

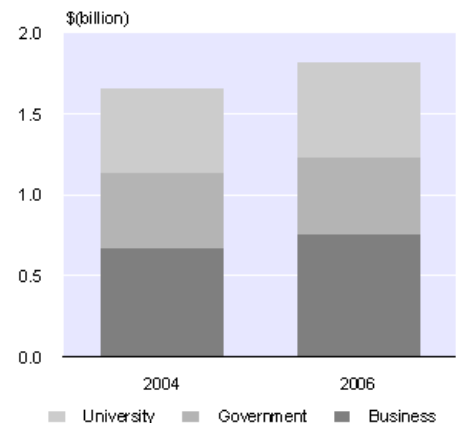
Embargoed until 10:45am – 25 June 2007

## Research and Development Survey 2006

### Highlights

- **Total R&D expenditure in the 2006 reference period was \$1,826 million, an increase of 10.0 percent** compared with the 2004 survey result.
- **Business sector R&D expenditure was \$763 million in the 2006 reference period, an increase of 12.7 percent** from the 2004 reference period.

Total R&D Expenditure by Sector



**Note:** The university sector change is for a one-year period only.

Geoff Bascand  
Government Statistician

**25 June 2007**  
Cat 50.900 Set 06/07 – 199

There is a companion Media Release published – [Research and Development Survey: 2006.](#)

# Commentary

## Research and Development Survey 2006

The Research and Development Survey 2006 (R&D Survey 2006) was a joint survey with the Ministry of Research, Science and Technology (MoRST). The R&D Survey measures the level of research and development activity, employment and expenditure by business sector enterprises, government departments, government-owned trading entities, and universities.

The R&D Survey is carried out biennially by Statistics New Zealand. A more detailed report on the results of the 2006 survey will be published by Statistics NZ in September 2007.

## Guide to interpreting the data

The following summary highlights the main points to consider when analysing the R&D Survey 2006 results. A full technical description is contained in the Technical notes.

### Definition of R&D

Statistics NZ uses the following definition of R&D which is based on international best practice: "Research and experimental development comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge. Any activity classified as R&D is characterised by originality. Investigation is a primary objective."

### Reference period for the survey

The reference period for the business and government sector is for the last financial year that falls between 1 October 2005 and 30 September 2006. The predominant financial year for the business sector is the year ended 31 March 2006, while for the government sector it is the year ended 30 June 2006.

The financial year for universities is the year ended 31 December. In the previous R&D Survey 2004, data was collected for the financial year ended December 2004. The university sector reference period for the R&D Survey 2006 has been set back to the year ended December 2005. Because of this change, there is only a one year difference between the two reference periods for the university sector in this publication. This should be taken into account when analysing the change between the two reference periods for total R&D expenditure, as it is not a full two-year period for all three sectors. See the Technical notes for more explanation.

### Published industries

This publication uses the same published industries as in the *Research and Development in New Zealand 2004* report which is based on the classification and frameworks recommended by the Organisation for Economic Co-operation and Development's (OECD) *Frascati Manual 2002*. This allows for international comparability with other OECD member countries' surveys. For more information on this change, and sector and industry breakdowns, see the Technical notes.

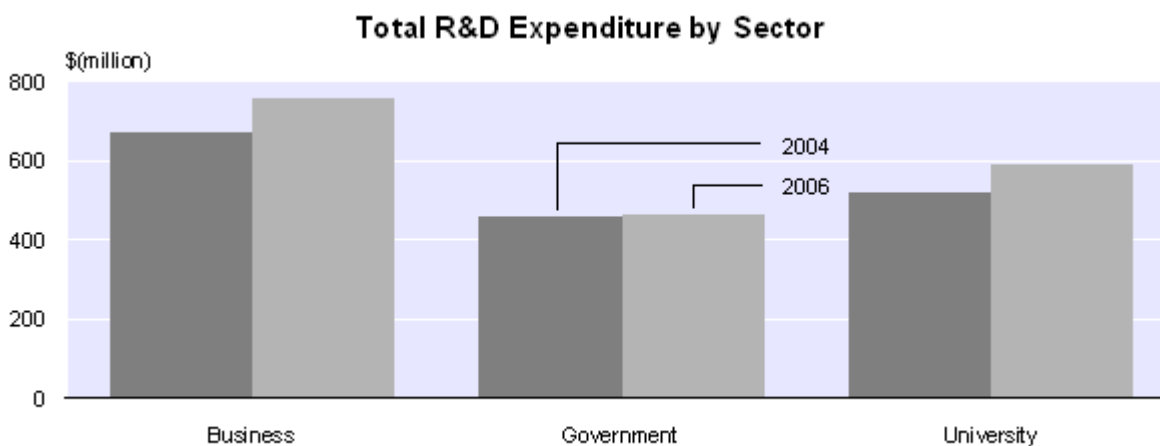
## R&D expenditure by sector

Total R&D expenditure in the 2006 reference period was \$1,826 million. This represents an increase of 10.0 percent or \$166 million from the 2004 reference period.

Survey results show that total R&D expenditure by the business sector was \$763 million. Compared to 2004, this is a 12.7 percent increase. The manufacturing and services industries contributed to this growth, increasing 18.5 and 19.6 percent, respectively.

Government sector R&D expenditure was \$469 million, an increase of 1.8 percent from 2004. The smaller increase compared with the business sector can be explained by the privatisation of a Crown Research Institute division and less R&D being undertaken by government agencies.

Due to the change in the reference period for the universities (detailed in the Technical notes), there is only a one year difference between the two reference periods for the university sector. Despite this, the university sector experienced strong growth, with expenditure increasing 13.6 percent to \$593 million. The main driver of this growth was increased government funding.



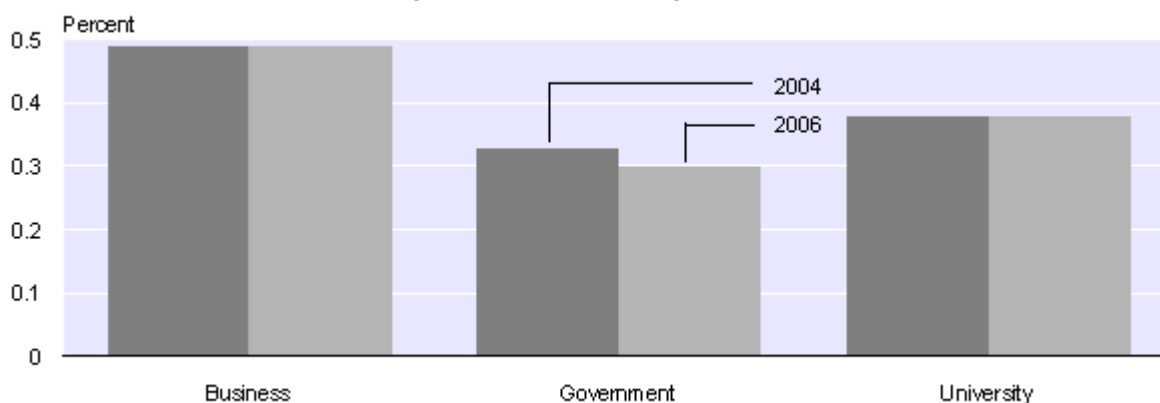
**Note:** The university sector change is for a one-year period only.

## R&D as a proportion of gross domestic product

Total R&D expenditure represented 1.17 percent of New Zealand's gross domestic product (GDP) in 2006. This is similar to the 1.19 percent of 2004. Between the 2004 and 2006 March years, New Zealand's GDP current price expenditure measure increased 11.9 percent. It should also be noted that the change in the reference period for the university sector in 2006 is likely to have slightly under-estimated the overall growth of R&D as a proportion of GDP between the two years.

Research and development expenditure within the university and business sectors kept up with the overall growth in the New Zealand economy between the 2004 and 2006 reference periods, remaining at 0.38 and 0.49 percent of GDP, respectively. Government sector R&D decreased as a proportion of GDP during the same period, from 0.33 percent down to 0.30 percent.

## R&D Expenditure as a Proportion of GDP



**Note:** The university sector change is for a one-year period only.

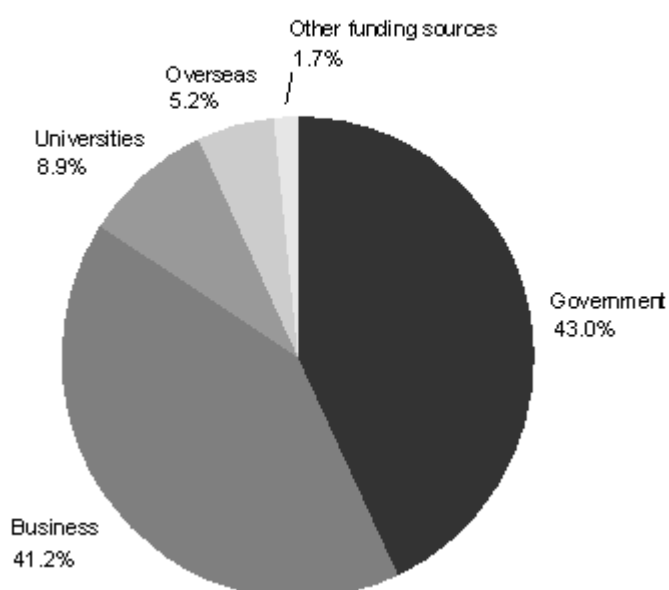
New Zealand's total R&D expenditure continues to be relatively low when compared with other countries in the OECD. Australia reported R&D expenditure as 1.76 percent of GDP in 2004, and the OECD average was 2.21 for the same period. International figures for the 2006 reference period were not available when this publication went to print.

## Source of funds for R&D

New Zealand's central and local government remains the largest funder of R&D, funding a total of \$785 million or 43.0 percent of all R&D undertaken in 2006. This is an 8.0 percent increase on the 2004 figure of \$727 million. New Zealand businesses are fast approaching the level of central and local government funding, accounting for 41.2 percent of total R&D expenditure for the 2006 reference year. In total, the business sector funded \$753 million worth of R&D, an increase of 18.6 percent from 2004. The proportion of R&D expenditure funded by New Zealand universities and overseas funding sources in 2006 was 8.9 and 5.2 percent, respectively.

### R&D Expenditure 2006

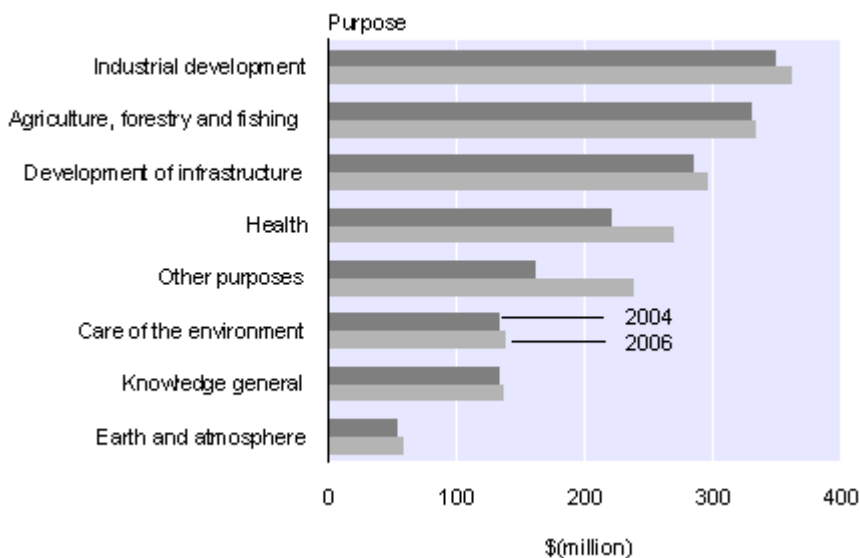
*By source of funds*



## R&D by purpose of research

Research and development expenditure can be broken down by purpose to highlight the main socio-economic objectives that New Zealand R&D is directed towards. The most significant purpose of New Zealand's R&D expenditure in 2006 was industrial development (at \$360 million), with the business sector the major contributor. Expenditure on primary industry purposes, namely agriculture, forestry and fishing, was the second largest purpose of research and increased 1.3 percent between the 2004 and 2006 reference periods to reach \$333 million. Over the same period, total R&D expenditure directed towards health increased 21.9 percent to \$269 million.

**R&D Expenditure by Purpose of Research**



## Type of research and development activity

There are three main types of research and development activity identified in this release.

**Basic research** is carried out to pursue a planned search for new knowledge with either a broad underpinning reference, or no reference, to a likely application.

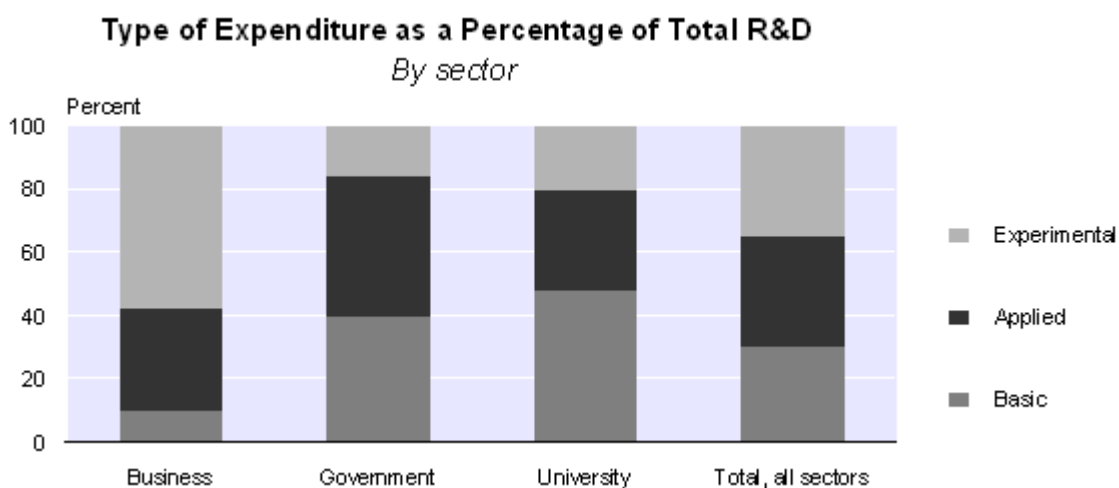
**Applied research** is investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective and determines possible uses of basic research.

**Experimental development** is systematic work, drawing on knowledge gained from research and practical experience that is directed at producing new materials, products and devices; installing new processes, systems and services; or improving substantially those already produced or installed.

Of the total expenditure on R&D in 2006 (\$1,826 million), \$551 million was attributed to basic research, \$647 million to applied research, and the remaining \$628 million to experimental development.

The majority of research conducted in the business sector was in the experimental development stage, with 57.2 percent in this category. A further 32.7 percent was applied research and 10.0 percent was basic research.

The most significant type of R&D for the government sector was applied research at 44.2 percent, while only 15.5 percent of the government sector R&D was experimental development. Basic research made up 48.1 percent of the university sector's R&D, while 31.9 percent was applied.



**For technical information contact:**

Dan Martin or Hamish Hill  
Wellington 04 931 4600

**Email:** [info@stats.govt.nz](mailto:info@stats.govt.nz)

# Technical notes

## Survey background

The Research and Development Survey 2006 (R&D Survey 2006) was run by Statistics New Zealand jointly with the Ministry of Research, Science and Technology (MoRST).

The R&D Survey measures the level of research and development activity, employment and expenditure by business sector enterprises, government departments, government-owned trading entities, and universities. The R&D Survey is carried out biennially by Statistics New Zealand. Results from surveys prior to 2002 have been released by MoRST.

This is the first release of data from the R&D Survey 2006. A full report will be released on the 17th September 2007.

## Changes to the R&D Survey 2006

After making significant changes in the R&D Survey in 2004, Statistics NZ and MoRST made only slight changes to the methodology used in the 2006 survey. These changes do not significantly affect the time series and a description of the changes can be found below in the 'targeted population' section.

The major change to the R&D Survey 2006 was in the university sector. Due to the fact that the financial year for universities is the year ended 31 December, there were difficulties in collecting, processing, and editing the data for the release. To improve the data quality of the university sector, the R&D Survey 2006 collected data from the universities for the financial year ended 31 December 2005 rather than 31 December 2006. This is closer to the majority of businesses financial year of 31 March and allows for greater certainty of the data. This change should be taken into account when comparing the results from the university sector between the R&D Survey 2006 and R&D Survey 2004.

Revisions were made to the 2004 university sector due to more accurate information being supplied. Revisions were made to the GDP measure which have contributed to slight revisions to the proportions of R&D to GDP.

Another change from the 2004 Hot Off The Press (HOTP) is that the 'Scientific Research' firms that have an ANZSIC classification of L781000 have been reclassified to the industries they predominately serve. Reclassifying these firms presents a fuller picture of which industries receive the benefits of the R&D undertaken within New Zealand. Also in accordance to international recommendations, state and local government-owned trading enterprises have been classified to the business sector. The *Research and Development in New Zealand* reports have historically presented industry classification in these ways.

## Data collection

The R&D Survey is a postal survey consisting of four questionnaires, a business form, a government form, a Crown Research Institute (CRI) form, and a university form. These forms are specifically designed to capture data on R&D from these different organisation types.

The business, government and CRI R&D surveys were posted out in mid August 2006. Information collected included the number of personnel within an enterprise working on R&D, current and capital expenditure on R&D, expenditure by type of R&D, source of funds for R&D carried out, as well as the area of application of the R&D. Information was requested for the last financial year within the 12 months up to 30 September 2006.

The R&D Universities Survey was posted out in January 2007. Data was collected for the year ended 31 December 2005. The university questionnaire was designed to allow universities to use financial information that is generally produced for the purposes of annual reporting. This means a number of data items for universities' R&D were produced using modelled information. The New Zealand Vice-Chancellors Commission (NZVCC) and MoRST assisted Statistics NZ in the determination of these modelling specifications. Information collected included university discretionary income, internal and external research funding, academic staff salaries, university operating expenditure by faculty, and R&D personnel data.

## Target population

Enterprises (business, government and CRI) are included in the R&D Survey population if they have satisfied the following conditions:

- Economic significance (GST sales greater than \$30,000) on Statistics NZ Business Frame
- Not classified to ANZSIC codes 'G', 'H', 'I' or 'N'
- Included in one of the following categories:

### Category 1

Has 'Yes' as the research and development indicator which is sourced from the:

- Annual Frame Update Survey (AFUS)
- Enterprises receiving Foundation for Research, Science and Technology (FRST) grants (including Technology NZ funding)
- Enterprises applying for patents in the last two years
- Units recording R&D activity in the 2005 Business Operations Survey or the previous two R&D Surveys (only from full coverage strata)
- Units recording R&D activity in the 2005 Biotechnology Survey.

**Note:** Increasing the pool of firms that have an R&D indicator of 'Yes' has been a slight methodological change for the 2006 R&D Survey. Historically AFUS has been the sole source for this indicator. However, to better target the firms that are more likely to undertake R&D, five new sources have been added which are repeatable over time. The main purpose of this change was to increase the chances of firms who undertake R&D to be captured in the survey. Increasing the sources of the R&D indicator has not significantly changed the sample design.

### Category 2

Has 'No' as the research and development indicator; Rolling Mean Employment (RME) greater or equal to 2; and is included in tiers 1 or 2 in the Statistics NZ Business Frame (tier 1 and 2 on the Statistics NZ Business Frame include enterprises with GST turnover of greater than \$200,000).

### **Category 3**

Is included in a list of enterprises having a significant contribution to total expenditure on R&D, or to R&D funded by the enterprise but carried out by others in the R&D Survey 2004, but not satisfying the previous criteria.

**Note:** The exclusion of ANZSIC codes 'H' (Accommodation, Cafes and Restaurants) is due to the fact that these industries performed no R&D activity according to the results of the R&D Survey 2002. The contribution of industries 'G' (Retail Trade) and 'I' (Transport and Storage) to the total reported for the total expenditure on R&D was 0.06% and 0.03%, respectively. Such contributions were considered too small to justify their inclusion in the survey population. These were also excluded from the R&D Survey 2004. ANZSIC code 'D' (Electricity, Gas and Water Supply) was included in the R&D Survey 2006.

## **Sample design**

The R&D Survey uses a stratified sample in its sample design. Strata were developed based on industries defined by their sector (ie business, government, university) and ANZSIC.

Substratum were then developed using the following variables:

1. Whether an enterprise had a 'Yes' or 'No' to the R&D indicator. This indicator is captured from a range of sources as detailed above.
2. The RME of the enterprise from the Statistics NZ Business Frame. This indicator is captured from tax data.
3. Annual GST sales of the enterprise from the Statistics NZ Business Frame. This indicator is captured from tax data.

These substrata were sampled in three different ways. Firstly, they could be selected for full coverage, meaning that all enterprises in the substratum were selected for the survey. Secondly, they could be selected as forced full coverage, which meant that there was 100 percent coverage of firms seen as key to the survey. Thirdly, a sample selection of enterprises from the substratum could have been selected.

## **Sampling error**

The sampling error on the total business sector R&D expenditure figure has been measured at 16.3 percent at the 95 percent confidence level. The business sector sample error is relatively high due to the large variance within sub-strata of responding firms that had an R&D indicator of 'No'. Based on responding business sector firms that had an R&D indicator of 'Yes', the sampling error for R&D expenditure is 4.4 percent.

There is no sampling error for either the government or university sectors due to the full coverage of these sectors.

The sampling error on the total R&D expenditure figure has been measured at 6.8 percent at the 95 percent confidence level. Based on the responding business sector firms that had an R&D indicator of 'Yes', the total sampling error for R&D expenditure is 1.9 percent.

## **Measurement errors**

The R&D Survey results are subject to measurement errors. These need to be considered when analysing the results from the survey.

Measurement errors include mistakes by respondents when completing the questionnaire, variation in respondents' interpretation of the questions asked, and errors made during the processing of the data. In addition, the survey applies imputation methodologies to cope with non-respondents and item non-response (see later in the Technical notes for more information on imputation).

Statistics NZ adopts procedures to minimise these types of errors, but they may still occur and are not quantifiable.

Given the nature of the data collected, there are limitations on the level of accuracy that can be expected from the R&D Survey. Many respondents do not keep separate account of their R&D expenditure, or they may include R&D with other scientific and technological services, such as consulting.

## **Response rate**

The target overall response rate for the R&D Survey 2006 was 85 percent for business, government and CRIs. The survey achieved an actual response rate of 89 percent.

The target population for the R&D Survey 2006 consisted of 3,528 enterprises, plus the eight universities.

The target overall response rate for the university survey was 100 percent, which was achieved.

## **Analysis of results**

The R&D survey results have been compared with annual reports and other indicators published by Statistics NZ. Where the survey results differed substantially, more detailed study of the data was made.

## **Imputation methodology**

The following gives an outline of the imputation methodology used in the R&D Survey (business, government and CRIs). No unit non-response was required for the R&D Universities Survey as a 100 percent response rate was achieved.

### **Unit non-response**

Unit (or complete) non-response occurs where units in the population do not return the questionnaire, or an invalid questionnaire is received. A weight adjustment method is used to rate up the responding firms to compensate for the non-responding firms within the same unit non-response estimation cell.

### **Item non-response**

Item (or partial) non-response is where units return the questionnaire but fail to provide breakdowns for selected aggregates.

Item non-response was applied to those breakdowns where a total could be sourced from another question. The item non-response method then used the mean proportion of all responding linked units within the item non-response estimation cell, and applies these proportions to the sourced total.

## Published sector and industry breakdowns

The published sector and industry breakdowns provided in this release have been created using recommendations from the OECD's *Frascati Manual 2002*. This is a change from the R&D 2004 Hot Off The Press which was based solely on the 1996 Australia and New Zealand Standard Industrial Classification (ANZSIC96) and New Zealand Institutional Sector 1996 codes. The classifications recommended in the *Frascati Manual 2002* are very similar to ANZSIC96 and NZSIC96, and using them allows for greater international comparability.

The OECD's *Frascati Manual 2002* recommends that state-owned enterprises (Business Type 1996 (BT96) classification) be classified to the business sector. In addition, the *Frascati Manual 2002* recommends that the industrial classification code for significant research organisations (L781) be changed to the industry they predominantly serve. The industry breakdowns have been applied using the Australian and New Zealand Standard Industrial Classification – NZ Version 1996 (ANZSIC).

### Government sector (excluding universities)

The government sector excludes the eight universities, central and local government trading enterprises, and includes all enterprises with the following New Zealand Institutional Sector Classification 1996 (NZISC96) codes:

#### *NZISC96 code – description*

1311\* – Central Government Enterprises

1321\* – Local Government Enterprises

2111 – Central Bank

2212 – Central Government Registered Banks

2213 – Local Government Registered Banks

2222 – Central Government Other Broad Money (M3) Depository Organisations

2223 – Local Government Other Broad Money (M3) Depository Organisations

2292 – Central Government Other Depository Organisations nec

2293 – Local Government Other Depository Organisations nec

2312 – Local Government Other Financial Organisations except Insurance and Pension Funds

2313 – Local Government Other Financial Organisations except Insurance and Pension Funds

2412 – Central Government Insurance and Pension Funds

2413 – Local Government Insurance and Pension Funds

3 pt – General Government (excluding universities)

\* Central and local government trading enterprises are included in business sector.

### Business sector

Includes central and local government trading enterprises and all other enterprises with the following New Zealand Institutional Sector 1996 codes:

#### *NZISC96 code – description*

- 1311\* – Central Government Enterprises
- 1321\* – Local Government Enterprises
- 1111 – Private Corporate Producer Enterprises
- 1121 – Private Non-corporate Producer Enterprises
- 1211 – Producer Boards
- 2211 – Private Registered Banks
- 2221 – Private Other Broad Money (M3) Depository Organisations
- 2291 – Private Other Depository Organisations
- 2311 – Private Other Financial Organisations except Insurance and Pension Funds
- 2411 – Private Insurance and Pension Funds
  - 4 – Private Non-Profit Organisations Serving Households

\* Central and local government trading enterprises are included in business sector

#### **Universities**

The university sector includes the eight New Zealand universities which are members of NZVCC. These are classified to NZISC96 code of 3111 (Cent Govt excl Funded Social Security), with an ANZSIC96 code of N843100 (Higher Education).

## **Published industries**

The published industries within the business sector have been based on ANZSIC96 classification apart from the reclassification of significant scientific research organisations (L781) to the industry the predominately serve and the inclusion of local and state owned trading enterprises.

#### **Business sector**

##### *NZISC96*

##### *Published Industry – code*

Primary Industries – A and B

Food, Beverage and Tobacco Manufacturing – C21

Textile, Clothing, Footwear and Leather Manufacturing – C22

Petroleum, Coal, Chemical and Associated Product Manufacturing – C25

Non-Metallic Mineral Product Manufacturing – C26

Metal Product Manufacturing – C27

Machinery and Equipment Manufacturing – C28

Other Machinery – C23, C24 and C29

Wholesale Trade – F

Scientific Research and Technical Services – L781 and L782

Computer Services – L783

Other Services – D to Q excluding (F, L781, L782, L783)

#### **Government sector**

##### *NZISC96*

##### *Published Industry – code*

Scientific Research – L781

Other Government Research – All ANZSIC codes except L781

#### **University Sector**

Total universities.

## Definitions

**ANZSIC:** Australian and New Zealand Standard Industrial Classification System – NZ Version 1996.

**Enterprise:** A legal business entity operating in New Zealand.

**Research and development (R&D):** The definition of R&D used in this survey is consistent with the OECD recommendations contained in the *Frascati Manual 2002*. R&D performed by enterprises is generally investigative work which is of actual or potential use in the development of new or enhanced materials, products, devices, processes or services. R&D directed towards duplicating work already developed by others is only included if the knowledge or technology required for the development is not available to the enterprise.

**Rolling Mean Employment:** The rolling mean employment (RME) is a 12-month moving average of the monthly employment count (EC) figure. The EC is obtained from taxation data.

**Statistics NZ Business Frame:** A register of all businesses operating in New Zealand.

**Basic research** is carried out for the advancement of knowledge, without seeking long-term economic or social benefits or making any effort to apply the results to sectors responsible for their application.

**Applied research** is also investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. For the purposes of this release, applied research also encompasses experimental development.

**Experimental development** is systematic work, drawing on knowledge gained from research and practical experience, that is directed at producing new materials, products and devices; installing new processes, systems and services; or improving substantially those already produced or installed.

## More information

For more information, follow the [link](#) from the Technical notes of this release on the Statistics New Zealand website.

## Copyright

Information obtained from Statistics NZ may be freely used, reproduced, or quoted unless otherwise specified. In all cases Statistics NZ must be acknowledged as the source.

## Liability

While care has been used in processing, analysing and extracting information, Statistics NZ gives no warranty that the information supplied is free from error. Statistics NZ shall not be liable for any loss suffered through the use, directly or indirectly, of any information, product or service.

## Timing

Timed statistical releases are delivered using postal and electronic services provided by third parties. Delivery of these releases may be delayed by circumstances outside the control of Statistics NZ. Statistics NZ accepts no responsibility for any such delays.

### Next release...

*Research and Development in New Zealand: 2006* will be released on 17 September 2007.

Statistics New Zealand: The first source of independent information for your key decisions.

## Tables

The following tables can be downloaded from the Statistics New Zealand website in Excel format. If you do not have access to Excel, you may use the [Excel file viewer](#) to view, print and export the contents of the file.

### List of tables

1. Research and development expenditure, by sector and published industry
2. Research and development expenditure as a proportion of GDP, by sector
3. Research and development expenditure as a proportion of GDP, international comparison
- 4a. Research and development expenditure, by source of funds and recipient sector, 2006
- 4b. Research and development expenditure, by source of funds and recipient sector, 2004
- 5a. Research and development expenditure, by purpose of research and sector, 2006
- 5b. Research and development expenditure, by purpose of research and sector, 2004
6. Type of research and development by sector, 2006