

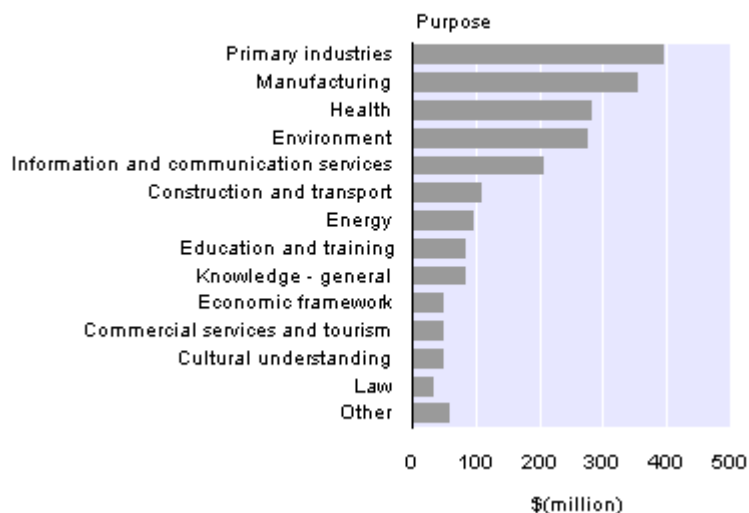
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Research and Development Survey: 2008

Highlights

- R&D carried out for the primary industries represented 19 percent of all R&D in the 2008 reference period.
- R&D for manufacturing, health, environment, and information and communication services purposes were significant – each benefitting by 10 percent or more.
- Total R&D expenditure across the business, government, and university sectors in the 2008 reference period was \$2.1 billion, up 17 percent on that reported two years previously.

R&D Expenditure 2008
By purpose of research



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See also [Research and Development Survey: 2008 – Media release](#).

Commentary

The Research and Development Survey 2008 (R&D Survey 2008) 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 2008 survey will be published by Statistics NZ in June 2009.

Guide to interpreting the data

The following summary highlights the main points to consider when analysing the R&D Survey 2008 results. A full technical description is contained in the technical notes of this release.

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 is for the last financial year that falls between 1 October 2007 and 30 September 2008.

Classification change

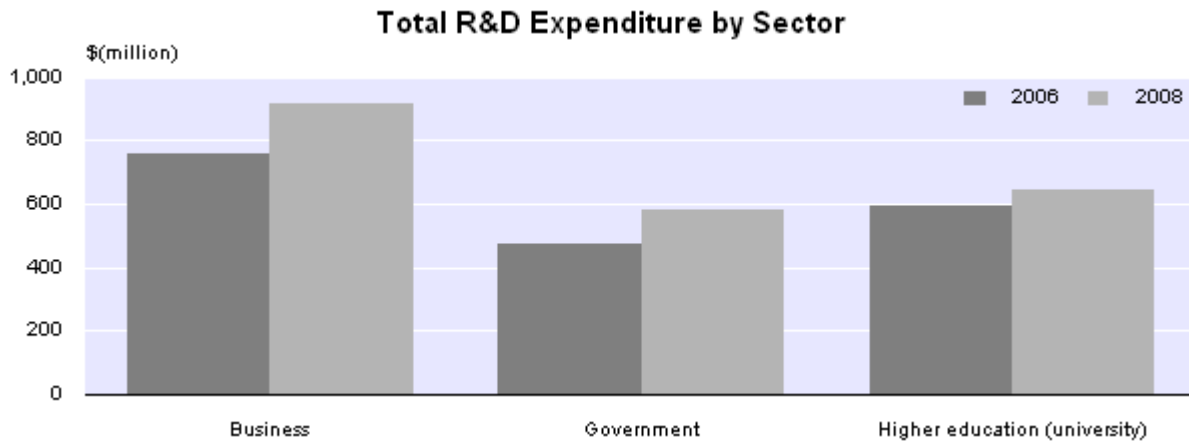
This is the first release of the R&D survey statistics on the basis of the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006. Further information can be found in the technical notes of this release.

R&D expenditure by sector

Total R&D expenditure in the 2008 reference period was \$2,140 million. This amount represents an increase of 17 percent or \$314 million from the 2006 reference period.

Survey results show that total R&D expenditure by the business sector was \$913 million, a 20 percent increase compared with 2006. The biggest area of growth in the business sector was in the primary industries, which rose from \$52 million in 2006 to \$72 million in 2008 (up 40 percent).

Government sector R&D expenditure was \$584 million, an increase of 23 percent from 2006. The university sector also grew, with expenditure increasing 9 percent to \$643 million.



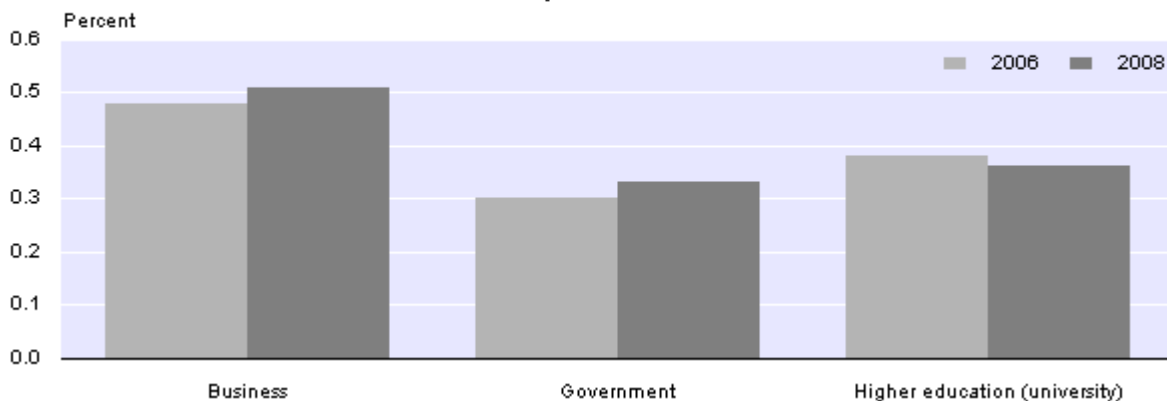
R&D as a proportion of gross domestic product

Total R&D expenditure represented 1.20 percent of New Zealand's gross domestic product (GDP) in 2008, up from 1.16 percent in 2006. Between the 2006 and 2008 March years, New Zealand's GDP current price expenditure measure increased 13 percent. The reported 17 percent increase in R&D expenditure resulted in its proportion of GDP increasing slightly from 2006.

R&D expenditure within the business and government sectors kept up with the overall growth in the New Zealand economy between the 2006 and 2008 reference periods, increasing slightly to 0.51 and 0.33 percent of GDP, respectively. University sector R&D decreased slightly as a proportion of GDP during the same period, from 0.38 percent down to 0.36 percent.

Despite increases, New Zealand's total R&D expenditure continues to be relatively low when compared with other countries in the OECD. Australia reported its R&D expenditure at 2.01 percent of GDP in 2006, and the OECD average was 2.26 percent for the same period. International figures for the 2008 reference period are not yet available.

R&D Expenditure as a Proportion of GDP *By sector*

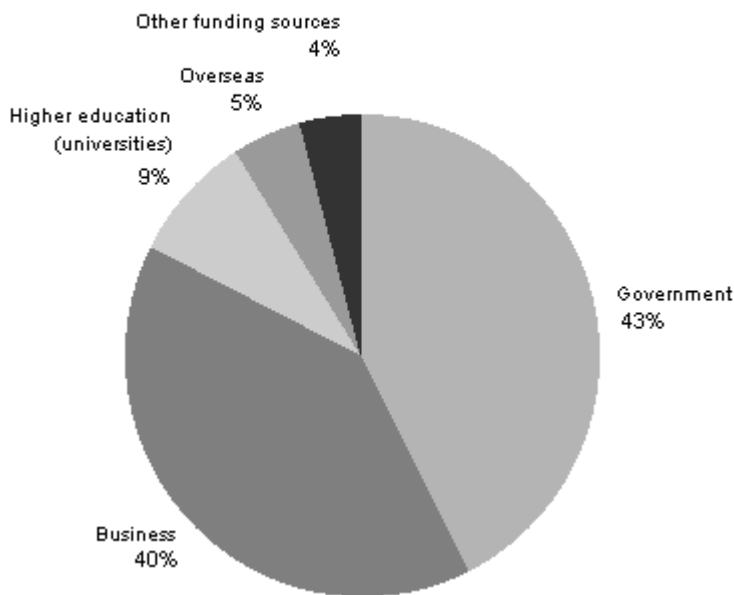


Source of funds for R&D

Both the government and business sectors were significant funders of R&D in New Zealand. The government sector funded a total of \$912 million or 43 percent of all R&D undertaken in 2008. This figure was just ahead of the business sector which funded 40 percent, or \$859 million of R&D undertaken in New Zealand in 2008. The proportion of R&D expenditure funded by the New Zealand university sector and overseas funding sources in 2008 was 9 and 5 percent, respectively, with a further 4 percent being funded from other sources.

R&D Expenditure 2008

By source of funds



R&D by purpose of research

New Zealand's R&D expenditure can be broken down by purpose to highlight its main socio-economic objectives and the areas of the economy that will ultimately benefit. The 2008 R&D Survey saw the adoption of a different breakdown for information on the purpose of the research being undertaken. This change will facilitate more consistent reporting of R&D activities across New Zealand and Australia.

The most significant purpose of New Zealand's R&D expenditure in 2008 was for primary industry purposes. These industries accounted for 19 percent (or \$398 million), with the government sector the major contributor. Expenditure for manufacturing purposes was the second largest, representing 17 percent. Health, environment, and information and communication services were significant, each being a focus of 10 percent or more of total R&D expenditure.

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.

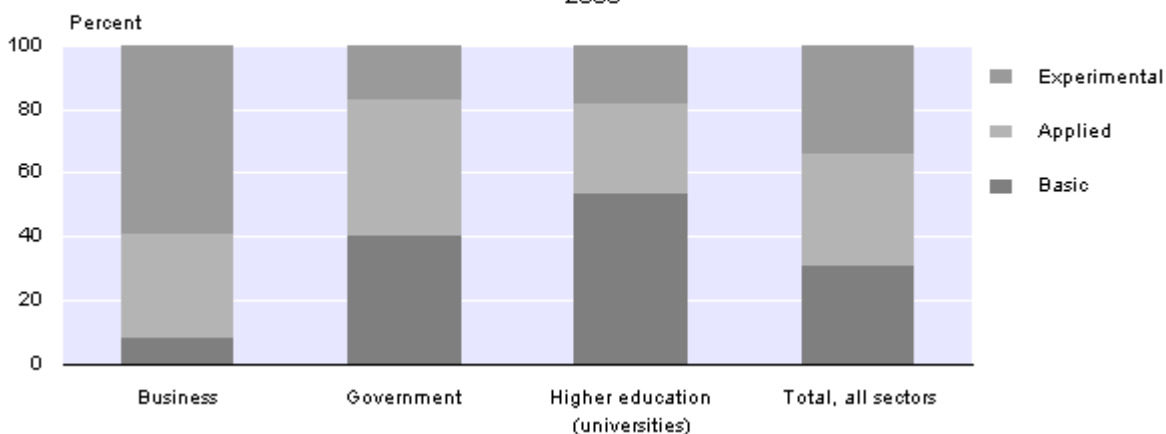
Of the total expenditure on R&D in 2008 (\$2,140 million), \$760 million (35 percent), was attributed to experimental development, \$730 million (34 percent), to applied research, and the remaining \$650 million (30 percent), to basic research.

The proportion of experimental development in the business sector was higher, with 60 percent in this category. A further 32 percent was attributed to applied research and 8 percent to basic research.

For the government sector, the most significant type of R&D was applied research at 43 percent, followed by basic research at 40 percent, while experimental development accounted for only 17 percent. For the university sector basic research made up 53 percent of its R&D, applied research at 28 percent, and experimental development at 18 percent.

Type of Expenditure as a Percentage of Total R&D

By sector
2008



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Next release...

Research and Development in New Zealand: 2008 will be released on 19 June 2009.

Technical notes

Survey background

The Research and Development Survey 2008 (R&D Survey 2008) 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 higher education (universities). The R&D Survey is carried out biennially by Statistics NZ. Results from surveys before 2002 were released by MoRST.

This is the first release of data from the R&D Survey 2008. A full report will be released on 19 June 2009.

Changes to the R&D Survey 2008

The major change to the R&D Survey 2008 was the implementation of the 2006 version of the Australian and New Zealand Standard Industrial Classification (ANZSIC06). ANZSIC06 has been jointly developed by Statistics NZ with the Australian Bureau of Statistics to ensure that the ANZSIC classification remained current and relevant. ANZSIC06 reflects the changes that have occurred in the structure and composition of industry since the previous 1996 edition and recognises changing user requirements for data classified to industry. International comparability has been enhanced by aligning the classification, as far as possible, with the upcoming revision of the International Standard Industrial Classification of All Economic Activities (ISIC) (Revision 4). See [Introducing ANZSIC 2006](#) for more details including links to the structure of the classification.

The design of the R&D Survey 2008 is based fully on ANZSIC06. The adoption of ANZSIC06 has resulted in some changes to the industry classifications of enterprises, specifically to the overall survey population and the make-up of the industries in scope. This release presents results from 2008 against those from the 2006 survey, which was based on the earlier 1996 version of the ANZSIC. Table 1 shows data from 2006 against 2008 data presented on both an ANZSIC96 and ANZSIC06 basis in order to indicate the effect on survey results due to the adoption of ANZSIC06.

Another change in the 2008 survey was in the information on 'purpose of research' collected. This information was modified to align with the socio-economic objectives of the Australian and New Zealand Standard Research Classification (ANZSRC) 2008. ANZSRC was jointly developed by Statistics NZ with the Australian Bureau of Statistics to support the collection, analysis, and dissemination of research and development data. The purpose of research or socio-economic objective indicates which sectors of the economy will ultimately benefit from the research and development work being undertaken. Adopting this classification means that purpose of research data from the 2008 survey cannot be compared with previous surveys, but will ensure this will now be consistent with other information being collected about research and development in New Zealand and Australia.

These changes should be considered when comparing 2008 data with that from 2006. Additionally, some minor revisions have also been made to 2006 data concerning the classification of work between the business and government sectors.

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 higher education (universities) 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 2008. 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 ending 30 September 2008.

The higher education (universities) questionnaire was also sent in August 2008. Data was collected for the year ended 31 December 2007. The higher education (universities) questionnaire was designed to allow universities to use financial information that is generally produced for the purposes of annual reporting. This means that 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

The target population is all economically significant enterprises that perform or fund R&D in New Zealand.

Survey population

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

- are economically significant and active on the Statistics NZ Business Frame;
- are not classified to ANZSIC06 codes 'G', 'H', 'I' or 'P'
- are included in one of the two categories detailed below:

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 2007 Business Operations Survey or the previous two R&D Surveys (only from full coverage strata)
- units recording R&D activity in the 2007 Biotechnology Survey.

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 (tiers 1 and 2 on the Statistics NZ Business Frame include enterprises with GST turnover of greater than \$200,000).

Note: The exclusion of ANZSIC division codes 'H' (Accommodation and Food Services); 'G' (Retail Trade) and 'I' (Transport, Postal and Warehousing) is due to the previous equivalents of these industries showing little or no contribution to the total reported expenditure on R&D in the 2002 survey. Such contributions were considered too small to justify their inclusion in the survey population so the equivalent industries were also excluded from the 2004 and 2006 R&D surveys. ANZSIC division 'P' (Education and Training) has been excluded with the exception of universities, who perform the vast majority of R&D in this industry.

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, higher education (universities)) 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.

Sampling error

The sampling error on the total R&D expenditure figure has been measured at 2.1 percent at the 95 percent confidence level. There is no sampling error for the higher education (universities) sector due to the full coverage of this sector. While the government sector also had full coverage, the method of handling non-response through weight adjustments generates sampling error. Sampling errors for individual sectors or industries can be supplied upon request.

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). These methods are not without error.

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 a 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 sample for the R&D Survey 2008 consisted of 3,507 enterprises, plus the eight universities.

The target overall response rate for the R&D Survey 2008 was 85 percent for business, government, and CRIs. The survey achieved an actual response rate of 87 percent. The target overall response rate for the higher education (universities) 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 higher education (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 imputation was applied to those breakdowns where a total could be sourced from another question. The item non-response imputation method then used the mean proportion of all responding linked units (excluding outliers) 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* to allow 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 (M691) be changed to the industry they predominantly serve. The industry breakdowns have been applied using the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC06).

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

Higher education (universities)

The higher education (universities) 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 ANZSIC06 code of P810200 (Higher Education).

Published industries

The published industries within the business sector have been based on ANZSIC06 apart from the reclassification of significant scientific research organisations (M691) to the industry the predominately serve and the inclusion of local and state owned trading enterprises.

Business sector

Published industry – ANZSIC06 codes

Primary industries – A and B

Food, beverage and tobacco manufacturing – C11 and C12

Textile, clothing, footwear and leather manufacturing – C13

Petroleum, coal, chemical and associated product manufacturing – C17, C18 and C19

Non-metallic mineral product manufacturing – C20

Metal product manufacturing – C21 and C22

Machinery and equipment manufacturing – C23 and C24

Other manufacturing – C14, C15, C16 and C25

Wholesale trade – F

Scientific research and technical services – M691 and M692 (excluding M6924)

Computer services – M70

Other services – D to S excluding (F, M691, M6921, M6922, M6923, M6925, M70)

Government sector

Published industry – ANZSIC06 codes

Scientific research – M691

Other government research – All ANZSIC codes except M691

Higher education (universities) sector

Total universities.

Definitions

ANZSIC: Australian and New Zealand Standard Industrial Classification System.

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 (RME): 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: 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: Investigation undertaken 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: 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 NZ website.

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Timing

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Tables

The following table is printed with this Hot Off The Press and can also 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.

1. Research and development expenditure, by sector and published industry
2. Research and development expenditure as a proportion of GDP, by sector
- 3a. Research and development expenditure, by source of funds and recipient sector, 2008
- 3b. Research and development expenditure, by source of funds and recipient sector, 2006
- 4a. Research and development expenditure, by purpose of research and sector, 2008
- 4b. Research and development expenditure, by purpose of research and sector, 2006
5. Type of research and development by sector, 2008