research with research performance, the PBRF aims to:

- increase the average quality of the research conducted in the sector
- ensure that research continues to inform and shape the teaching and learning of degree and postgraduate students
- ensure funding is provided to support postgraduate research students and new researchers in the sector
- underpin the existing strengths in tertiary education research.

The PBRF will create a pool of funding to be allocated to providers on the basis of their performance in:

- the quality of the research outputs produced
- the number of research degree completions
- the amount of external research income they can generate.

The government expects that, in aligning research funding to research performance and in separating it from tuition funding, it will create a climate that rewards innovation and excellence in research and hence it will foster and enhance the sector's research capability and, consequently, its performance.

In making this reform, the government has committed some new funding to the PBRF. However, most of the funding for the PBRF will come from the progressive transfer to the fund of the research component of the tuition subsidy.

An evaluation of the implementation of the PBRF is currently underway.

Development of networks and clusters of specialisation

This strategy includes an emphasis on developing research networks and clusters of specialisation. This recognises the need to make good use of the limited resources available for research in New Zealand and the need to build critical mass around strategic research programmes.

High levels of international collaboration but low levels of inter-institutional collaboration

The National Bibliometric Report 1997 to 2001 shows that papers produced in the tertiary education sector were more likely to have involved collaboration than those produced in most other parts of the national research system. The report states that in 2001, 52 percent of university publications were the result of collaborations, compared with the 59 percent reported for publications in 1996 and 32 percent in 1986.

While there was extensive joint publication between researchers in New Zealand universities and their colleagues overseas, there was relatively low propensity for joint publication between the New Zealand universities in research.

More than 70 percent of these collaborative publications were with overseas bodies, compared with 67 percent in 1996. International collaborations in papers produced by universities were more likely than in papers produced in other parts of the research system. For instance, around 60 percent of CRI papers that involved collaboration and about 50 percent of collaboratively produced health research papers involved collaboration overseas. Nearly 10 percent of collaborations on university papers

were with CRIs. Only five percent were with other New Zealand universities, compared with eight percent in 1996.

Centres of Research Excellence to support collaboration and networks

The CoREs have been set up to encourage higher levels of domestic collaboration, both between the universities and between the universities and CRIs. All of the CoREs are hosted by universities; five out of the seven involve formal partner institutions, including universities and research organisations, while one other involves a cluster of multidisciplinary research teams across one institution.

The role of the seven CoREs is to support leading-edge, international standard innovative research that fosters excellence and contributes both to New Zealand's national goals, and to knowledge transfer. The CoREs are:

Allan Wilson Centre for Molecular Ecology and Evolution

Host Institution: Massey University

Partners: University of Canterbury, University of Auckland, University of Otago, and Victoria University of Wellington

Centre for Molecular Biodiscovery

Host Institution: University of Auckland

The MacDiarmid Institute for Advanced Materials and Nanotechnology

Host Institution: Victoria University of Wellington

Partners: University of Canterbury, Industrial Research Limited, and Institute of Geological and Nuclear Sciences

National Centre for Advanced Bio-Protection Technologies

Host Institution: Lincoln University

Partners: Massey University, New Zealand Crop and Food Research Ltd and AgResearch Ltd

New Zealand Institute of Mathematics and its Applications

Host Institution: University of Auckland

Partner: New Zealand Mathematics Research Institute



National Centre for Growth and Development

Host Institution: University of Auckland

Partners: Massey University, University of Otago, with contributions from AgResearch Ltd

NgāPae o te Māramatanga (Horizons of Insight) – The National Institute of Research Excellence for Māori Development and Advancement

Host Institution: University of Auckland

Partners: Te Whare Wānanga o Awanuiārangi, Te Wānanga o Aotearoa, Victoria University of Wellington, University of Otago, University of Waikato, and Landcare Research

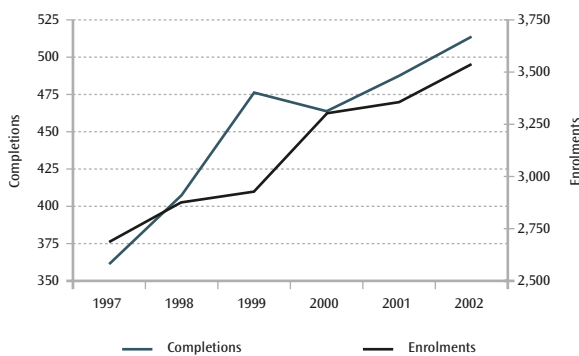
Development of new researchers

Another emphasis in this strategy is on the support for research students and emerging researchers.

Increased participation and completion of doctoral degrees

Formal training in research is mainly carried out through postgraduate research degrees, particularly at doctoral level. Between 1997 and 2002, enrolments in doctoral studies at tertiary education providers increased by 31 percent. Over the same period, completions of PhDs have increased by 41 percent.

Figure 45: Enrolments in, and completions of, PhD qualifications, 1997–2002



Women, Māori and Pasifika remain under-represented in research degrees

Women were under-represented in enrolments in research degrees in 2002, but the trends are positive. In 2002, while women represented 57 percent of all formal enrolments in tertiary education and 58 percent of all postgraduate enrolments, they constituted only 48 percent of doctoral enrolments. The corresponding figure for 1997 was 43 percent. Enrolments by women in doctoral degrees have grown by more than 48 percent over the last six years while doctoral enrolments as a whole grew by 31 percent.

In 2002, Māori made up six percent of doctoral enrolments, whereas Māori constituted 20 percent of all enrolments in tertiary education and eight percent of all postgraduate enrolments. The rate of participation of Māori in postgraduate study in 2002 was little more than half the rate of non-Māori – 0.5 percent of the population over the age of 15, compared with 0.9 percent for non-Māori. While these statistics show that Māori are still not engaging in postgraduate study to the same extent as the whole population, Māori enrolments in postgraduate qualifications have grown faster than for the whole population. Māori doctoral enrolments have grown by 96 percent over the last six years, from 103 to 201. This is around three times the rate of growth in doctoral enrolments as a whole.

The trend is more mixed for Pasifika peoples. Pasifika students constitute only one percent of doctoral enrolments but 5.5 percent of all tertiary enrolments. At the doctoral level, Pasifika enrolments rose by 37 percent, over the period 1997 to 2002, while for the whole population doctoral enrolments grew by 31 percent. The rate of participation by Pasifika peoples in postgraduate study was low; only 0.4 percent of the Pasifika population aged 15 or over was enrolled in postgraduate study on 31 July 2002. The rate for the population as a whole was twice that – 0.8 percent.

The new research funding formula, under the PBRF, will provide additional funding for TEOs on the basis of the number of Māori and Pasifika research-based postgraduate degree completions.