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Statistics
New Zealand
TATAURANGA AOTEAROA

Research and Development in New Zealand



*Research and development activity,
employment and expenditure
in New Zealand*

2008

MINISTRY OF
RESEARCH
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TE HANATO POTAIAO

Statistics
New Zealand
TATAURANGA AOTEAROA

A graphic element consisting of a series of overlapping circles of varying sizes, arranged in a roughly vertical, slightly curved line, resembling a stylized map of New Zealand or a data visualization.A dark grey horizontal bar with a white circular icon containing a smaller dark grey circle, resembling a target or a lens.

Research and Development in New Zealand: 2008



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Citation

Statistics New Zealand (2009). *Research and Development in New Zealand: 2008*.
Wellington: Author

Published in June 2009 by

Statistics New Zealand	Ministry of Research, Science and Technology
Tātauranga Aotearoa	Te Manatu Putaiao
Wellington, New Zealand	Wellington, New Zealand

ISSN 1177-0295

Recommended retail price \$35.00 (including GST)

Preface

Research and Development in New Zealand: 2008 presents a statistical picture of research and development (R&D) in New Zealand in 2008. It is based on data collected in the R&D Survey 2008, which was conducted by Statistics New Zealand jointly with the Ministry of Research, Science and Technology.

R&D is important for economic growth and for sustaining a dynamic New Zealand economy that is capable of competing successfully on the international stage. R&D is also vital in addressing a range of socio-economic issues unique to New Zealand. The detailed statistics that the biennial R&D Survey provides are important for measuring and evaluating New Zealand's R&D performance. These statistics also provide a basis for benchmarking this R&D performance against other countries.

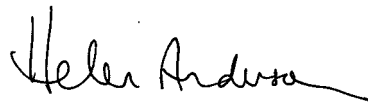
The R&D Survey 2008 collected information on business, government, and higher education (university) spending on R&D. Initial results from the survey were released on 28 April, 2009. This report contains more detailed results from the survey.

This survey included two key improvements that are a change from previous surveys. This is the first release of R&D survey statistics using the updated Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 version. Previous surveys used the earlier 1996 version. In addition, the information collected about purpose of research or socio-economic objective, was changed to be consistent with the breakdown in the Australian and New Zealand Standard Research Classification (ANZSRC) 2008. Further information can be found in chapter 7, 'technical documentation'.

Statistics New Zealand and the Ministry of Research, Science and Technology are grateful for the cooperation of the organisations that participated in the R&D Survey 2008.



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Information

This report was prepared jointly by Statistics New Zealand's Business Performance, Energy and Agriculture Business Unit and the Ministry of Research, Science and Technology (MoRST). It was published by the Product Development and Publishing Business Unit of Statistics New Zealand.

Statistics NZ and MoRST are grateful for the support of the New Zealand Vice-Chancellors' Committee and the participation of all respondents to the survey.

Further information on research, science, and technology policy can be found by visiting MoRST's website (www.morst.govt.nz).

For further information on the statistics in this report, or on other reports or products, contact Statistics NZ's Information Centre, details of which are given below.

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Percentage movements are, in a number of cases, calculated using data of greater precision than published. This could result in slight variations.

Rounding procedures

On occasion, figures are rounded to the nearest thousand or some other convenient unit. This may result in a total disagreeing slightly with the total of the individual items as shown in tables. Where figures are rounded the unit is in general expressed in words below the table headings, but where space does not allow this the unit may be shown as (000) for thousands, etc.

Data published from the R&D Survey 2008 is governed by the provisions of the Statistics Act 1975, which requires that all statistical information published by Statistics NZ must be arranged so as to prevent any individual respondent being identifiable. Cell suppression has been used to prevent the disclosure of sensitive information. For more information on Statistics NZ confidentiality rules, please see our website: www.stats.govt.nz.

All counts in this report have been randomly rounded to base 3 to protect the confidentiality of respondents. Totals are rounded independently of the components, and so not all components will add to the stated totals.

Source

All data is compiled by Statistics NZ, except where otherwise stated.

Symbols

The interpretation of the symbols used throughout this report is as follows:

- C figure not available as it is confidentialised
- R revised
- .. figure not available
- ... not applicable

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1 Guide to interpreting data

The following summary highlights the main points to consider when analysing the results of the Research and Development (R&D) Survey 2008. A full technical description of the survey is contained in chapter 7, 'Technical documentation'.

Background to the R&D Survey 2008

The R&D Survey 2008 was run by Statistics NZ 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 in the business, government, and higher education (university) sectors.

The R&D Survey 2008 follows a similar methodology used previously. The R&D Survey 2008 included two key improvements which are a change from previous R&D Surveys. This is the first release of R&D Survey statistics using the updated Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 version. Previous surveys used the earlier 1996 version. In addition, the information collected about purpose of research or socio-economic objective, was changed to be consistent with the breakdown in the Australian and New Zealand Standard Research Classification (ANZSRC) 2008. A description of these classifications is provided in chapter 7, 'Technical documentation'.

Definition of R&D

Statistics NZ uses the following definition of R&D, which is based on OECD guidelines for 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."

Data collection

The R&D Survey 2008 was conducted as a postal survey. The business, government and Crown Research Institute (CRI) questionnaires were posted out in August 2008 to collect information on the 2007/08 financial year. The university questionnaires were also posted out in August 2008, and collected information for the year ended December 2007.

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' Committee (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.

Nature of the survey

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 accounts of their R&D expenditure, or they may include R&D with other scientific and technological services, such as consulting. Records may not be kept in the form required for the survey and estimation may be required.

Detailed descriptions of what should and should not be included as R&D were provided on the questionnaire, and phone-in help was available to respondents.

Published sector and industry breakdowns

Published results have been created using classifications and frameworks recommended by the *OECD Frascati Manual 2002* to allow for international comparability with other Organisation for Economic Co-operation and Development (OECD) member country surveys. Full details of sector and industry breakdowns are provided in the technical documentation.

2 All sectors

A full set of statistical tables is available with this report. Please consult tables 1 to 5 in conjunction with this chapter.

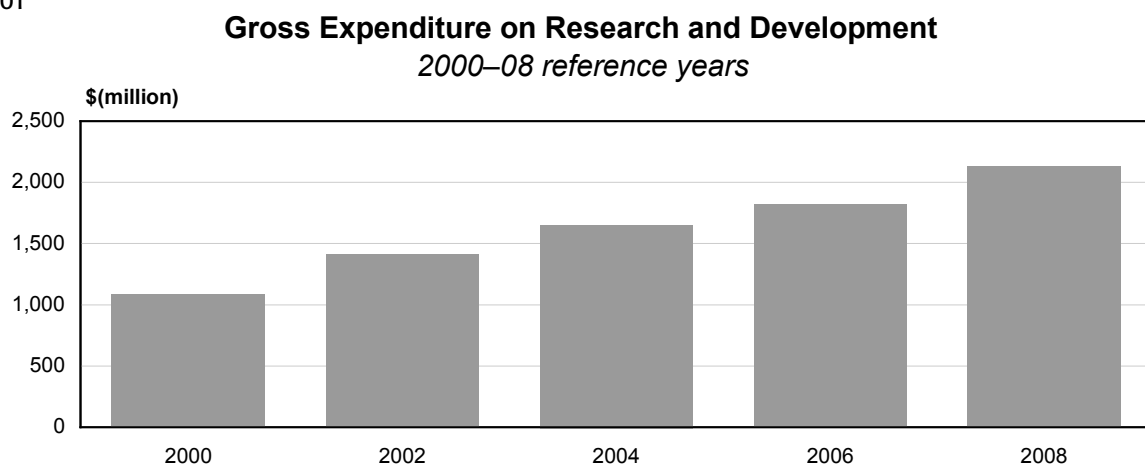
This chapter provides an overview of research and development (R&D) activity across all sectors in New Zealand for the 2008 reference year. It includes information about R&D expenditure across the economy, the sources of funding for R&D, and personnel engaged in R&D, as well as comparisons with previous survey periods and with the Organisation for Economic Co-operation and Development (OECD) data.

Gross expenditure on research and development (GERD)

Total R&D expenditure for the 2008 reference year was estimated at \$2,140 million. This compares with \$1,826 million for the 2006 reference year. The increase observed between the 2000 and 2004 reference years was partly due to earlier methodology changes.

Figure 2.01 illustrates GERD over the last five survey periods.

Figure 2.01



GERD by sector

R&D expenditure was measured in the business, government, and higher education sectors. Universities were the only tertiary education institutes included in the higher education sector in this survey. State-owned enterprises and private non-profit organisations were included in the business sector.

The business sector was responsible for 43 percent of all expenditure on R&D in New Zealand in the 2008 reference year. The government sector contributed 27 percent and the higher education sector made up the remaining 30 percent.

Table 2.01 shows GERD in New Zealand by sector from the 2000 reference year through to the 2008 reference year.

Table 2.01

Gross Expenditure on Research and Development By sector By reference year

Sector	2000	2002	2004	2006	2008
	\$(million)				
Business	324	524	677	760 R	913
Government	393	456	461	473 R	584
Higher education (universities)	374	436	522	593	643
Total	1091	1416	1660	1826	2140

Note: Due to rounding, figures may not sum to stated totals.

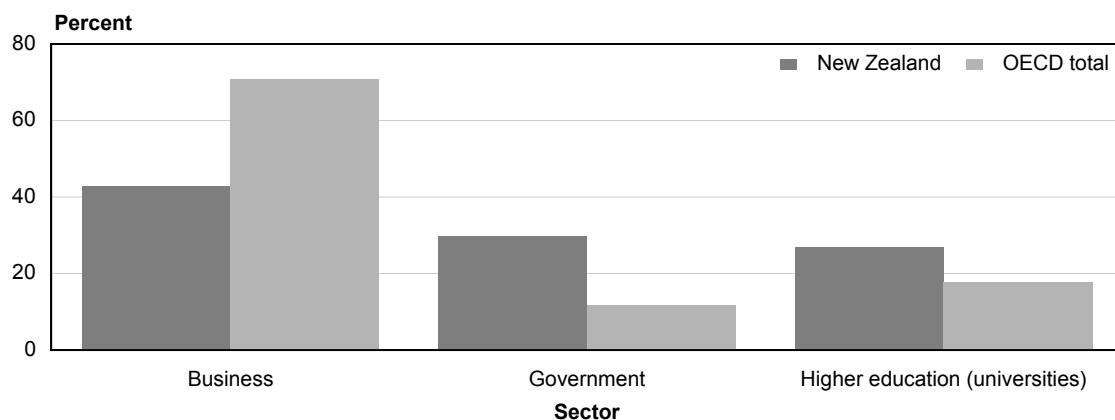
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Figure 2.02 compares the proportion of New Zealand R&D in each sector with the OECD total.

Figure 2.02

Sector Expenditure on Research and Development As a proportion of GERD⁽¹⁾ New Zealand and OECD total⁽²⁾



(1) Gross expenditure on research and development.

(2) 2008 reference year for New Zealand, 2006 reference year for OECD total.

GERD as a proportion of gross domestic product (GDP)

R&D expenditure was 1.20 percent of GDP in the 2008 reference year, compared with 1.16 percent of GDP in 2006. The OECD total was 2.26 percent in the 2006 reference year.¹ Table 2.02 shows GERD as a proportion of GDP in New Zealand over the last five survey periods.

Table 2.02

Gross Expenditure on Research and Development as a Proportion of GDP ⁽¹⁾ By reference year

	2000	2002	2004	2006	2008
	\$(million)				
GERD	1,091	1,416	1,660	1,826	2,140
GDP	109,639	124,644	139,938	157,397	178,063
	Percent				
GERD as percentage of GDP	1.00	1.14	1.19	1.16	1.20

(1) Statistics New Zealand GDP current price expenditure measure, year ended 31 March.

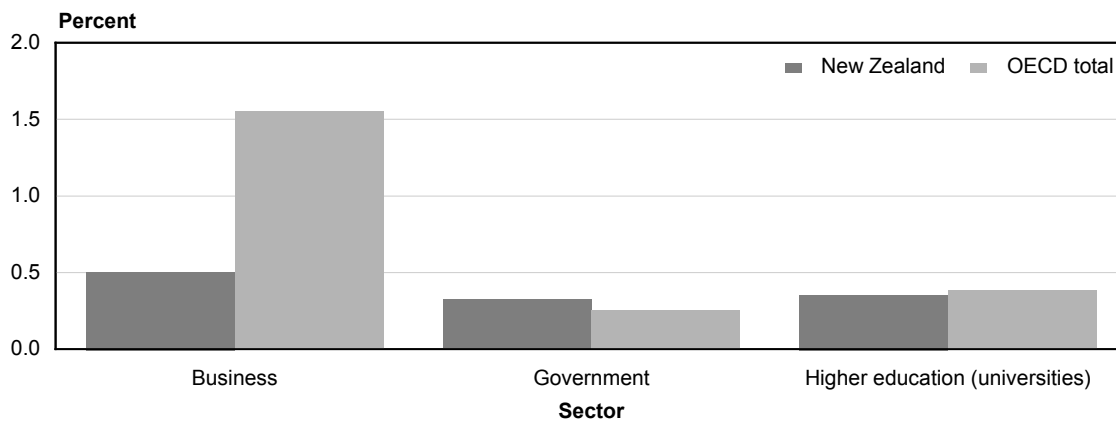
Figure 2.03 shows the expenditures on R&D in the business, government, and higher education sectors as a proportion of GDP, and compares these with the OECD total.

Figure 2.03

Research and Development Expenditure as a Proportion of GDP

By sector

New Zealand and OECD total⁽¹⁾



(1) 2008 reference year for New Zealand, 2006 reference year for OECD total.

Table 2.03 compares GERD as a proportion of GDP in New Zealand with the OECD total and selected reference countries.

¹ OECD Statistical Databases, (2008).

Table 2.03

Gross Expenditure on Research and Development as a Proportion of GDP

Selected OECD countries and OECD total⁽¹⁾

Country	Percent
Australia	2.01
Denmark	2.46
Finland	3.45
Ireland	1.32
Norway	1.52
Sweden	3.74
OECD total	2.26
New Zealand ⁽²⁾	1.16

(1) Calculated from purchasing power parity values, OECD statistical databases, 2008.

Data for OECD total and selected OECD countries is for the 2006 reference year

(2) 2008 reference year.

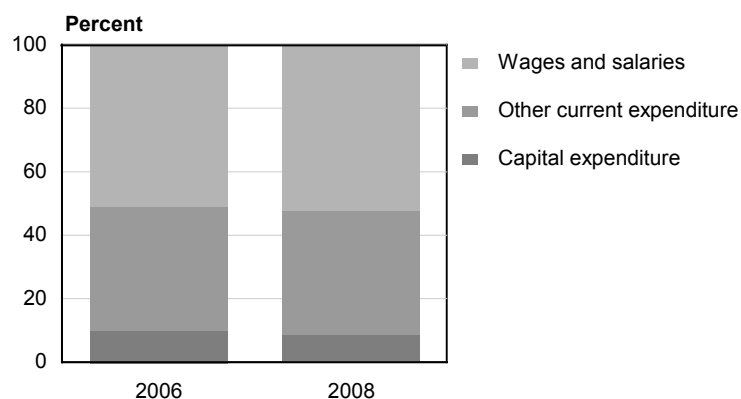
GERD by type of expenditure

Wages and salaries represented 52 percent of R&D expenditure in the 2008 reference year. Other current expenditure (including consumables and overheads incurred by direct and indirect R&D support activities) accounted for a further 39 percent, and capital expenditure on R&D contributed the remaining 9 percent.

Figure 2.04 shows the distribution of R&D expenditure across the three expenditure types in the 2006 and 2008 reference years. In terms of dollar value, R&D expenditure increased for wages and salaries (up 22 percent), other current expenditure (up 15 percent), and capital expenditure (up 4 percent).

Figure 2.04

Research and Development Expenditure in New Zealand 2006 and 2008 reference years



GERD by type of research

GERD is split into three main types of research:

- basic research
- applied research
- experimental development.

Note that for the government and university sectors, basic research is broken down further into pure basic research and targeted basic research. For definitions of the types of research, see chapter 7, 'Technical documentation'.

Table 2.04 shows GERD by type of research for the 2008 reference year. Of the \$2,140 million spent on R&D in the 2008 reference year, 35 percent was spent on experimental development, 34 percent on applied research, and 30 percent on basic research.

Table 2.04

Gross Expenditure on Research and Development

By type of research⁽¹⁾

2008 reference year

Type of research	\$(million)	Percent
Basic ⁽²⁾	650	30
Applied	730	34
Experimental	760	35
Total	2,140	100

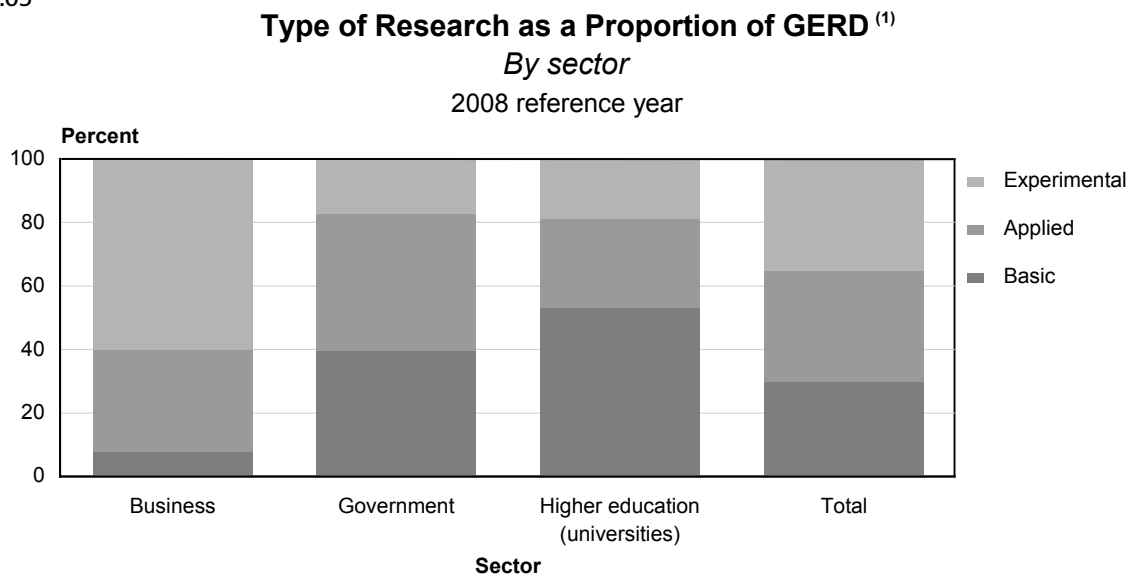
(1) See the technical documentation for definitions of the different types of research.

(2) Basic research is an aggregate of the basic research category in the business sector, and the pure basic and targeted basic research types in the government and higher education sectors.

Note: Due to rounding, some figures may not add to stated totals.

Figure 2.05 shows the distribution of R&D expenditure across the three types of research in the business, government, and higher education sectors in the 2008 reference year.

Figure 2.05



(1) Gross expenditure on research and development.

(2) 2008 reference year for New Zealand, 2006 reference year for OECD total.

In terms of dollar value, most sectors recorded an increase of between 12 and 34 percent, between the 2006 and 2008 reference years by type of research. In this period, 34 percent and 25 percent increases were recorded for government sector and business sector experimental research, respectively. Between those same reference periods, applied research expenditure for the higher education sector and basic research for business sector decreased 4 percent and 3 percent, respectively. Overall, experimental, basic, and applied research expenditure increased 21 percent, 18 percent, and 13 percent, respectively.

GERD by socio-economic objective

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 about the purpose of research being undertaken. This change will facilitate more consistent reporting of R&D activities for New Zealand and Australia.

The largest amount 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 being 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.

Table 2.05 shows the distribution of GERD by socio-economic objective in the 2008 reference year.

Table 2.05

Gross Expenditure on Research and Development
By socio-economic objective
2008 reference year

Socio-economic objective	\$(million)	Percent
Primary industries	398	19
Energy	96	4
Manufacturing	356	17
Construction and transport	108	5
Information and communication services	207	10
Commercial services and tourism	51	2
Health	283	13
Education and training	85	4
Law, politics and community services	35	2
Cultural understanding	49	2
Economic framework	51	2
Environment	276	13
Other ⁽²⁾	61	3
Knowledge – general ⁽³⁾	83	4
Total	2,140	100

(1) 2008 based on Australia New Zealand Standard Research Classification 2008.

(2) Includes defence and other research purposes.

(3) Research that is undertaken by universities that does not relate to a specific socio-economic objective.

Note: Due to rounding, some figures may not add to stated totals.

Source of funds

Respondents were asked to report the source of funds for their stated R&D expenditure.

Table 2.06 shows the sources of funds for R&D for the 2008 reference year.

Table 2.06

Research and Development Funding
By source of funds
2008 reference year

Source of funds	\$(million)	Percent
NZ business	859	40
NZ government ⁽¹⁾	912	43
NZ universities	187	9
Overseas	103	5
Other funding sources	79	4
Total	2,140	100

(1) Includes New Zealand local government agencies.

Note: Due to rounding, some figures may not add to stated totals.

The proportion of R&D funding provided by the government in New Zealand in 2008, at 43 percent, is significantly higher than the OECD total of 29 percent in 2006. Conversely, New Zealand businesses funded just 40 percent of R&D in 2008, compared with the OECD average of 64 percent for the 2006 OECD balance year.²

Figure 2.06 compares the levels of funding of R&D in New Zealand in each of the sectors where R&D was carried out. The government sector funded 43 percent of all R&D in New Zealand, and carried out 27 percent of all R&D in the 2008 reference year. The business sector funded 40 percent and carried out 43 percent, and the higher education sector funded 9 percent, and carried out 30 percent. The remaining 9 percent of funding came from overseas and other sources.

Figure 2.06

Research and Development in New Zealand by Research Sector
By source of funding and expenditure
 2008 reference year

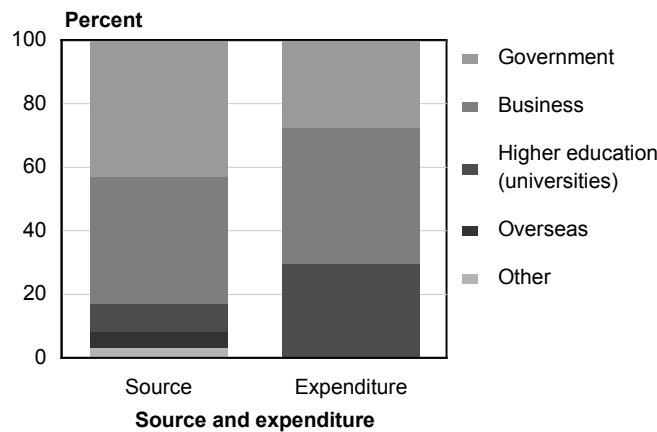
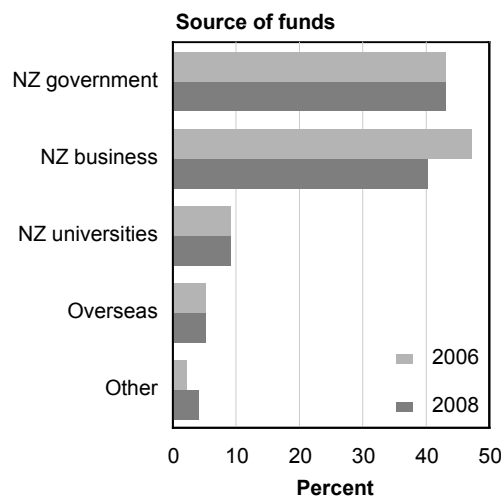


Figure 2.07 shows the source of funds for R&D expenditure in the 2006 and 2008 reference years.

Figure 2.07

Source of Funds for Research and Development
2006 and 2008 reference years



² OECD Statistical Databases, (2008).

Collaboration among sectors

Collaboration among sectors allows different types of organisations to share knowledge, skills, and resources for the purpose of R&D.

The R&D Survey 2008 collected information on the value of R&D activities that were funded by one sector but carried out in a different sector, as a measure of collaboration among sectors.

Table 2.07 shows that 20 percent of government R&D and 3 percent of higher education R&D was funded by New Zealand businesses, while 9 percent of R&D in the business sector and 63 percent of R&D in the higher education sector was funded by the government sector. Overseas sources funded 6 percent of R&D carried out in the business sector and 5 percent of government R&D.

Table 2.07

Source of Funds for Research and Development

By research sector
2008 reference year

Source of funds	Research sector			
	Business	Government	Higher education	Total
	\$(million)			
NZ business	725	114	20	859
NZ government ⁽¹⁾	80	429	403	912
NZ universities	2	8	177	187
Overseas	54	27	22	103
Other funding sources	52	5	22	79
Total	913	584	643	2,140
	Percent			
NZ business	79	20	3	40
NZ government ⁽¹⁾	9	74	63	43
NZ universities	0	1	27	9
Overseas	6	5	3	5
Other funding sources	6	1	3	4
Total	100	100	100	100

(1) Includes New Zealand local government agencies.

Note: Due to rounding, some figures may not add to stated totals.

R&D personnel

R&D personnel information was collected on both a headcount and full-time equivalent worker (FTE)³ basis. This data was classified by occupational groups (researchers, technicians, and support staff) and highest qualification levels.

The number of R&D staff was estimated at 24,700 FTEs in the 2008 reference year. Researchers made up 74 percent of this total, followed by technicians (15 percent), and the remaining 11 percent were support staff.

Table 2.08 compares the number of R&D FTEs in the 2006 and 2008 reference years.

Table 2.08

Personnel Involved in Research and Development
Full-time equivalents (FTEs) by occupation
By reference year

Occupation	2006		2008	
	FTEs	Percent	FTEs	Percent
Researchers	8,800	38	10,000	40
Student researchers	8,500	37	8,300	34
Total researchers	17,200	74	18,300	74
Technicians	3,200	14	3,800	15
Support staff	2,800	12	2,600	11
Total	23,100	100	24,700	100

Note: Due to rounding, some figures may not add to stated totals.

Table 2.09 shows that 66 percent of personnel involved in R&D in 2008 held a bachelor's degree or higher qualification (excluding doctorate) and 17 percent held a doctorate.

Table 2.09

Personnel Involved in Research and Development
Full-time equivalents (FTEs) by highest qualification
2008 reference year

Qualification	FTEs	Percent
PhD	4,100	17
Bachelor's degree / postgraduate ⁽¹⁾	16,200	66
Technical and trade ⁽²⁾	2,100	9
Other qualification	2,300	9
Total	24,700	100

(1) Bachelor's degrees or equivalent, and postgraduate qualifications other than PhD. All postgraduate research students in the higher education sector were included in this group.

(2) Technical and trade qualifications, eg New Zealand Certificate of Engineering or Science, or New Zealand Trade Certificate.

Note: Due to rounding, some figures may not add to stated totals.

³ The headcount of R&D personnel included a count of all personnel involved in research activities. The FTE measure takes into account each person's total working time spent on research activities. For example, a full-time employee spending half their time on research activities during the year would contribute 0.5 towards the FTE measure.

Biotechnology R&D

The R&D Survey 2008 collected information about biotechnology related R&D expenditure, as a proportion of total R&D expenditure. Biotechnology data is collected as biotechnology is viewed as an important part of the New Zealand economy.

Seventy-four businesses engaged in biotechnology R&D activities during the 2008 reference year, along with 14 government sector respondents, and the eight universities that make up the higher education sector. In 2006, there were 12 government sector biotechnology respondents while in the business sector there were 87 respondents.

Total biotechnology R&D expenditure was \$313 million for the 2008 reference year, equivalent to 15 percent of total R&D expenditure.

Table 2.10 shows biotechnology R&D expenditure by sector, and as a proportion of total R&D expenditure.

Table 2.10

Biotechnology Research and Development Expenditure

By sector
2008 reference year

Sector	Biotechnology R&D	Sector R&D expenditure	Biotechnology R&D as a proportion of sector R&D
	\$ (million)		Percent
Business	88	913	10
Government	132	584	23
Higher education	93	643	14
Total	313	2140	15

Note: Due to rounding, some figures may not add to stated totals.

The biotechnology R&D expenditure fell 5 percent from the 2006 reference year. This decrease, which resulted from decreases in the higher education sector, was offset partly by an increase in the government sector.

3 Business sector

Additional tables are available with this report. Please consult tables 6 to 18 in conjunction with this chapter.

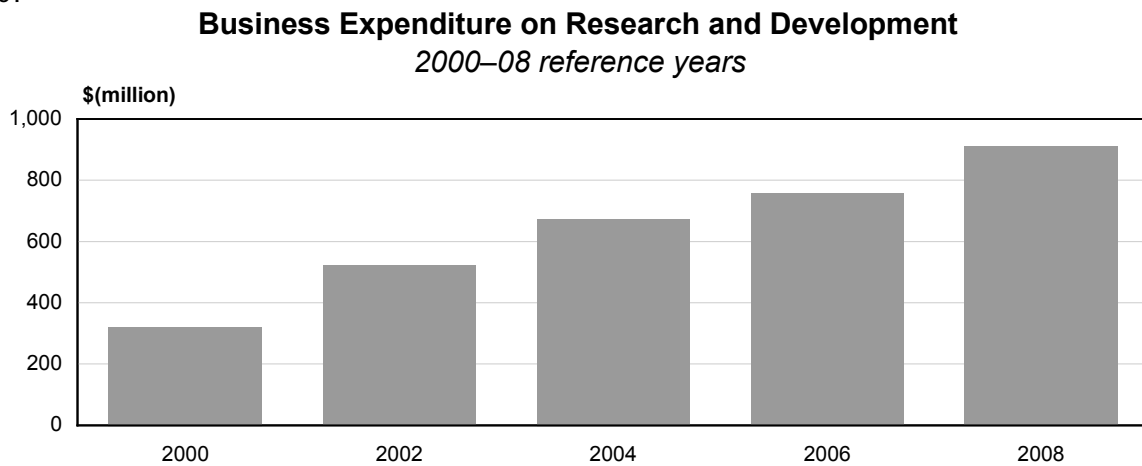
This chapter examines R&D in the business sector in the 2008 reference year. It includes measures of business expenditure on R&D, sources of funds for business R&D, R&D personnel, and the purposes of R&D activities. State-owned enterprises and private non-profit organisations are included in the business sector.

Business expenditure on R&D

Total business expenditure on R&D (BERD) for the 2008 reference year was estimated at \$913 million. This is a 20 percent increase from \$760 million in the 2006 reference year.

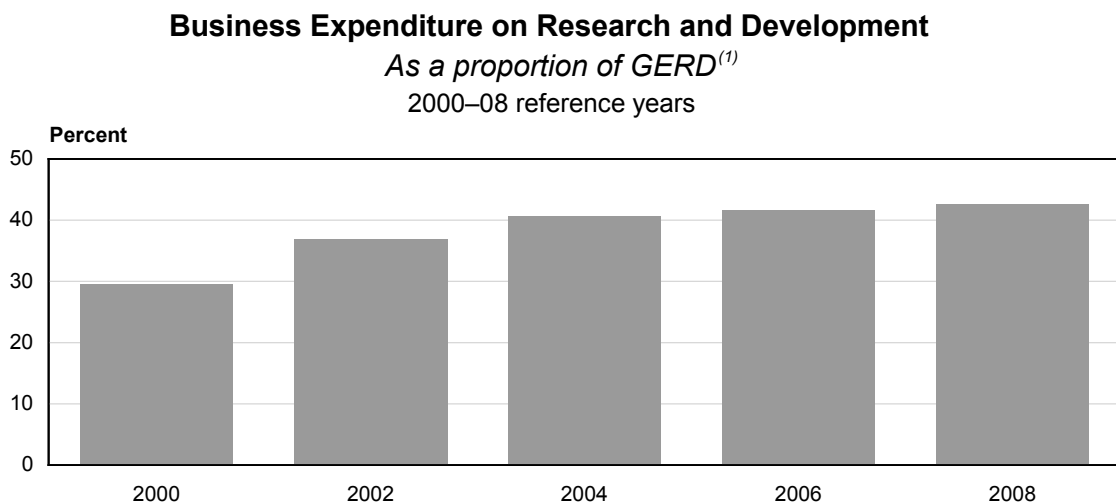
Figure 3.01 shows BERD over the last five survey periods.

Figure 3.01



BERD represented 43 percent of gross expenditure on R&D (GERD) in the 2008 reference year, a similar proportion to the 42 percent in the 2006 reference year. Figure 3.02 shows BERD as a proportion of GERD over the last five survey periods.

Figure 3.02



(1) Gross expenditure on research and development.

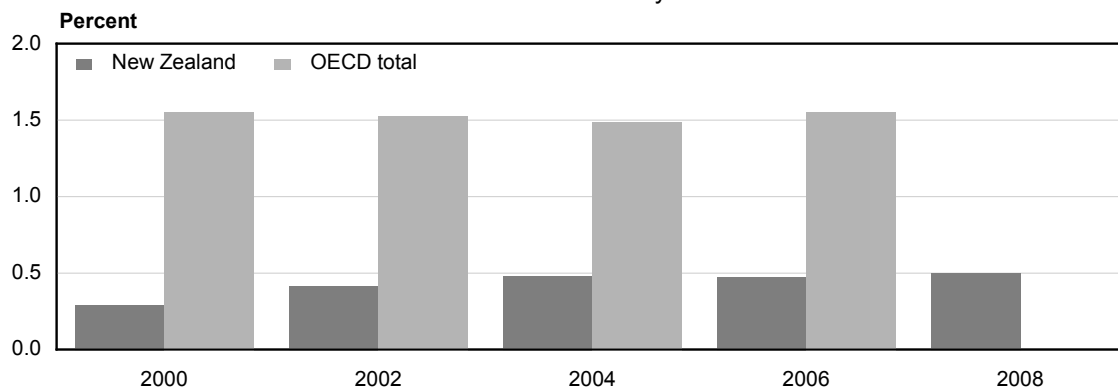
BERD as a proportion of gross domestic product

Business expenditure on R&D as a percentage of GDP was 0.51 percent in the 2008 reference year. This compares with 0.48 percent in the 2006 reference year. The OECD total was 1.56 percent in the 2006 reference year.¹

Figure 3.03 compares BERD as a proportion of GDP in New Zealand with the OECD total, by reference year. Over the last five reference periods, New Zealand BERD as a percentage of GDP has been well below the OECD total.

Figure 3.03

Business Expenditure on Research and Development as a Proportion of GDP New Zealand and OECD total⁽¹⁾ 2000–08 reference years



(1) OECD data not available for the 2008 reference year.

Table 3.01 compares BERD as a proportion of GDP in New Zealand with selected OECD results.

Table 3.01

Business Expenditure on Research & Development as a Proportion of GDP Selected OECD countries and OECD total⁽¹⁾

Country	Percent
Australia	1.15
Denmark	1.65
Finland	2.46
Ireland	0.89
Norway	0.82
Sweden	2.79
OECD total	1.56
New Zealand ⁽²⁾	0.51

(1) Calculated from purchasing power parity values, OECD statistical databases, 2008. Data for OECD total and selected OECD countries is for the 2006 reference year.

(2) 2008 reference year.

1 OECD Statistical Databases, "Main Science and Technology Indicators", Volume 2008–2, www.oecd.org [May 2007].

BERD by industry

In the 2008 reference year, 48 percent of BERD was carried out by manufacturing industries. Service industries represented 44 percent of business R&D expenditure, and primary industries contributed the remaining 8 percent.

Figure 3.04 shows the distribution of BERD across the primary, service, and manufacturing industries in the 2006 and 2008 reference years.

Figure 3.04

Business Expenditure on Research and Development Proportion by industry 2006 and 2008 reference years

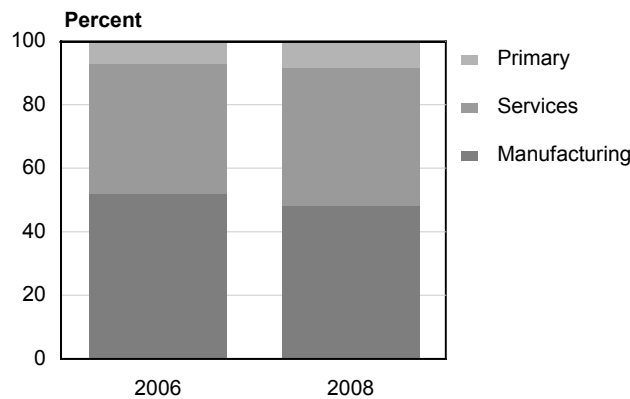


Table 3.02 shows that R&D expenditure increased in the primary, manufacturing, and service industries between the 2006 and 2008 reference years. Expenditure increased in the primary (up 38 percent), service (up 28 percent), and manufacturing (up 11 percent) industries between the 2006 and 2008 reference years.

Table 3.02

Business Expenditure on Research and Development By industry By reference year

Industry	2006		2008	
	\$(million)	Percent	\$(million)	Percent
Primary	52	7	72	8
Manufacturing	398	52	442	48
Services	310 R	41 R	398	44
Total	760 R	100	913	100

Note: Due to rounding, some figures may not add to stated totals.

Symbol:

R revised

BERD by size of business

Table 3.03 compares the R&D expenditure of smaller and larger businesses in the 2006 and 2008 reference years. Business size is measured according to the rolling mean employment (RME) measure from Statistics NZ's Business Frame.

Table 3.03

Business Expenditure on Research and Development
By industry and firm size
 By reference year

Industry	RME ⁽¹⁾ less than 50		RME ⁽¹⁾ 50 or greater	
	2006	2008	2006	2008
	\$(million)			
Primary	22	35	30	37
Manufacturing	125	164	273	278
Services	206	257	104 R	141
Total	352	456	407 R	457

(1) RME rolling mean employment.

Symbol:

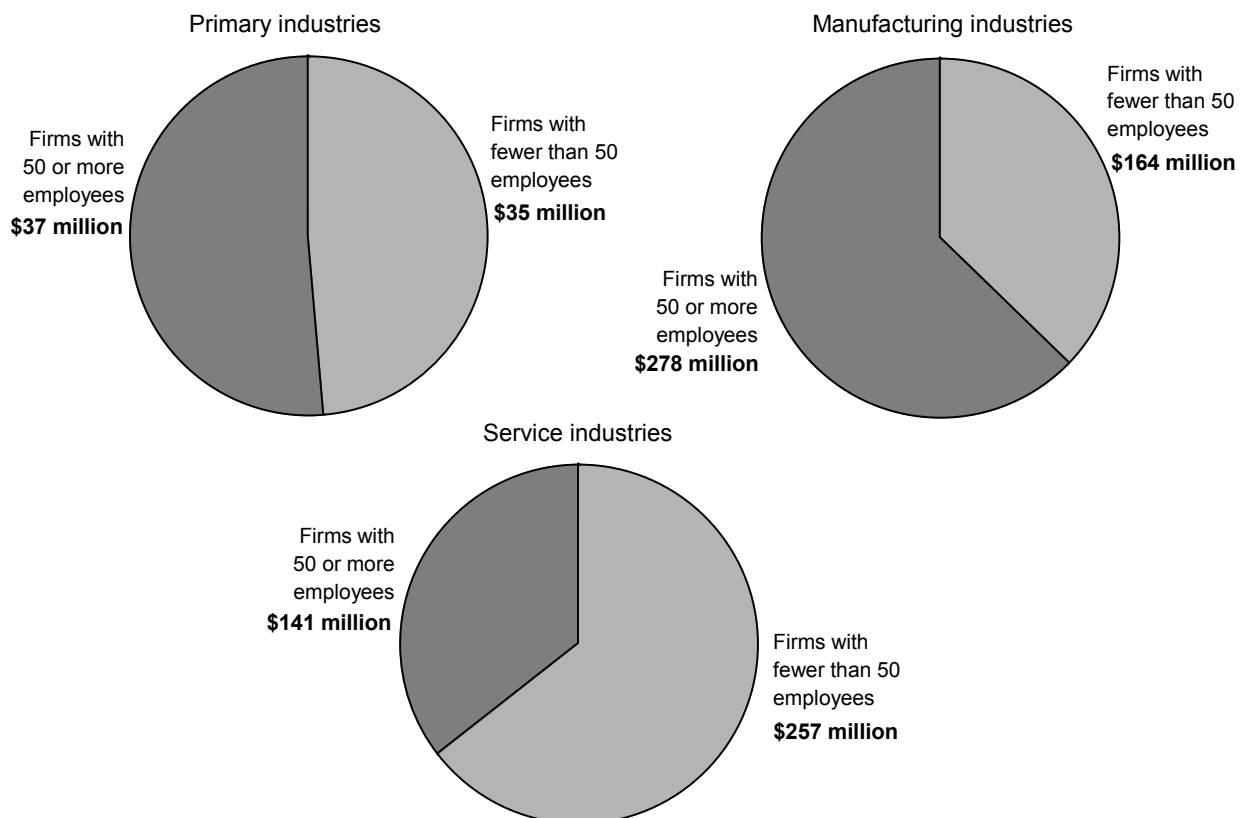
R revised

Note: Due to rounding, some figures may not add to stated totals.

Business expenditure on R&D is equally split between the larger and smaller businesses in the 2008 reference year. For the smaller businesses, firms were concentrated in the service industries, which represented 56 percent of R&D expenditure in this group. For the larger businesses, firms were largely centred in the manufacturing industry (61 percent of this group). Figure 3.05 shows R&D spending by firms in each size category in the primary, manufacturing, and service industries, respectively.

Figure 3.05

Business Expenditure on Research and Development
By firm size and industries
 2008 reference year



BERD by type of expenditure

Wages and salaries accounted for 54 percent of BERD in the 2008 reference year, and other current expenditure (consumables and overheads) represented a further 36 percent. Capital expenditure on land and buildings represented just 2 percent of BERD, while other capital expenditure (including plant, machinery, vehicles, capitalised software, and other assets) accounted for 8 percent.

Figure 3.06 shows that BERD by type of expenditure has remained relatively consistent over the last four survey periods.

Figure 3.06

Business Expenditure on Research and Development
By type of expenditure
2000–08 reference years



BERD by type of research

Business expenditure on R&D was split into three types of research, as shown in figure 3.07. Experimental development accounted for \$543 million (59 percent), applied research for \$295 million (32 percent), and basic research for \$74 million (9 percent) in the 2008 reference year. See chapter 7 ‘Technical documentation’ for definitions of the three types of research.

Figure 3.07

Business Expenditure on Research and Development
By type of research
2008 reference year

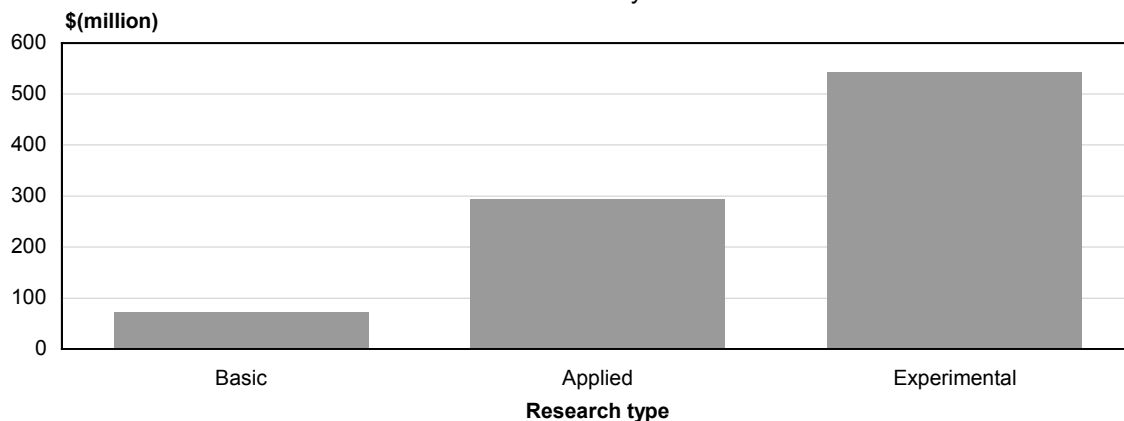


Table 3.04 shows BERD in the 2008 reference year by industry and the type of research.

Table 3.04

Business Expenditure on Research and Development
By industry and type of research
 2008 reference year

Industry	Type of research			
	Basic	Applied	Experimental	Total
	\$(million)			
Primary	12	35	25	72
Manufacturing	30	140	272	442
Services	32	120	246	398
Total	74	295	543	913

Note: Due to rounding, some figures may not add to stated totals.

BERD by socio-economic objective

Business expenditure on R&D was classified according to the socio-economic objectives guiding R&D activities.

The major contributors to BERD in the 2008 reference year were purposes related to manufacturing, information and communication services, and health.

Table 3.05

Business Expenditure on Research and Development
By socio-economic objective
 2008⁽¹⁾ reference year

Socio-economic objective	\$(million)	Percent
Plant production and plant primary products	40	4
Animal production and animal primary products	83	9
Mineral resources (excluding energy)	11	1
Energy	54	6
Manufacturing	283	31
Construction	46	5
Transport	1	3
Information and communication services	163	18
Commercial services and tourism	20	2
Health	110	12
Education and training	9	1
Law, politics and community services	3	0
Cultural understanding	2	0
Economic framework	6	1
Environment	21	2
Defence	10	1
Other	25	3
Total	913	100

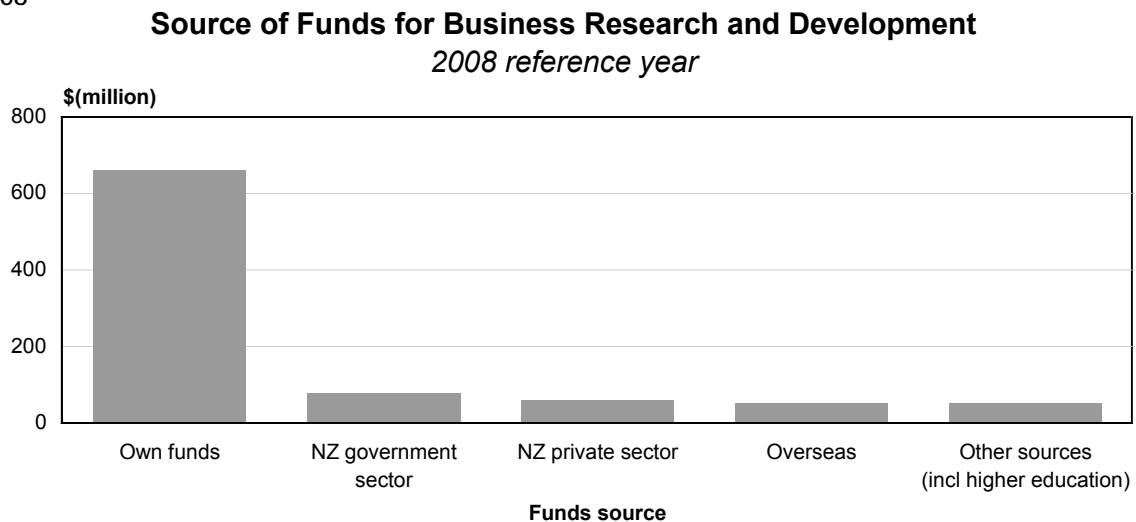
(1) 2008 based on Australia New Zealand Standard Research Classification 2008.

Note: Due to rounding, some figures may not add to stated totals.

Source of funds

Figure 3.08 shows that in the 2008 reference year, 80 percent of R&D expenditure in the business sector came from businesses' own funds, 9 percent was funded by the government sector, 6 percent was funded by overseas sources, and 6 percent was funded by other sources. BERD funded by businesses' own funds increased 21 percent from \$549 million in 2006 to \$663 million in 2008.

Figure 3.08



R&D personnel

There were 8,100 FTEs involved in business R&D in the 2008 reference year, comprising 4,700 researchers, 2,200 technicians, and 1,200 support staff. Manufacturing and service industries accounted for 94 percent of business FTEs.

The increased number of FTEs in the 2008 reference year in business R&D was consistent with the increase in funding for R&D across the business sector.

Table 3.06

Personnel Involved in Business Research and Development
Full-time equivalent (FTEs) by occupation
By reference year

Occupation	2006		2008	
	FTEs	Percent	FTEs	Percent
Researchers	3,700 R	61	4,700	58
Technicians	1,500	25	2,200	27
Support staff	940 R	15	1,200	15
Total	6,100 R	100	8,100	100

Note: Due to rounding, some figures may not add to stated totals.

Symbol:

R revised

More than half of business R&D staff in the 2008 reference year held a bachelor's degree or postgraduate qualification other than a doctorate degree as their highest qualification. Around 9 percent had a doctorate degree, a 26 percent increase from the 564 PhDs in the 2006 reference year.

Table 3.07

Personnel Involved in Business Research and Development
Full-time equivalent (FTEs) by industry and occupation
 2008 reference year

Industry	Occupation			
	Researcher	Technician	Support	Total
	FTEs			
Primary	310	60	150	530
Manufacturing	2,200	1,100	500	3,800
Services	2,200	1,100	580	3,800
Total	4,700	2,200	1,200	8,100
	Percent			
Primary	7	3	13	7
Manufacturing	47	50	42	47
Services	47	50	48	47
Total	100	100	100	100

Note: Due to rounding, some figures may not add to stated totals.

Table 3.08

Personnel Involved in Business Research and Development
Full-time equivalent (FTEs) by highest qualification
 2008 reference year

Qualification	FTEs	Percent
PhD	710	9
Bachelor's degree / postgraduate ⁽¹⁾	4,600	57
Technical and trade ⁽²⁾	1,500	19
Other qualification	1,300	16
Total	8,100	100

(1) Bachelor's degree or equivalent, and postgraduate qualifications other than PhD.

(2) Technical and trade qualifications, eg New Zealand Certificate of Engineering or Science, or New Zealand Trade Certificate.

Note: Due to rounding, some figures may not add to stated totals.

Businesses' expectations of BERD

Table 3.09 shows that in the 2008 reference year, more than half (55 percent) of businesses indicated that they would not reduce the amount of R&D in the next financial year. Only 13 percent of businesses would decrease the amount of R&D.

Table 3.09

Expectation for Amount of Research and Development in Next Financial Year
 2008 reference year

	Percent
Decrease	13
Stay the same	22
Increase	33
Don't know or not answered	31

Note: Due to rounding, some figures may not add to stated totals.

4 Government sector

Additional tables are available with this report. Please consult tables 19 to 26 in conjunction with this chapter.

This chapter presents information about government expenditure on research and development (R&D) during the 2008 reference year. It includes information about government expenditure and government funding of R&D, the source of funds for government R&D, the purposes of government R&D, and personnel involved in government R&D.

The government sector includes New Zealand central government ministries and departments, Crown entities (including the Crown Research Institutes), Crown-owned companies, government funding agencies, and local government organisations. The government sector does not include state-owned enterprises. They are included in the business sector.

Total government R&D funding

In the 2008 reference year, the New Zealand government sector carried out \$584 million of R&D. This is a dollar-value increase of \$111 million (23 percent) on the 2006 reference year. In the same period, the government sector funded \$912 million of R&D. This is a dollar-value increase of \$123 million (16 percent) on the 2006 reference year.

Government expenditure on R&D

GOVERD was estimated at \$584 million for the 2008 reference year. This was 27 percent of all R&D expenditure during this period.

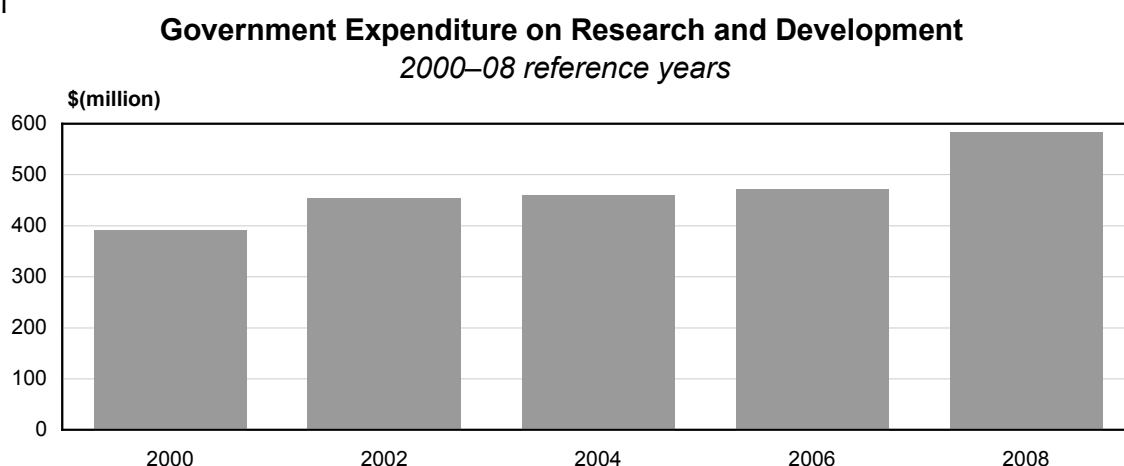
This compares with \$473 million GOVERD in the 2006 reference year, and \$461 million in the 2004 reference year.

Crown Research Institutes accounted for 82 percent of government R&D activity in the 2008 reference year.

The Foundation for Research, Science and Technology (www.frst.govt.nz) and the Crown Company Monitoring Advisory Unit (www.ccm.au.govt.nz) are useful resources for information on Crown Research Institutes' activity and funding.

Figure 4.01 shows GOVERD across the last five survey periods.

Figure 4.01



While GOVERD has increased over each of the last five survey periods, GOVERD as a proportion of total R&D expenditure has generally decreased over the same period. This is due to increases in business expenditure on R&D over this time, see chapter 3 'Business sector'.

Figure 4.02 shows GOVERD as a proportion of GERD over the last five survey periods.

Figure 4.02

Government Expenditure on Research and Development
As a proportion of GERD⁽¹⁾
2000–08 reference years



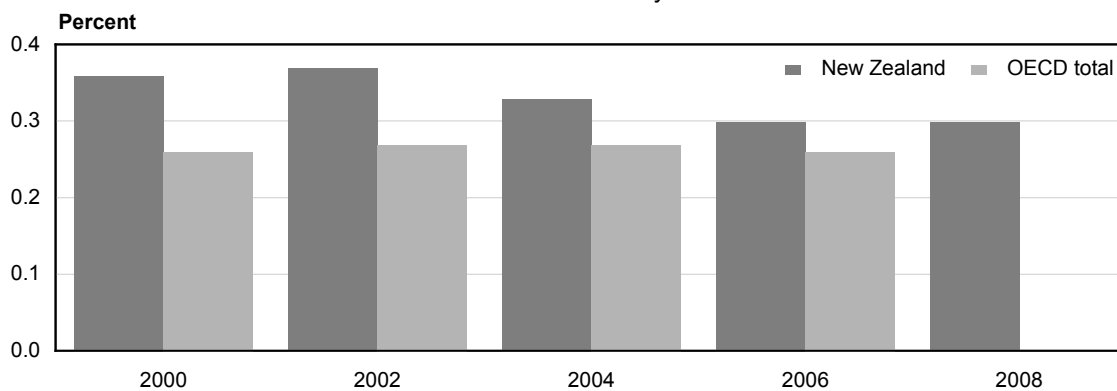
(1) Gross expenditure on research and development.

GOVERD as a proportion of GDP

Figure 4.03 shows GOVERD as a proportion of GDP over the past five survey periods. In the 2008 reference year, GOVERD represented 0.33 percent of GDP. This is the fifth highest proportion in the OECD, and higher than the 2006 OECD total GOVERD as a proportion of GDP (0.26 percent), the most recent figure available (OECD Main Science and Technology Indicators 2008/2).

Figure 4.03

Government Expenditure on Research and Development as a Proportion of GDP
New Zealand and OECD total⁽¹⁾
2000–08 reference years



(1) OECD total not available for the 2008 reference year.

Table 4.01 shows GOVERD as a percent of GDP for New Zealand, selected reference countries, and the total OECD.

Table 4.01

Government Expenditure on Research and Development as a Proportion of GDP
Selected OECD countries and OECD total⁽¹⁾

Country	Percent
Australia	0.28
Denmark	0.16
Finland	0.32
Ireland	0.09
Norway	0.24
Sweden ⁽²⁾	0.17
OECD total	0.26
New Zealand⁽³⁾	0.33

(1) Calculated from purchasing power parity values, OECD statistical databases, 2008. Data for OECD total and selected OECD countries is for the 2006 reference year

(2) Federal and central government only.

(3) 2008 reference year.

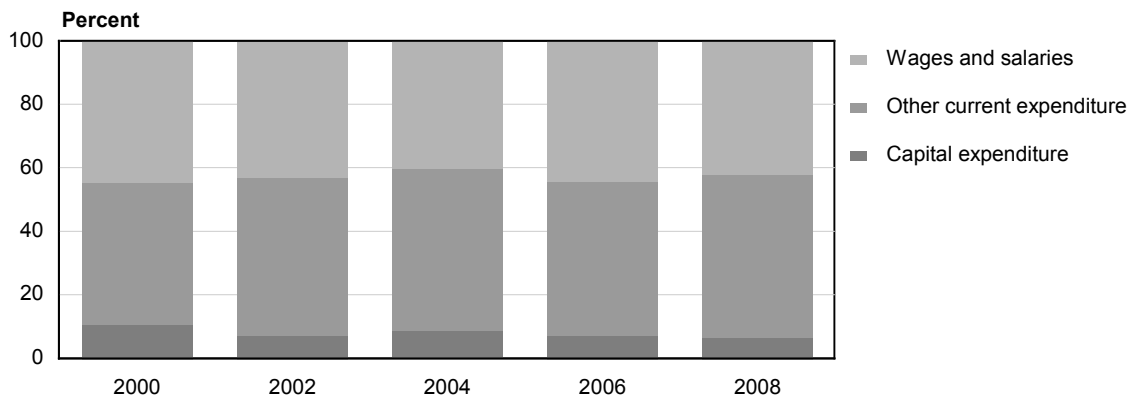
GOVERD by type of expenditure

Over 93 percent of the \$584 million GOVERD in the 2008 reference year was current expenditure. Wages and salaries accounted for \$245 million (42 percent), and a further \$299 million (51 percent) was other current expenditure. Capital expenditure on land and buildings accounted for \$15 million (3 percent) while capital expenditure on other items totalled \$25 million (4 percent).

Figure 4.04 shows the proportions of GOVERD attributable to wages and salaries, other current expenditure, and capital expenditure.

Figure 4.04

Government Expenditure on Research and Development
By type of expenditure
2000–08 reference years



The proportions of GOVERD by type of expenditure do not vary significantly over the five survey periods. Within the ordinary level of variation that exists over this period, capital expenditure figures are the least stable, and wages and salaries expenditure figures are the most stable, on the basis of analysis of standard deviations. In terms of dollar value, wages and salaries expenditure has increased 18 percent, other current expenditure has increased 32 percent, and capital expenditure has increased 14 percent, from the 2006 reference year to the 2008 reference year.

GOVERD by type of research

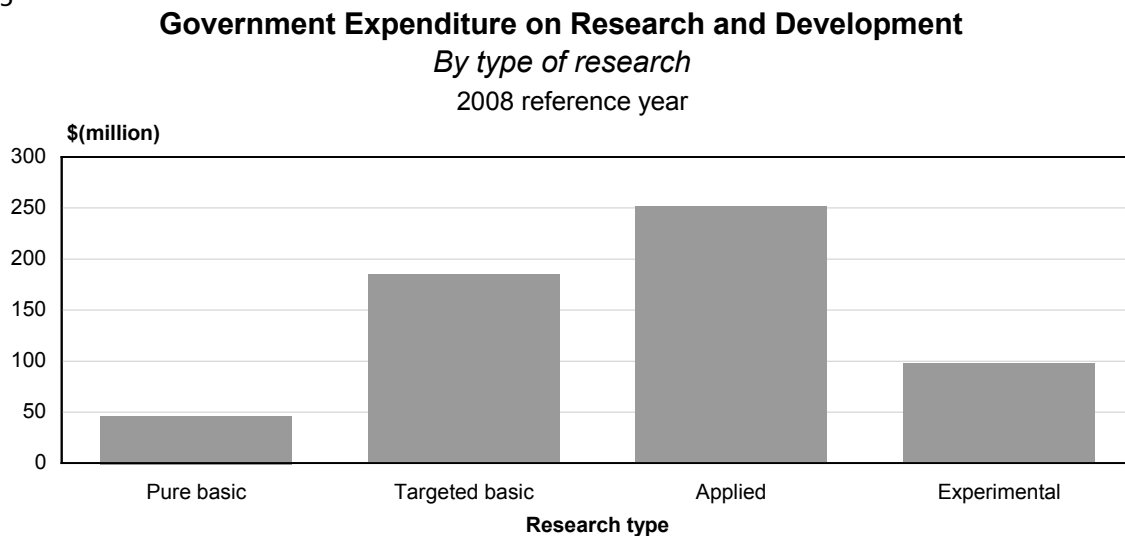
Government expenditure on R&D in the 2008 reference year can be split into four types of research, based on the *OECD Frascati Manual 2002* type of research definitions:

- pure basic
- targeted basic
- applied
- experimental development.

Applied research represented \$253 million (43 percent) of government expenditure on R&D, and targeted basic research accounted for a further \$186 million (32 percent). Experimental development was \$98 million (17 percent) of government expenditure on R&D, and pure basic research accounted for the remaining \$47 million (8 percent).

See chapter 7 'Technical documentation' for more information about the type of research definitions.

Figure 4.05



Dollar-value increases were recorded for all types of research categories for GOVERD expenditure from the 2006 reference year to the 2008 reference year. Experimental research expenditure increased 35 percent, targeted basic research expenditure increased 26 percent, applied research expenditure increased 22 percent, and pure basic research expenditure increased 13 percent.

The experimental research expenditure category has progressively increased its share of GOVERD since the 2004 reference year. The shares for other types of research have slightly decreased.

GOVERD by research purpose

The purpose of research is measured by socio-economic objective classifications.

Table 4.02 shows that, as for the 2006 reference year, the largest single contributor to GOVERD was research related to the environment, which accounted for \$216 million (37 percent) of GOVERD. A similar \$213 million (36 percent) of GOVERD was spent on R&D related to primary industries (plant and animal production, and non-energy-related mineral resources).

Industry and infrastructure development-related research (energy, manufacturing, construction and transport, ICT, and commercial services and tourism) when added together accounted for 16 percent of GOVERD. Five percent of GOVERD is health-related research. All other research purposes combined made up the remaining 6 percent of GOVERD.

Table 4.02

Government Expenditure on Research and Development By socio-economic objective 2008⁽¹⁾ reference year

Socio-economic objective	\$(million)	Percent
Primary industries	213	36
Energy	21	4
Manufacturing	44	8
Construction and transport	20	3
Information and communication services	6	1
Commercial services and tourism	3	1
Health	27	5
Education and training	0	1
Law, politics and community services	5	1
Cultural understanding	4	1
Economic framework	6	1
Environment	215	37
Other ⁽²⁾	13	2
Total	584	100

(1) 2008 based on Australia New Zealand Standard Research Classification 2008.

(2) Includes defence and other research purposes.

Note: Due to rounding, some figures may not add to stated totals.

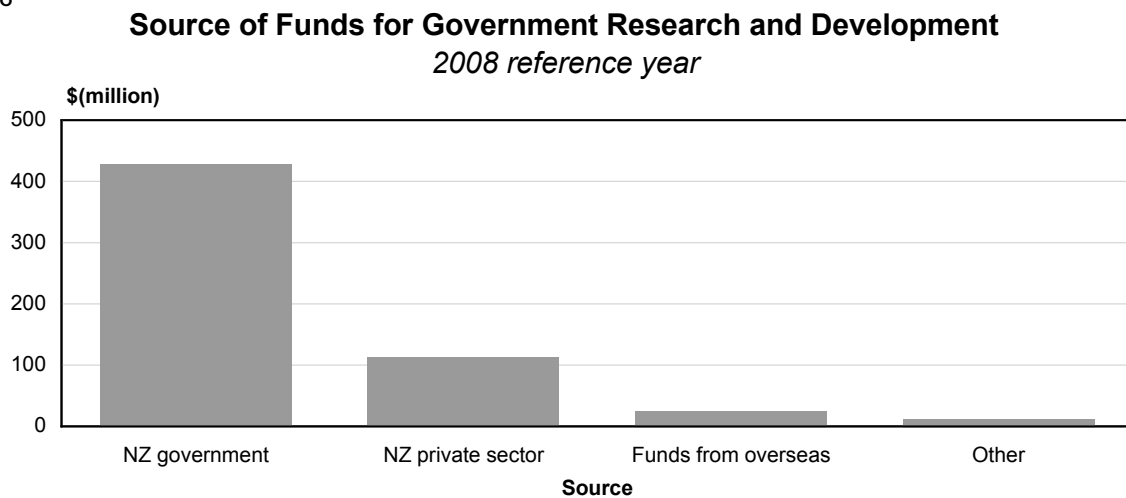
Source of funds

Government funding supported \$429 million (74 percent) of the R&D carried out in the government sector during the 2008 reference year, as shown in figure 4.06.

Of this \$429 million, \$274 million was funded through government funding agencies, such as the Foundation for Research, Science and Technology, Health Research Council, and the Royal Society of New Zealand-administered Marsden Fund.

The New Zealand private sector funded \$114 million (20 percent) of the R&D carried out by the government sector during the same period.

Figure 4.06



The proportions of GOVERD sources of funds, by sector, in the 2008 reference year have not changed significantly compared with the 2006 reference year.

Government R&D personnel

There were 3,400 full-time equivalent workers (FTEs) involved in R&D in the government sector during the 2008 reference year, comprising 2,100 researchers, 1,000 technicians, and 270 support staff.

Table 4.03 shows FTEs involved in government R&D in the 2006 and 2008 reference years.

Table 4.03

Personnel Involved in Government Research and Development
Full-time equivalent (FTEs) by occupation
By reference year

Occupation	2006		2008	
	FTEs	Percent	FTEs	Percent
Researchers	1,800 R	58	2,100	62
Technicians	1,000	32	1,000	30
Support staff	300 R	10	270	8
Total	3,100 R	100	3,400	100

Note: Due to rounding, some figures may not add to stated totals.

Symbol:

R revised

Table 4.04 shows that more than three-quarters of government R&D personnel in the 2008 reference year held a bachelor's degree or higher, while 37 percent held a doctorate, and a further 40 percent had a bachelor's degree or postgraduate qualification (other than a doctorate) as their highest qualification. These percentages have not changed significantly since the 2006 reference year.

Table 4.04

**Personnel Involved in Government Research
and Development**

Full-time equivalent (FTEs) by highest qualification
2008 reference year

Qualification	FTEs	Percent
PhD	1,300	37
Bachelor's degree / postgraduate ⁽¹⁾	1,400	40
Technical and trade ⁽²⁾	270	8
Other qualifications	530	15
Total	3,400	100

(1) Bachelor's degree or equivalent, and postgraduate qualification other than PhD.

(2) Technical and trade qualifications, eg New Zealand Certificate of Engineering or Science, or New Zealand Trade Certificate.

Note: Due to rounding, some figures may not add to stated totals.

5 Higher education (university) sector

Additional tables are available with this report. Please consult tables 27 to 32 in conjunction with this chapter.

This chapter provides information relating to the higher education sector of the New Zealand economy. Data from this sector has been collected by Statistics NZ since the 2002 reference year. Prior to 2002, data was collected by the Ministry of Research, Science and Technology (MoRST).

It should also be noted that, in this report, New Zealand's higher education expenditure (HERD) on R&D is based on universities only. This is because investigations have shown that universities perform the vast majority of R&D in this sector in New Zealand. This may differ from other OECD countries and should be noted in any international comparisons.

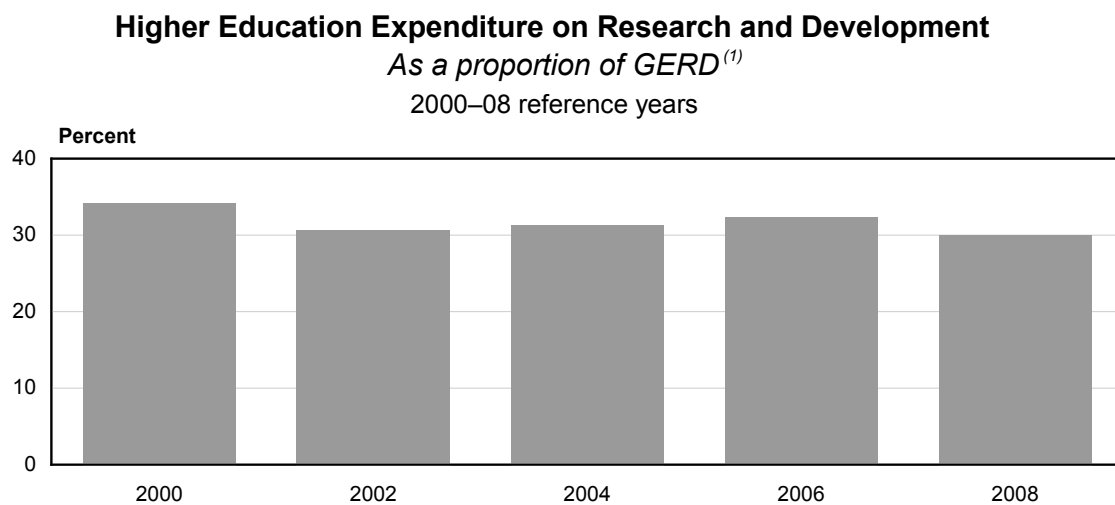
Higher education expenditure on R&D

HERD for the 2008 reference year was determined to be \$643 million. This compares with \$593 million for the 2006 reference year.

University expenditure accounted for 30 percent of total R&D expenditure in the 2008 reference year, compared with 33 percent in 2006.

Figure 5.01 shows HERD over the last five survey periods.

Figure 5.01



(1) Gross expenditure on research and development.

HERD as a proportion of GDP

The proportion of HERD to GDP was 0.36 percent in the 2008 reference year. This compares with 0.38 percent in 2006.

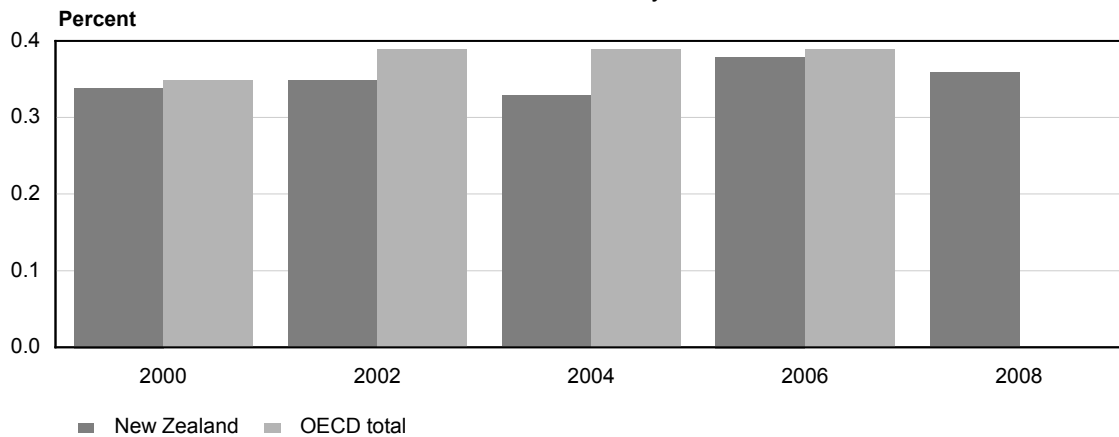
Figure 5.02 compares HERD as a proportion of GDP in New Zealand with the OECD total.

Figure 5.02

Higher Education Expenditure on Research and Development as a Proportion of GDP

New Zealand and OECD total⁽¹⁾

2000–08 reference years



(1) OECD total not available for the 2008 reference year.

Table 5.01 compares HERD as a proportion of GDP in New Zealand with the OECD total and selected reference countries.

Table 5.01

Higher Education Expenditure on Research and Development as a Proportion of GDP

Selected OECD countries and OECD total⁽¹⁾

Country	Percent
Australia	0.52
Denmark	0.64
Finland	0.65
Ireland	0.34
Norway	0.46
Sweden	0.77
OECD total	0.39
New Zealand⁽²⁾	0.36

(1) Calculated from purchasing power parity values, OECD statistical databases, 2008. Data for OECD total and selected OECD countries is for the 2006 reference year.

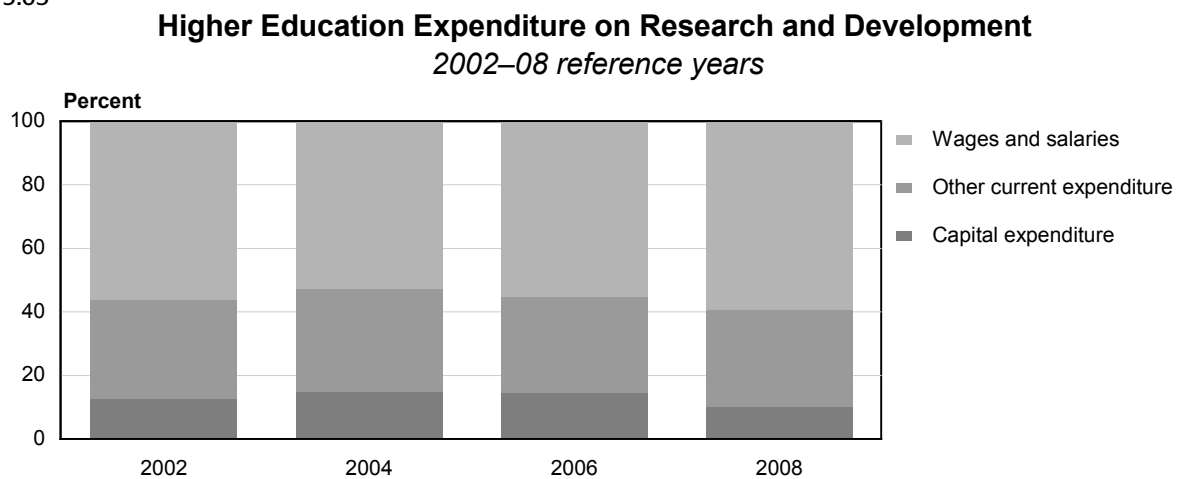
(2) 2008 reference year.

HERD by type of expenditure

Wages and salaries accounted for 59 percent of HERD in the 2008 reference year, followed by other current expenditure (30 percent), and capital expenditure (10 percent). Capital expenditure includes purchases of land, buildings, plant, equipment, machinery, vehicles, capitalised software, and other assets.

Figure 5.03 shows the distribution of HERD across the three types of expenditure. While expenditure on wages and salaries and other current expenditure in this sector increased by 17 percent and 9 percent, respectively, from 2006 in dollar terms, capital expenditure decreased 23 percent.

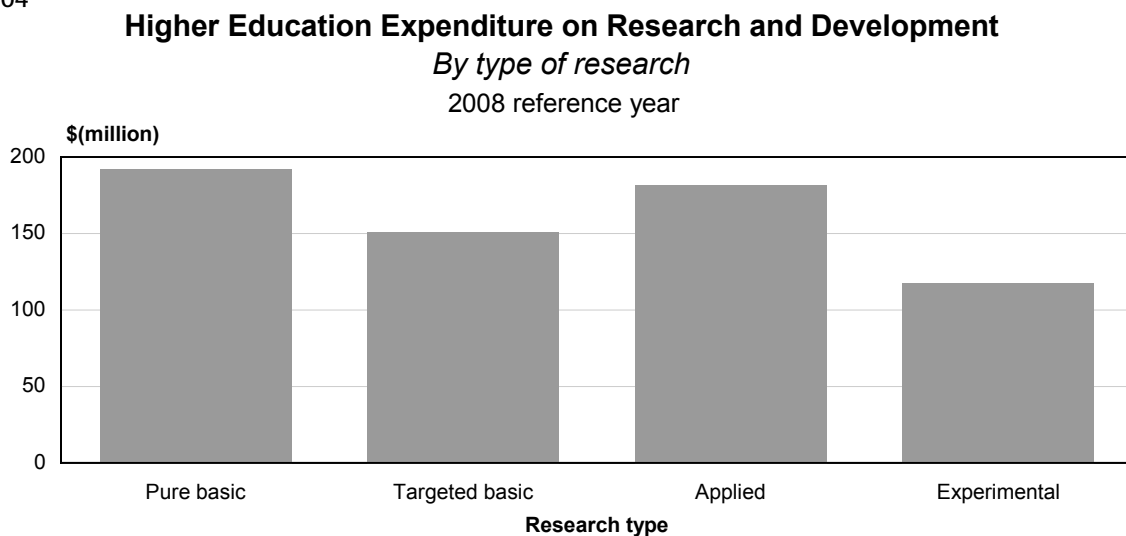
Figure 5.03



HERD by type of research

Higher education expenditure on R&D was broken down into four types of research, as shown in figure 5.04. While the overall emphasis of university research remains on basic, and targeted basic research, since 2004 universities have also made considerable contributions in applied research and experimental development. Basic, and targeted basic research together accounted for 53 percent of HERD in the 2008 reference year. Applied research accounted for 28 percent of higher education expenditure on R&D.

Figure 5.04



HERD by socio-economic objective

Table 5.02 shows HERD by socio-economic objective for the 2008 reference year. Note that 'knowledge general' includes R&D activities that cannot be attributed to a specific sector.

The primary socio-economic objective for university R&D in the 2008 reference year was health, which represented 23 percent of all university R&D expenditure. This was followed by general advancement of knowledge (13 percent), and education and training (11 percent).

Table 5.02

Higher Education Expenditure on Research and Development⁽¹⁾ By socio-economic objective 2008 reference year

Socio-economic objective	2008	
	\$(million)	Percent
Plant production and plant primary products	12	2
Animal production and animal primary products	29	5
Mineral resources (excluding energy)	10	2
Energy	21	3
Manufacturing	29	5
Construction	9	1
Transport	7	1
Information and communication services	37	6
Commercial services and tourism	28	4
Health	146	23
Education and training	70	11
Law, politics and community services	27	4
Cultural understanding	43	7
Economic framework	40	6
Environment	40	6
Defence	5	1
Knowledge general	83	13
Other	8	1
Total	643	100

(1) Universities only.

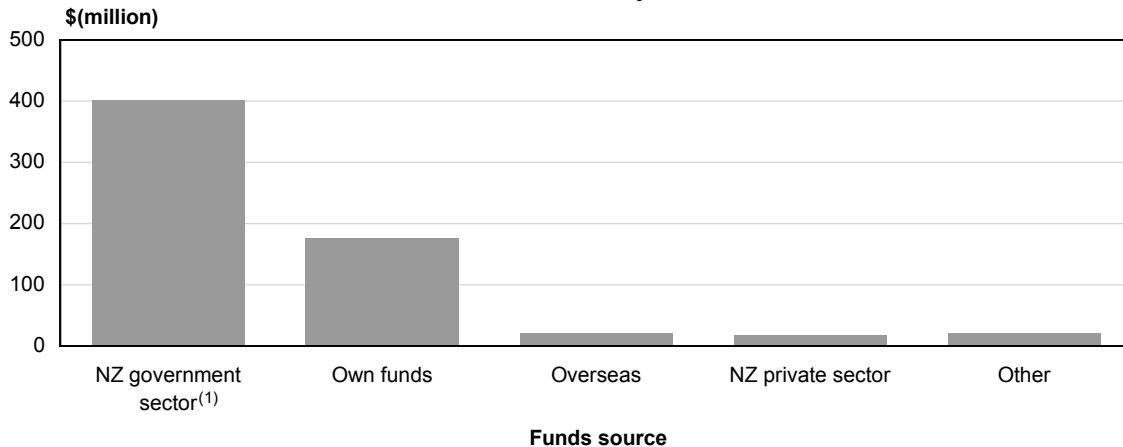
Note: Due to rounding, figures may not sum to stated totals.

Source of funds

The New Zealand government funded 63 percent of university R&D expenditure, as shown in figure 5.05. Government funding of university R&D consisted of government research contracts (41 percent) and funds from the Tertiary Education Commission (22 percent). Universities funded 27 percent of HERD with their own funds (including student fees).

Figure 5.05

Source of Funds for Higher Education Research and Development 2008 reference year



(1) Includes New Zealand government research contracts and funds from the Tertiary Education Commission (TEC). TEC funds include those from performance based research funds (PBRF).

Higher education R&D personnel

R&D staff in the higher education sector are categorised as researchers, technicians, or support staff, according to the following definitions, which differ slightly from those in the other sectors.

Researchers: academic staff who supervise or conduct teaching and/or research, and whose salaries are related to academic salaries. Research fellows/officers with academic duties are included in this category.

Technicians: staff who undertake technical or professional tasks in support of teaching and/or research, and whose salaries are related to technical salaries. Research assistants with technical duties are included in this category.

Support staff: administrative and general service employees whose work supports teaching and/or research, for example administration officers.

There were 13,200 FTEs involved in university R&D in the 2008 reference year. Table 5.03 compares the number of FTEs in the 2006 and 2008 reference years. Over this period, there was a decrease in FTEs recorded for support staff (down 31 percent), technicians (down 13 percent) and researchers (down 3 percent).

For universities, the R&D Survey 2008 collected data about postgraduate research students. Postgraduate research students were required to be undertaking at least one thesis to be included. There were an estimated 8,300 FTE postgraduate research students at New Zealand universities in the year ended 31 December 2007.

Table 5.03

Personnel Involved in Higher Education Research and Development
Full-time equivalent (FTEs) by occupation
 By reference year

Occupation	2006		2008	
	FTEs	Percent	FTEs	Percent
Researchers	3,300	24	3,200	24
Technicians	630	5	550	4
Support staff	1,600	11	1,100	8
Research postgraduate students	8,400	60	8,300	63
Total	13,900	100	13,200	100

Note: Due to rounding, figures may not sum to stated totals.

Table 5.04 shows the highest qualifications of personnel engaged in higher education R&D. Postgraduate research students were assumed to have a minimum of a bachelor's degree or a postgraduate qualification other than a doctorate and were therefore grouped in the bachelor's / postgraduate degree category.

Table 5.04

**Personnel Involved in Higher Education
 Research and Development⁽¹⁾**

Full-time equivalents (FTEs) by highest qualification
 2008 reference year

Qualification	FTEs	Percent
PhD	2,000	16
Bachelor's degree / postgraduate ⁽²⁾	10,200	78
Technical and trade ⁽³⁾	360	3
Other qualifications	460	3
Total	13,200	100

(1) Universities only.

(2) Bachelor's degree or equivalent, and postgraduate qualifications other than PhD. All postgraduate research students were included in this group.

(3) Technical and trade qualifications, eg New Zealand Certificate of Engineering or Science, or New Zealand Trade Certificate.

Note: Due to rounding, figures may not sum to stated totals.

6 Scientific research industry

Organisations in the business and government sectors that are classified to 'scientific research industry' in the Australian and New Zealand Standard Industrial Classification (M691 under ANZSIC 2006 and L781 under ANZSIC 1996), and that have reported significant contributions to R&D expenditure, have been reclassified throughout this survey report to the industry they predominantly serve. The objective of this reclassification is to more accurately calculate R&D in each industry sector and the areas of the economy where the benefits will be realised.

However, since the R&D results of scientific research organisations are of particular interest and importance independently of their impact within their industry sector, this chapter focuses specifically on R&D carried out by these organisations.

Universities are part of the education industry classification, and are not included in this chapter.

In R&D surveys before 2004, the scientific research industry was a full-coverage industry. That is, enterprises in this classification were always surveyed before 2004. Since 2004, only a sample of these enterprises has been surveyed. In the 2008 survey results, 98 enterprises were classified to the scientific research industry classification. This compares with 148 in 2006 and 82 in 2004.

R&D expenditure in the scientific research industry

In 2008, the scientific research industry R&D expenditure was \$622 million (29 percent of gross expenditure on R&D - GERD), compared with \$604 million (33 percent of GERD) in 2006, and \$576 million (35 percent of GERD) in 2004.

The government sector was responsible for 78 percent of all expenditure in the scientific research industry in New Zealand in the 2008 reference year. The business sector contributed the remaining 22 percent.

Table 6.01 and figure 6.01 show scientific research industry activity in New Zealand by sector.

Table 6.01

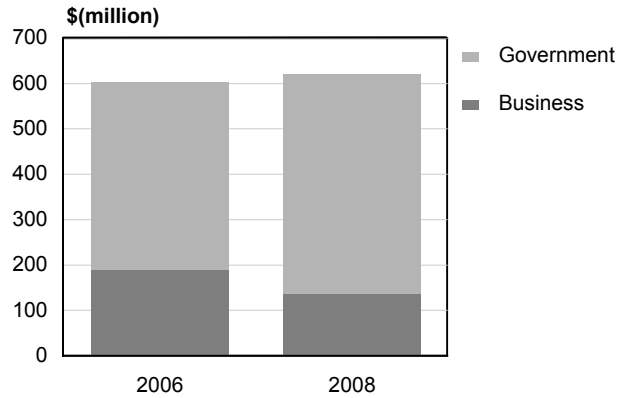
Research and Development Expenditure in the Scientific Research Industry

By sector
By reference year

Sector	2006	2008
	\$(million)	
Business	191	138
Government	413	484
Total	604	622

Figure 6.01

**Research and Development Expenditure
in the Scientific Research Industry
2006 and 2008 reference years**



Scientific research expenditure as a proportion of GDP was 0.35 percent in the 2008 reference year, compared with 0.39 percent in the 2006 reference year, and 0.41 percent in the 2004 reference year.

A significant reason for this decline is the redistribution of R&D expenditure in the 2008 reference year, from the scientific research industry classification into other non scientific research industry classifications. This has been caused by business sector structural changes within large corporate organisations. The scientific research industry classification is particularly sensitive to the setting up or disestablishing of specific research entities within large corporate organisations.

Types of R&D expenditure in the scientific research industry

Other current expenditure, including consumables and overheads incurred by direct and indirect R&D support activities, represented 50 percent of R&D expenditure in the scientific research industry in the 2008 reference year. Wages and salaries accounted for 42 percent, and capital expenditure contributed the remaining 8 percent.

Figure 6.02

**Scientific Research Industry Expenditure
2006 and 2008 reference years**



From the 2006 reference year to the 2008 reference year, in terms of dollar value, scientific research industry R&D expenditure on wages and salaries increased 1 percent. Current expenditure increased 2 percent, and capital expenditure was up 27 percent. However, as figure 6.02 shows, each expenditure type as a proportion of R&D expenditure in the scientific research industry did not vary significantly over this period.

Types of research in the scientific research industry

Scientific research expenditure on R&D is split into three main types of research:

- basic research
- applied research
- experimental development.

Table 6.02 shows expenditure on R&D by type of research for the 2008 reference year. Of the \$622 million spent by the scientific research industry in the 2008 reference year, 36 percent was spent on basic research, 43 percent on applied research, and 21 percent on experimental development.

Table 6.02

Research and Development Expenditure in the Scientific Research Industry

By type of research⁽¹⁾
2008 reference year

Type of research	\$(million)	Percent
Basic ⁽²⁾	223	36
Applied	269	43
Experimental	130	21
Total	622	100

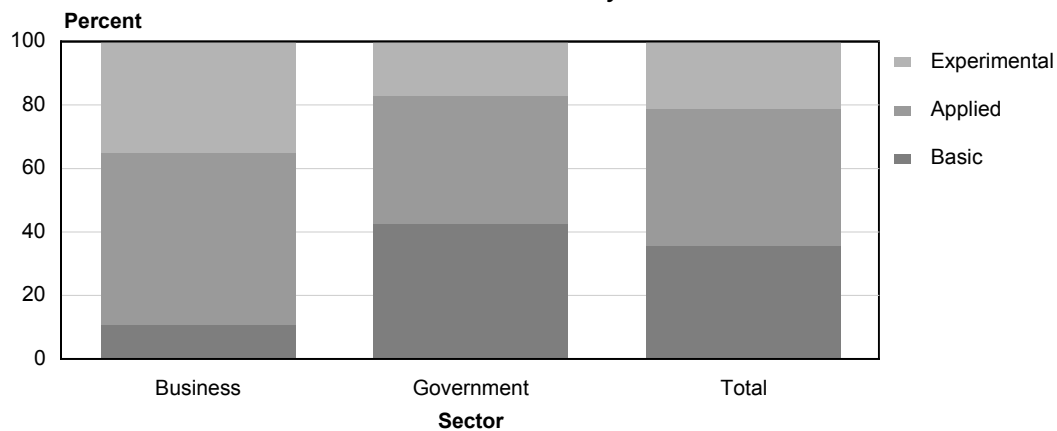
(1) See chapter 7, 'Technical documentation' for definitions of the different types of research.

(2) Basic research is an aggregate of the basic research category in the business sector, and the pure basic, and targeted basic research types in the government sector.

Figure 6.03 shows the distribution of R&D expenditure across the three types of research in the business and government sectors in the scientific research industry in the 2008 reference year.

Figure 6.03

Type of Research as a Proportion of Scientific Research Sector Expenditure 2008 reference year



Scientific research industry R&D expenditure by research purpose

Research purpose is measured using socio-economic objective (SEO) classifications.

Table 6.03 shows the distribution of scientific research by SEO in the 2008 reference year.

Table 6.03

Research and Development Expenditure in the Scientific Research Industry By socio-economic objective 2008⁽¹⁾ reference year

Socio-economic objectives	\$(million)	Percent
Primary industries	260	42
Industrial development	107	17
Energy	30	5
Manufacturing	47	8
Other industrial development ⁽²⁾	30	5
Society	63	10
Other purposes	193	31
Total	622	100

(1) 2008 based on Australia New Zealand Standard Research Classification 2008.

(2) Includes 'construction', 'transport', 'information and communication services' and 'commercial services and tourism' research purposes.

Note: Due to rounding, some figures may not add to stated totals.

In the 2008 reference year, 42 percent of expenditure on R&D in the scientific research industry was related to primary industries (plant and animal production, and non-energy-related mineral resources). Industrial development accounted for a further 17 percent.

Ten percent was related to social research, and 31 percent was related to research concerning other purposes, neither of which have been disaggregated further – to protect respondent confidentiality.

In table 6.03, the socio-economic objectives in bold represent a combination of research purposes, while those objectives that are not bold represent a research purpose at the lowest level. The latter categories are not aggregates of any further lower level objectives.

Source of funds for scientific research industry R&D

Table 6.04 illustrates the sources of funds for scientific research industry R&D for the 2008 reference year.

Table 6.04

Scientific Research Industry Funding By source of funds 2008 reference year

Source of funds	\$(million)	Percent
NZ business	170	27
NZ government ⁽¹⁾	378	61
NZ universities	7	1
Overseas	33	5
Other funding sources	35	6
Total	622	100

(1) Includes New Zealand local government agencies.

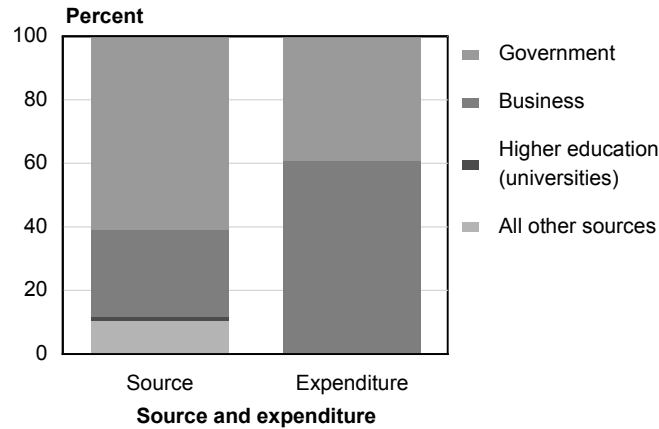
Note: Due to rounding, some figures may not add to stated totals.

Figure 6.04 compares the funding of scientific research industry R&D in New Zealand and the sectors where R&D was carried out.

Government funds 61 percent of scientific research industry R&D, and businesses fund 27 percent of scientific research industry R&D. Government carries out 39 percent of scientific research industry R&D, and businesses the remaining 61 percent.

Figure 6.04

Scientific Research Industry Research and Development
By source of funding and expenditure on research sectors
 2008 reference year



Personnel in the scientific research industry

The number of scientific research industry R&D staff was estimated at 3,700 full-time equivalent workers (FTEs) in the 2008 reference year. Researchers made up 59 percent of this total, followed by technicians (30 percent), with the remaining 13 percent being support staff.

Table 6.05 compares the number of R&D FTEs in the scientific research industry in the 2008 and 2006 reference years.

Table 6.05

Personnel Involved in Scientific Research Industry Research and Development
Full-time equivalent (FTEs) by occupation
 By reference year

Occupation	2006		2008	
	FTEs	Percent	FTEs	Percent
Researchers	1,900	52	2,200	59
Technicians	1,300	35	1,100	30
Support staff	470	13	470	13
Total	3,700	100	3,700	100

Note: Due to rounding, some figures may not add to stated totals.

Table 6.06 shows that in the 2008 reference year, 35 percent of scientific research industry R&D personnel held a doctorate, and another 41 percent held a bachelor's degree or higher non-doctorate qualification.

Table 6.06

**Personnel Involved in Scientific Research Industry
Research and Development**
Full-time equivalent (FTEs) by highest qualification
2008 reference year

Qualification	FTEs	Percent
PhD	1,300	35
Bachelor's degree / postgraduate ⁽¹⁾	1,500	41
Technical and trade ⁽²⁾	300	8
Other qualifications	660	18
Total	3,700	100

(1) Bachelor's degree or equivalent, and postgraduate qualifications other than PhD. All postgraduate research students in the higher education sector were included in this group.

(2) Technical and trade qualifications, eg New Zealand Certificate of Engineering or Science, or New Zealand Trade Certificate.

Note: Due to rounding, some figures may not add to stated totals.

Scientific research industry biotechnology R&D

Thirty one business sector scientific research organisations engaged in biotechnology R&D activity in the 2008 reference year, while eight government sector scientific research organisations were involved in the same period.

Total biotechnology R&D expenditure in the scientific research industry amounted to \$188 million for the 2008 reference year, or 9 percent of total gross expenditure on R&D. Table 6.07 shows biotechnology R&D expenditure by sector, and as a proportion of each sector's R&D expenditure.

Table 6.07

Biotechnology Expenditure in the Scientific Research Industry
By sector
2008 reference year

Sector	Biotechnology R&D	Proportion of sector's R&D ⁽¹⁾
	\$(million)	Percent
Business	58	6
Government	130	22
Total	188	13

(1) Australian and New Zealand Standard Industrial Classification (2006) M691 Biotechnology R&D expenditure as a percentage of total R&D expenditure each sector.

7 Technical documentation

This chapter provides a technical description of the data that has been used to compile this report. It focuses on the data quality and the definitions and processes used for data collection and analysis.

Survey background

The Research and Development (R&D) Survey 2008 was run by Statistics NZ jointly with the Ministry of Research Science Technology (MoRST).

The R&D Survey measures the level of R&D activity, employment, and expenditure by business sector enterprises, government departments, government-owned trading entities, and the higher education sector (universities). The R&D Survey is carried out biennially by Statistics NZ. Results from surveys before 2002 were released by MoRST.

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).

The design of the R&D Survey 2008 was 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 report presents results from 2008 against those from the 2006 survey, which was based on the earlier 1996 version of ANZSIC.

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 R&D data. The 'purpose of research' or socio-economic objective indicates which sectors of the economy will ultimately benefit from the R&D 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 R&D 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 form. The questionnaires were designed to capture R&D data in the most efficient manner for each of these sectors.

The business, government, and CRI 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 out in August 2008. Data was collected for the year ended 31 December 2007. The higher education 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' Committee (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 was all economically significant enterprises that carry out 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 Statistics NZ's Business Frame and are not classified to ANZSIC 2006 codes 'G', 'H', 'I' or 'P'
- not classified to institutional sector codes 5111 (Households) or 6111 (Rest of world) and are included in one of the two categories detailed below.

Additionally, all universities are included in the R&D Survey population.

Category 1

The organisation has 'yes' as the R&D indicator that is sourced from:

- 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 2006 or 2007 Business Operations Survey or the previous two R&D Surveys (only from full coverage strata)
- units recording R&D activity in the 2005 or 2007 Biotechnology Survey.

Category 2

The organisation has 'no' as the R&D indicator, rolling mean employment (RME) greater than or equal to 2, and has a GST tier of 1 or 2 in the Statistics NZ Business Frame or GST turnover greater than \$200,000.

Notes

An economically significant enterprise is one that meets at least one of the following criteria:

- has greater than \$30,000 annual GST expenses or sales
- has more than two full-time equivalent paid employees

- is in a GST-exempt industry except residential property leasing and rental
- is part of a group of enterprises
- is a new GST registration that is compulsory, special, or forced (this means the business is expected to exceed the \$30,000 boundary.)
- is registered for GST and is involved in agriculture or forestry.

Active enterprises are those with a life cycle code of 'birth' or 'reactivated', a non-trading entity flag of 'no', and a survey availability flag of 'yes' on the Statistics NZ Business Frame.

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 (that is, business, government, university) and ANZSIC.

Substrata 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 by the enterprise from the Statistics NZ Business Frame. This indicator is captured from tax data.

Some of these substrata were made full coverage, meaning that all enterprises in the substratum were selected for the survey. Within the full coverage, keys were identified for intensive attention in the data collection phase. Keys were identified as enterprises that made significant R&D or received \$2 million or more of FRST funding.

For the remaining substrata, a sample selection of enterprises was made, with a higher sampling fraction used in strata with 'yes' as the R&D indicator.

Sampling error

The sampling error on the total R&D expenditure figure has been measured at 2 percent at the 95 percent confidence level.

There is no sampling error for the university sector due to the full coverage of this sector. Whilst the government sector was also full coverage, the method of handling non-response through weight adjustments generates sampling error.

The sampling error on the R&D expenditure figures at the 95 percent confidence level for the total business sector has been measured at 5 percent, and for the total government sector at 1 percent.

Table 7.01 shows the sampling error on R&D expenditure across the business, government and higher education (university) sectors, along with the overall sample error.

Table 7.01

Sample Error by Sector
2008 reference year

Sector	Sample error (percent)
Business	5
Government	1
Higher education	0
Total	2

Table 7.02 shows the business sector sampling error on R&D expenditure by published industry.

Table 7.02

Business Sector Sample Error
2008 reference year

Published industry	Sample error (percent)
Primary	17
Food, beverage and tobacco manufacturing	8
Textiles, clothing, footwear and leather manufacturing	15
Petroleum, coal, chemical and associated product manufacturing	15
Non-metallic mineral product manufacturing	14
Metal product manufacturing	14
Machinery and equipment manufacturing	9
Other manufacturing	36
Manufacturing	6
Wholesale trade	10
Scientific research and technical services	18
Computer services	15
Other services	17
Services	8

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, whilst the survey applies imputation methodologies to cope with non-respondents and item non-response (see 'Imputation methodology' in this chapter), 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 separate accounts 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.

Table 7.03 shows the response rate obtained by sector.

Table 7.03

Response Rate by Sector 2008 reference year

Sector	Response rate (percent)
Business	86
Government	97
Higher education	100
Total	87

Table 7.04 shows the response rate obtained in the business sector by published industry.

Table 7.04

Business Sector Response Rate 2008 reference year

Published industry	Response rate (percent)
Primary	84
Food, beverage and tobacco manufacturing	84
Textiles, clothing, footwear and leather manufacturing	86
Petroleum, coal, chemical and associated product manufacturing	89
Non-metallic mineral product manufacturing	96
Metal product manufacturing	89
Machinery and equipment manufacturing	85
Other manufacturing	86
Manufacturing	87
Wholesale trade	88
Scientific research and technical services	85
Computer services	84
Other services	85
Services	85
Total business sector	86

Imputation methodology

This section gives an outline of the imputation methodology used in the R&D Survey 2008 of the business and government sectors. No unit non-response treatment was required for the higher education (university) 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. The data from responding firms are multiplied by the inverse of the response rate for the 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 applied these proportions to the sourced total.

Published sector and industry breakdowns

The published sector and industry breakdowns provided in this report have been created using recommendations from the *OECD Frascati Manual 2002*.

This manual recommends that State-owned enterprises (business type 1996 classification) be classified to the business sector. In addition, the manual recommends that the industrial classification code for significant research organisations be changed to the industry they predominantly serve. The industry breakdowns have been applied using ANZSIC06.

Business sector

The business sector includes all enterprises with the following New Zealand Institutional Sector 1996 codes:

Table 7.05

Business Sector Institutional Codes 1996

Code	Description
1311 ⁽¹⁾	central government enterprises
1321 ⁽¹⁾	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

(1) Central and local government trading enterprises are included in business sector.

Government sector (excluding universities)

The government sector excludes the eight universities in New Zealand, and includes all enterprises with the New Zealand Institutional Sector 1996 codes detailed in table 7.06.

Table 7.06

Government Sector Institutional Codes 1996

Code	Description
1311 ⁽¹⁾	central government enterprises
1321 ⁽¹⁾	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	central 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 fund
3 pt	general government (excluding universities)

(1) Central and local government trading enterprises are included in business sector.

Higher education (universities)

The higher education sector consists of the eight New Zealand universities that are members of the NZVCC. These are classified to New Zealand Institutional Sector 1996 code of 3111 (central government excluding funded social security), with an ANZSIC code of P8102 (higher education).

Note: Statistics NZ and MoRST examined the possibility of including other organisations (particularly the polytechnic institutes) in the higher education sector on an ongoing basis. The outcome of the last feasibility study showed that an insignificant amount of R&D is carried out by these organisations.

Published industry

The published industries within the business sector are based on the ANZSIC06 classification, apart from the reclassification of significant scientific research services organisations (M691) to the industry they 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	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 machinery	C14-16 and C25
Wholesale trade	F
Scientific research and technical services (exclude M6924)	M691 and M692
Computer services	M70
Other services	D,E, J, K, L, M, N, O,Q, R, S (exclude M691, M6921-6923, M6925 and M70)

Government sector

NZISC96

Published industry	code
Scientific research	M691
Other government research	All ANZSIC codes except M691

Higher education (university) sector

Total universities.

Confidentiality and rounding

Data published from the R&D Survey 2008 is governed by the provisions of the Statistics Act 1975, which requires that all statistical information published by Statistics NZ must be arranged so as to prevent any individual respondent being identifiable. Cell suppression has been used to prevent the disclosure of sensitive information. For more information on Statistics NZ confidentiality rules please see our website: www.stats.govt.nz.

On occasion, figures are rounded to the nearest thousand or some other convenient unit. This may result in a total disagreeing slightly with the total of the individual items shown in tables. Where figures are rounded, the unit is in general expressed in words below the table headings, but where space does not allow this the unit may be shown as (000) for thousands, etc.

All counts in this report have been randomly rounded to base 3 to protect the confidentiality of respondents. Totals are rounded independently of the components, and so not all components will add to the stated totals.

Definitions of types of R&D

Business and government sectors

The government and CRI sector questionnaires asked for R&D expenditure to be categorised into the following R&D types: basic research, targeted basic research, applied research, experimental development. The business sector questionnaire did not make a distinction between basic research and targeted basic research. The type of R&D breakdown relates to the following definitions.

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.

Targeted basic research is research to produce a broad base of new knowledge likely to underpin solutions to current or future applications.

Applied research is also investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.

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.

The wording of these definitions is the result of cognitive testing of the definitions provided in chapter 4 of the *Frascati Manual 2002* (OECD, 2002), and the *Glossary of Terms for Scientific and Technological Activities in New Zealand* (MoRST, 1991).

Higher education (university) sector: types of R&D expenditure were not directly captured in the universities component of the R&D Survey 2008. They were derived by applying type of research weightings provided to Statistics NZ by the NZVCC.

Weightings were provided for four types of research: pure-basic research, oriented-basic research, applied research, and experimental development. These types of research were based on the *Frascati Manual 2002* definitions. Within the higher education chapter of this report, oriented-basic research has been labelled targeted basic research.

All sectors: three types of research have been outlined in chapter 2, 'All sectors'. These are basic research, applied research, and experimental development. These were compiled from the business, government and higher education sector types of research breakdowns detailed previously.

General definitions

ANZSIC: Australian and New Zealand Standard Industrial Classification (2006 version).

Biotechnology: the application of science and technology to living organisms as well as parts, products, and models thereof, to alter living or non-living materials for the production of knowledge, goods, and services.

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

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 that 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.

Purchasing power parities (PPPs): these are conversion rates that equalise the purchasing power of different currencies by eliminating the differences in price levels between countries. PPPs are the most suitable measure of international standard-of-living comparisons because they reflect just the differences in the volume of goods and services produced. When the expenditure or prices of countries are converted to a common currency using PPPs, they are also revalued at a common set of prices or expenditure. Consequently, they reflect only differences in the volumes of goods and services produced in the countries, and are real measures.

Rolling mean employment (RME): defines the number of employees of an enterprise. This is a 12-month rolling average of the monthly employment count figure. The employment count is obtained from taxation data.

Performance-Based Research Fund (PBRF): is administered through the Tertiary Education Commission in order to ensure that excellent research in the tertiary education sector is encouraged and rewarded. This entails assessing the research performance of tertiary education organisations and funding them on this basis.

Gross domestic product (GDP): is defined as the market value of all final goods and services produced within a country in a given period of time. It is also the sum of value added at every stage of production of all final goods and services produced within a country in a given period of time. Given that GDP data is provisional for a two-year period from the first release, the figures included in this report are provisional. Once updated figures are obtained, the GDP data and derived data based on GDP are revised. The revisions of this nature (as a result of changes external to the R&D dataset) are therefore not expressed in the report with a revision code, R alongside. The same logic is also used in expressing GDP and other data from the OECD's Main Science and Technology Indicator report.

Research and development indicator: response from respondents stating whether or not they carry out R&D activity.

References

Organisation for Economic Co-operation and Development (2002). *Frascati Manual 2002: proposed standard practice for surveys on research and experimental development / Organisation for Economic Co-operation and Development*, OECD, Paris.

OECD Statistical Databases, Main Science and Technology Indicators, Retrieved 20 April 2008 from: www.oecd.org.

Statistics New Zealand (2003). *Purchasing Power Parities*, Retrieved 24 July 2007 from: <http://www.stats.govt.nz/products-and-services/Articles/ppp-Jul03.htm>.

Additional Tables

Table 1

Gross Expenditure on Research and Development⁽¹⁾

By sector

Sector expenditure	New Zealand 2008	OECD total 2006 ⁽²⁾
	\$(million)	\$(million) current PPP
Business expenditure on R&D (BERD)	913	570,630
Government expenditure on R&D (GOVERD)	584	94,130
Higher education expenditure on R&D (HERD) ⁽³⁾	643	141,680
BERD+GOVERD+HERD⁽³⁾	2,140	806,439
Percent		
BERD as percentage of GERD	43	71
GOVERD as percentage of GERD	27	12
HERD ⁽³⁾ as percentage of GERD	30	18
Total	100	100

(1) GERD gross expenditure on research and development

(2) OECD statistical databases, 2008. PPP purchasing power parity.

(3) Universities only.

Table 2

Gross Expenditure on Research and Development as a Proportion of GDP

By sector

Sector expenditure	New Zealand 2008	OECD total 2006 ⁽¹⁾
	\$(million)	\$(million) current PPP
Business expenditure on R&D (BERD)	913	570,630
Government expenditure on R&D (GOVERD)	584	94,130
Higher education expenditure on R&D (HERD) ⁽²⁾	643	141,680
GDP ⁽³⁾	178,063	36,511,052
Percent		
BERD as percentage of GDP	0.51	1.56
GOVERD as percentage of GDP	0.33	0.26
HERD ⁽²⁾ as percentage of GDP	0.36	0.39

(1) OECD statistical databases, 2008. PPP purchasing power parity.

(2) Universities only.

(3) GDP as at year ended 31 March 2009.

Table 3

Gross Expenditure on Research and Development
By type of expenditure
 By reference year

Type of expenditure	2006		2008	
	\$(million)	Percent	\$(million)	Percent
Wages and salaries ⁽¹⁾	922	51	1,121	52
Other current expenditure ⁽²⁾	718	39	827	39
Capital expenditure ⁽³⁾	185	10	192	9
Total	1,826	100	2,140	100

(1) Wages and salaries in the business and government sectors include wages and salaries for research and development (R&D) personnel. They also include other employment-related costs (eg overtime, holiday pay, sick pay, redundancy and severance payments). They exclude wages and salaries of personnel indirectly supporting R&D. Wages and salaries in the higher education sector are modelled estimates based on total university wages, salaries and other employment-related costs.

(2) Other current expenditure in the business and government sectors includes all consumables and overheads incurred by direct and indirect R&D support activities (eg materials, power, rent, repairs etc). It includes the wages and salaries of personnel indirectly supporting R&D (only the part of wages and salaries that is attributable to the indirect support of R&D). For example, central finance or personnel services. Other current expenditure in the higher education sector is a modelled estimate, based on all consumables and overheads incurred by direct and indirect university support activities. Depreciation is excluded in all three sectors.

(3) Capital expenditure on R&D in the business and government sectors includes purchases of land and buildings, and purchases of plant, equipment, machinery, vehicles, capitalised software and other assets. Capital expenditure in the higher education sector is a modelled estimate, based on total university expenditure on land and buildings; and purchases of plant, equipment, machinery, vehicles, capitalised software and other assets.

Table 4

Source of Funds for Research and Development
By source of funds and research sector
 2006 reference year

Source of funds	Sector			Total
	Business	Government	Higher education	
\$(million)				
NZ business	612 R	90	48	749 R
NZ government ⁽¹⁾	87	355 R	347	789 R
NZ universities ⁽²⁾	1	5	157	162
Overseas	53	22	20	95
Other funding sources	7	2	22	31
Total	760	473	593	1,826
Percent				
NZ business	81 R	19	8	41 R
NZ government	11	75 R	58	43 R
NZ universities	0	1	26	9
Overseas	7	5	3	5
Other funding sources	1	0	4	2
Total source of funds	100	100	100	100

(1) Includes New Zealand local government agencies.

(2) Funding received by the government and business sectors from the New Zealand tertiary sector is included in the category 'other funding sources' for confidentiality reasons.

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 5

Biotechnology Research and Development Expenditure*By sector*
2006 reference year

Sector	Biotechnology R&D	Sector R&D expenditure	Biotechnology R&D as a proportion of sector R&D
	\$(million)		Percent
Business	83 R	760 R	11 R
Government	114 R	473 R	24 R
Higher education	131	593	22
Total	329	1,826	18

Note: Due to rounding, figures may not sum to stated totals.**Symbol:**

R revised

Table 6

Business Expenditure on Research and Development
As a proportion of gross expenditure on research and development
 By reference year

	2000	2002	2004	2006	2008
	\$(million)				
BERD ⁽¹⁾	324	524	677	760 R	913
GERD ⁽²⁾	1,091	1,416	1,660 R	1,826	2,140
Percent					
BERD as percentage of GERD	30	37	41 R	42 R	43

(1) business expenditure on research and development.

(2) gross expenditure on research and development.

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 7

Business Expenditure on Research and Development as a Proportion of GDP
Compared with OECD⁽¹⁾
 By reference year

	2000	2002	2004	2006	2008
	\$(million)				
New Zealand BERD	324	524	677	760 R	913
New Zealand GDP ⁽²⁾	109,639	124,644	139,938	157,397	178,063
OECD BERD	421,992	445,446	483,464	570,630	..
OECD GDP ⁽¹⁾	27,478,306	29,629,127	32,634,306	36,511,052	..
Percent					
NZ BERD as percentage of GDP	0.30	0.42	0.48	0.48 R	0.51
OECD BERD as percentage of GDP	1.54	1.50	1.48	1.56	..

(1) OECD statistical databases, 2008. Purchasing power parity values.

(2) GDP current price expenditure measure, year ended 31 March.

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

.. not available

Table 8

Business Expenditure on Research and Development
By sector and published industry
 By reference year

Published industry ⁽¹⁾	2006	2008
	\$(million)	
Primary	52	72
Food, beverage and tobacco manufacturing	94	102
Textiles, clothing, footwear and leather manufacturing	26	7
Petroleum, coal, chemical and associated product manufacturing	80	99
Non-metallic mineral product manufacturing	3	4
Metal product manufacturing	16	19
Machinery and equipment manufacturing	167	195
Other manufacturing	12	16
Manufacturing	398	442
Wholesale trade	55	61
Scientific research and technical services	56	58
Computer services	105	152
Other services	94 R	126
Services	310 R	398
Total	760 R	913
Percent		
Primary	7	8
Manufacturing	52	48
Services	41 R	44
Total	100	100

(1) Sector and published industry breakdowns are in accordance with OECD's recommendations for international comparability. See chapter 7 for sector and published industry definitions.

Note: Due to rounding, figures may not sum to stated totals.

Table 9(a)

Business Expenditure on Research and Development
By industry and firm size
2008 reference year

Industry	Rolling mean employment (RME) less than 50		Rolling mean employment (RME) 50 or greater	
	\$(million)	Firms	\$(million)	Firms
Primary	35	243	37	9
Food, beverage and tobacco manufacturing	12	57	90	66
Textiles, clothing, footwear and leather manufacturing	4	15	3	9
Petroleum, coal, chemical and associated product manufacturing	74	135	25	30
Non-metallic mineral product manufacturing	0	9	3	6
Metal product manufacturing	11	117	9	15
Machinery and equipment manufacturing	54	222	142	66
Other manufacturing	9	69	8	18
Manufacturing	164	618	278	210
Wholesale trade	33	138	28	30
Scientific research and technical services	37	135	21	12
Computer services	103	315	49	15
Other services	84	690	43	45
Services	257	1,278	141	96
Total	456	2,139	457	318

Note: Due to rounding, figures may not sum to stated totals.

Table 9(b)

Business Expenditure on Research and Development
By industry and firm size
2006 reference year

Industry	Rolling mean employment (RME) less than 50		Rolling mean employment (RME) 50 or greater	
	\$(million)	Firms	\$(million)	Firms
Primary	22	48	30	21
Food, beverage and tobacco manufacturing	7	45	88	51
Textiles, clothing, footwear and leather manufacturing	4	18	22	18
Petroleum, coal, chemical and associated product manufacturing	48	147	32	39
Non-metallic mineral product manufacturing	1	12	2	6
Metal product manufacturing	9	63	7	18
Machinery and equipment manufacturing	48	183	118	51
Other manufacturing	8	51	4	27
Manufacturing	125	522	273	204
Wholesale trade	27	108	28	27
Scientific research and technical services	50	159	6	6
Computer services	56	165	49	12
Other services	72	306	22 R	36 R
Services	206 R	741 R	104 R	78 R
Total	352 R	1,311 R	407 R	300 R

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 10

Business Expenditure on Research and Development
By firm size
By reference year

Rolling mean employment	2000	2002	2004	2006	2008
	Percent				
Less than 50	26	37	46	46 R	50
50–99	17	9	11	11	11
100–499	40	40	28	29	18
500–999	11	9	8	10	5
1,000 or greater	8	6	6	5	16
Total	100	100	100	100	100

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 11

Business Expenditure on Research and Development
By type of expenditure
2008 reference year

Type of expenditure	Expenditure	
	\$(million)	Percent
Wages and salaries ⁽¹⁾	494	54
Other current expenditure ⁽²⁾	332	36
Capital expenditure (land and buildings)	15	2
Capital expenditure (other) ⁽³⁾	70	8
Total	913	100

(1) Includes redundancy and severance payments.

(2) Includes all consumables and overheads incurred by direct and indirect research and development support activities. For example, materials, power, rent, rates, repairs, interest, books and travel. Depreciation is excluded.

(3) Includes purchases of plant, equipment, machinery, vehicles, capitalised software and other assets.

Note: Due to rounding, figures may not sum to stated totals.

Table 12

Business Expenditure on Research and Development
By type of expenditure
 By reference year

Type of expenditure	2000	2002	2004	2006	2008
	Percent				
Wages and salaries ⁽¹⁾	52	47	51	51 R	54
Other current expenditure ⁽²⁾	40	41	41	41	36
Capital expenditure (land and buildings)	1	1	1	2 R	2
Capital expenditure (other) ⁽³⁾	8	11	7	6 R	8
Total	100	100	100	100	100

(1) Includes redundancy and severance payments.

(2) Includes all consumables and overheads incurred by direct and indirect research and development support activities. For example, materials, power, rent, rates, repairs, interest, books, and travel. Depreciation is excluded.

(3) Includes purchases of plant, equipment, machinery, vehicles, capitalised software, and other assets.

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 13

Business Expenditure on Research and Development
By type of research⁽¹⁾
 2008 reference year

Type of research	Expenditure	
	\$(million)	Percent
Basic	74	8
Applied	295	32
Experimental	543	60
Total	913	100

(1) See chapter 7, Technical documentation, for definitions of the different types of research.

Note: Due to rounding, figures may not sum to stated totals.

Table 14

Business Expenditure on Research and Development
By industry and type of research
 2008 reference year

Industry	Type of research			
	Basic	Applied	Experimental	Total
	\$(million)			
Primary	12	35	25	72
Food, beverage and tobacco manufacturing	4	25	73	102
Textiles, clothing, footwear and leather manufacturing	0.4	2	4	7
Petroleum, coal, chemical and associated product manufacturing	8	42	50	99
Non-metallic mineral product manufacturing	0.3	2	2	4
Metal product manufacturing	0.6	3	15	19
Machinery and equipment manufacturing	16	59	120	195
Other manufacturing	1	7	8	16
Manufacturing	30	140	272	442
Wholesale trade	4	12	45	61
Scientific research and technical services	4	15	39	58
Computer services	10	43	100	152
Other services	14	51	62	126
Services	32	120	246	398
Total	74	295	543	913
Percent				
Primary	16	12	5	8
Food, beverage and tobacco manufacturing	5	9	13	11
Textiles, clothing, footwear and leather manufacturing	1	1	1	1
Petroleum, coal, chemical and associated product manufacturing	10	14	9	11
Non-metallic mineral product manufacturing	0	1	0	0
Metal product manufacturing	1	1	3	2
Machinery and equipment manufacturing	22	20	22	21
Other manufacturing	1	2	1	2
Manufacturing	41	47	50	48
Wholesale trade	5	4	8	7
Scientific research and technical services	6	5	7	6
Computer services	13	14	18	17
Other services	18	17	11	14
Services	42	41	45	44
Total	100	100	100	100

Note: Due to rounding, figures may not sum to stated totals.

Table 15

Source of Funds for Business Research and Development
By reference year

Source of funds	2000	2002	2004	2006	2008
	\$(million)				
Own funds	199	284	474	549 R	663
NZ private sector⁽¹⁾	78	132	42	64	63
Government funding agencies	27	40	54	74	65
Other government departments	4	7	7	11	13
Local government	C	0	6	1	2.0
NZ government	C	47	68	87	80
Overseas	17	62	81	53	54
Tertiary education	C	0	1	0.5	2
Other sources	4	5	12	7	52
Other funding sources	C	5	13	8	53
Total⁽²⁾	329	529	677	760 R	913
Percent					
Own funds	60	54	70	72 R	73
NZ private sector	24	25	6	8	7
Government funding agencies	8	8	8	10	7
Other government departments	1	1	1	1	1
Local government	C	0	1	0	0
NZ government	C	9	10	11	9
Overseas	5	12	12	7	6
Tertiary education	C	0	0	0	0
Other sources	1	1	2	1	6
Other funding sources	C	1	2	1	6
Total	100	100	100	100	100

(1) Includes State-owned enterprises.

(2) For reference years prior to 2004, data on source of funds was collected separately from data on R&D expenditure. The figures for R&D funds may, therefore, not equal the stated R&D expenditure for those reference years.

Note: Due to rounding, figures may not sum to stated totals.

Symbols:

C confidential

R revised

Table 16

Personnel Involved in Business Research and Development
Full-time equivalents (FTEs) by occupation
 By reference year

Occupation	2000	2002	2004	2006	2008
	FTEs				
Researchers	2,200	2,500	4,100	3,700 R	4,700
Technicians	820	1,200	1,400	1,500	2,200
Support staff	320	540	1,000	940	1,200
Total	3,300	4,200	6,400	6,100 R	8,100

Note: Due to rounding, figures may not sum to stated totals.

Table 17

Personnel Involved in Business Research and Development
Full-time equivalents (FTEs) by industry and occupation
 2008 reference year

Industry	Occupation			
	Research	Technical	Support	Total
FTEs				
Primary	310	60	150	520
Food, beverage and tobacco manufacturing	440	170	110	720
Textiles, clothing, footwear and leather manufacturing	20	20	12	50
Petroleum, coal, chemical and associated product manufacturing	250	230	75	550
Non-metallic mineral product manufacturing	12	20	3	35
Metal product manufacturing	130	60	45	230
Machinery and equipment manufacturing	1,200	530	220	2,000
Other manufacturing	90	60	35	180
Manufacturing	2,200	1,100	490	3,700
Wholesale trade	290	120	45	440
Scientific research and technical services	200	180	95	470
Computer services	990	450	170	1,600
Other services	740	300	280	1,300
Services	2,200	1,000	580	3,800
Total	4,700	2,200	1,200	8,100
Percent				
Primary	7	3	13	6
Manufacturing	47	50	41	46
Services	47	45	49	47
Total	100	100	100	100

Note: Due to rounding, figures may not sum to stated totals.

Table 18

Personnel Involved in Business Research and Development
Headcount by industry and occupation
 2008 reference year

Industry	Occupation			Total
	Research	Technical	Support	
	Headcount			
Primary	580	80	210	880
Food, beverage and tobacco manufacturing	520	260	210	980
Textiles, clothing, footwear and leather manufacturing	70	25	15	12
Petroleum, coal, chemical and associated product manufacturing	380	350	150	880
Non-metallic mineral product manufacturing	20	35	12	65
Metal product manufacturing	200	160	120	480
Machinery and equipment manufacturing	1,500	730	370	2,600
Other manufacturing	140	130	70	340
Manufacturing	2,800	1,700	950	5,400
Wholesale trade	370	200	110	680
Scientific research and technical services	390	1,300	610	2,300
Computer services	1,700	620	280	2,500
Other services	1,400	690	620	2,700
Services	3,800	2,800	1,600	8,100
Total	7,100	4,500	2,800	14,400
Percent				
Primary	8	2	8	6
Manufacturing	39	37	34	38
Services	52	61	58	56
Total	100	100	100	100

Note: Due to rounding, figures may not sum to stated totals.

Table 19

Government Expenditure on Research and Development
As a proportion of GERD⁽¹⁾
 By reference year

	2000	2002	2004	2006	2008
	\$(million)				
GOVERD ⁽²⁾	393.0	456.4	461.2	473.2 R	584.1
GERD	1,091.3	1,416.2	1,660.2	1,825.6	2140.0
Percent					
GOVERD as percentage of GERD	36	32	28	26 R	27

(1) Gross expenditure on research and development.

(2) Government expenditure on research and development.

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 20

Government Expenditure on Research and Development as a Proportion of GDP
Compared with OECD⁽¹⁾
 By reference year

	2000	2002	2004	2006	2008
	\$(million)				
New Zealand GOVERD	393.0	456.4	461.2	473.2 R	584.1
New Zealand GDP ⁽²⁾	109,639.0	124,644.0	139,938.0	157,397.0	178063.0
OECD GOVERD ⁽³⁾	71573.9	80,336.4	86,561.7	94,129.6	..
OECD GDP	27,478,305.7	29,629,127.3	32,634,305.9	36,511,052.4	..
Percent					
NZ GOVERD as percent of GDP	0.36	0.37	0.33	0.30 R	0.33
OECD GOVERD as percent of GDP	0.26	0.27	0.27	0.26	..

(1) OECD statistical databases, 2008. Purchasing power parity values.

(2) GDP current price expenditure measure, year ended 31 March.

(3) OECD GOVERD data not available for the 2008 reference year.

Note: Due to rounding, figures may not sum to stated totals.

Symbols:

R revised

.. not available

Table 21

Government Expenditure on Research and Development
By type of expenditure
 2008 reference year

Type of expenditure	Expenditure	
	\$(million)	Percent
Wages and salaries ⁽¹⁾	244.9	42
Other current expenditure ⁽²⁾	298.8	51
Capital expenditure (land and buildings)	24.9	4
Capital expenditure (other) ⁽³⁾	15.4	3
Total	584.1	100

(1) Includes redundancy and severance payments.

(2) Includes all consumables and overheads incurred by direct and indirect research and development support activities. For example, materials, power, rent, rates, repairs, interest, books and travel. Depreciation is excluded.

(3) Includes purchases of plant, equipment, machinery, vehicles, capitalised software and other assets.

Note: Due to rounding, figures may not sum to stated totals.

Table 22

Government Expenditure on Research and Development
By type of expenditure
 By reference year

Type of expenditure	2000	2002	2004	2006	2008
	Percent				
Wages and salaries ⁽¹⁾	45	43	40	44 R	42
Other current expenditure ⁽²⁾	45	50	51	48 R	51
Capital expenditure (land and buildings)	3	2	4	2 R	4
Capital expenditure (other) ⁽³⁾	8	6	5	6 R	3
Total	100	100	100	100	100

(1) Includes redundancy and severance payments.

(2) Includes all consumables and overheads incurred by direct and indirect research and development support activities. For example, materials, power, rent, rates, repairs, interest, books, and travel. Depreciation is excluded.

(3) Includes purchases of plant, equipment, machinery, vehicles, capitalised software, and other assets.

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 23

Government Expenditure on Research and Development*By type of research*⁽¹⁾
2008 reference year

Type of research	Expenditure	
	\$(million)	Percent
Pure basic	47.1	8
Targeted basic	185.9	32
Applied	252.7	43
Experimental	98.4	17
Total	584.1	100

(1) See chapter 7, Technical documentation, for definitions of the different types of research.

Note: Due to rounding, figures may not sum to stated totals.

Table 24

Source of Funds for Government Research and Development
By reference year

Source of funds	2000	2002	2004	2006	2008
	\$(million)				
Government funding agencies	253.7	266.0	239.9	256.6	273.5
Other government departments	36.2	44.3	30.8	40.3	60.0
Local government	3.1	12.8	2.7	6.9	7.5
Own funds	15.8	32.6	85.9	51.4 R	88.3
NZ government	308.8	355.7	359.4	355.2 R	429.4
NZ private sector⁽¹⁾	80.2	96.7	80.6	89.5	114.1
Overseas	11.4	18.6	18.4	22.1	26.8
Tertiary education	1.2	1.8	C	4.6	8.5
Other sources	0.9	1.2	C	1.7	5.3
Other funding sources	2.1	3.0	2.9	6.3	13.8
Total⁽²⁾	402.6	474.0	461.2	473.2 R	584.1
Percent					
Government funding agencies	63	56	52	54	47
Other government departments	9	9	7	9	10
Local government	1	3	1	1	1
Own funds	4	7	19	11 R	15
NZ government	77	75	78	75 R	74
NZ private sector	20	20	18	19	20
Overseas	3	4	4	5	5
Tertiary education	0	0	C	1	1
Other sources	0	0	C	0	1
Other funding sources	1	1	1	1	2
Total	100	100	100	100	100

(1) Includes State-owned enterprises.

(2) For reference years prior to 2004, data on source of funds was collected separately from data on R&D expenditure. The figures for R&D funds may, therefore, not equal the stated R&D expenditure for those reference years.

Note: Due to rounding, figures may not sum to stated totals.

Symbols:

C confidential

R revised

Table 25

Personnel Involved in Government Research and Development
Full-time equivalents (FTEs) by occupation
 By reference year

Occupation	2000	2002	2004	2006	2008
	FTEs				
Researchers	1,600	2,000	1,800	1,800 R	2,100
Technicians	1,100	1,100	1,100	1,000	1,100
Support staff	700	700	450	310 R	270
Total	3,500	3,800	3,500	3,100 R	3,400

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 26

Personnel Involved in Government Research and Development
Headcount by occupation
 By reference year

Occupation	2004	2006	2008
	Headcount		
Researchers	2,300	2,200 R	2,600
Technicians	1,600	1,200	1,300
Support staff	610	390 R	350
Total	4,500	3,700 R	4,200

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

R revised

Table 27

Higher Education Expenditure on Research and Development⁽¹⁾
As a proportion of gross expenditure on research and development
 By reference year

	2000	2002	2004	2006	2008
	\$(million)				
HERD ⁽¹⁾	374.1	435.8	521.9	592.9	643.4
GERD ⁽²⁾	1,091.3	1,416.2	1,660.2	1,825.6	2140.0
Percent					
HERD as percentage of GERD	34	31	31	33	30

(1) HERD higher education expenditure on research and development. Universities only.

(2) GERD gross expenditure on research and development.

Table 28

Higher Education Expenditure on Research and Development as a Proportion of GDP
Compared with selected OECD countries and OECD total⁽¹⁾
 By reference year

Country	2000	2002	2004	2006	2008
	Percent				
Australia	0.40	0.44	0.48	0.52	..
Denmark	0.45	0.58	0.61	0.64	..
Finland	0.60	0.64	0.68	0.65	0.65
Ireland	0.23	0.25	0.33	0.34	0.37
Norway ⁽²⁾	0.47	0.44	0.47	0.46	..
Sweden ⁽³⁾	0.80	0.82	0.83	0.77	..
OECD total	0.35	0.39	0.39	0.39	..
New Zealand ⁽⁴⁾	0.34	0.35	0.37	0.38	0.36

(1) Calculated from purchasing power parity values, OECD statistical databases, 2008.

(2) The value for Norway 1999 corresponds with the 2000 reference year.

(3) The values for Sweden for 1999 and 2001 correspond with the 2000 and 2002 reference years.

(4) Statistics New Zealand GDP current price expenditure measure, year ended 31 March.

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

.. not available

Table 29

Higher Education Expenditure on Research and Development⁽¹⁾*By type of expenditure*

By reference year

Type of expenditure	2006		2008	
	\$(million)	Percent	\$(million)	Percent
Wages and salaries ⁽²⁾	325.2	55	379.9	59
Other current expenditure ⁽³⁾	179.6	30	196.0	30
Capital expenditure ⁽⁴⁾	88.0	15	67.5	10
Total	592.9	100	643.4	100

(1) Universities only.

(2) Wages and salaries in the higher education sector are modelled estimates, based on total university wages, salaries, and other employment-related costs.

(3) Other current expenditure in the higher education sector is a modelled estimate, based on all consumables and overheads incurred by direct and indirect university support activities. Depreciation is excluded.

(4) Capital expenditure in the higher education sector is a modelled estimate, based on total university expenditure on land and buildings and on purchases of plant, equipment, machinery, vehicles, capitalised software and other assets.

Note: Due to rounding, figures may not sum to stated totals.

Table 30

Higher Education Expenditure on Research and Development⁽¹⁾*By type of research⁽²⁾*

By reference year

Type of research	2006		2008	
	\$(million)	Percent	\$(million)	Percent
Pure basic	137.3	23	192.4	30
Targeted basic	148.0	25	151.1	23
Applied	189.3	32	182.1	28
Experimental	118.3	20	117.8	18
Total	592.9	100	643.4	100

(1) Universities only.

(2) See chapter 7, Technical documentation, for definitions of the different types of research.

Note: Due to rounding, figures may not sum to stated totals.

Table 31

Source of Funds for Higher Education Research and Development⁽¹⁾
2008 reference year

Source of funds	Funding	
	\$(million)	Percent
Own funds	176.9	27
Tertiary Education Commission	141.7	22
New Zealand research contracts (government)	261.5	41
New Zealand private sector ⁽²⁾	19.8	3
Overseas	21.7	3
Other	21.7	3
Total	643.3	100

(1) Universities only.

(2) Includes State-owned enterprises.

Note: Due to rounding, figures may not sum to stated totals.

Table 32

Personnel Involved in Higher Education Research and Development⁽¹⁾
Headcount by occupation
2008 reference year

Occupation	Teaching staff	Research only	Total
	Headcount		
Researchers	8,700	1,500	10,200
Technicians	1,500	330	1,900
Support staff	2,300	770	3,100
Sub-total	12,700	2,600	15,300
Masters research students	4,500
PhD research students	5,300
Total	12,600	2,500	25,000

(1) Universities only.

Note: Due to rounding, figures may not sum to stated totals.

Symbol:

... not applicable

Appendix



ED/RD/01



Research & Development Survey

Research & Development survey 2008 for Businesses

For Help and Information:

- ☎ Phone: **0800 333 108**
64 9 920 9108
- 📠 Fax: 09 920 9195
- ✉ Email: bus@stats.govt.nz
- ✉ Mail: Statistics New Zealand
Freepost 10007
Private Bag 92003
Auckland

Are the address details above correct? If not, use the boxes below to correct any errors.

Contact name	<input type="text"/>	0001
Organisation name	<input type="text"/>	0002
PO Box number or street number and name	<input type="text"/>	0003
Suburb	<input type="text"/>	0004
City	<input type="text"/>	0005

Please complete, sign and return this questionnaire in the envelope supplied.
Return date:

Purpose of this survey

The purpose of this survey is to collect data which will be used to produce summarised statistics of research and development activities for release to Government, business and other users in the community. The statistics will be used in the development of science policy areas.

Compulsory requirement

The taking of this survey has been approved by the Minister of Statistics and the return of this questionnaire, duly filled in and signed, is a compulsory requirement under the Statistics Act 1975.

Confidentiality of information supplied

Only people authorised by the Statistics Act 1975 are allowed to see your individual information, and they must use it only for statistical purposes. Your information will be combined with similar information to prepare summary statistics.

This is a joint collection by Statistics New Zealand and the Ministry of Research, Science & Technology under section 9 of the Statistics Act 1975. For detailed confidentiality information read page 16.


As Government Statistician I thank you for completing this survey. Your information contributes to statistics available for business decision-making. To find out how Statistics New Zealand can help your business grow, contact our information centre on 0508 525 525.



Geoff Bascand
Government Statistician

Instructions

1 How to answer:

- This form will be scanned and recognised by electronic equipment. Therefore please:
 - mark answers like this 
 - print answers in **CAPITAL** letters and
 - keep each letter or number **within** the spaces provided
 - for example **J O N E S** or **1 2 3**
- Please use a blue or black pen.
- Where actual figures are not available, please give careful estimates.
- Where there is no response, leave blank unless instructed to write **0**
- Supply whole dollar values only.
- Supply GST EXCLUSIVE values if possible.

2 Only include information for the organisation named on the front page. Do not provide consolidated data.

Don't include:

- subsidiary or associated organisations
- accounting divisions that operate entirely outside New Zealand

3 Please keep a record of the time it takes you to complete this questionnaire. You are asked to record this at the end of the questionnaire.

Include:

- the time spent reading the instructions, working on the questions and obtaining information
- the time spent by all employees in collecting and providing this information



Personnel by qualification

9 Please show both the highest qualification levels of personnel working on R&D as at 30 June 2008, and show the corresponding number of full-time equivalents working on R&D tasks during the year ended 30 June 2008.

Note: The total headcount should agree with total A. The total number of full-time equivalents should agree with total B.

Qualification	Headcount as at 30 June 2008	and	Full-time equivalents during the year ended 30 June 2008
PhD	<input type="text"/>		<input type="text"/>
	0901		0906
Bachelor degrees or equivalent, and post graduate qualifications other than PhD For example: Masters degrees and post graduate diplomas.	<input type="text"/>		<input type="text"/>
	0902		0907
Technical and Trade qualifications For example: NZ Certificate of Engineering or Science and NZ Trade Certificate.	<input type="text"/>		<input type="text"/>
	0903		0908
Other qualifications	<input type="text"/>		<input type="text"/>
	0904		0909
Total	<input type="text"/>		<input type="text"/>
	Headcount to agree with total A		FTE to agree with total B
	0905		0910



Current and capital expenditure

10 Please allocate the total expenditure on R&D carried out by this organisation during the financial year in questions 11 to 16

Don't include:

- R&D funded by this organisation, but carried out by other organisations. See 53

Note:

- If the figures are not specified in your accounts please give a careful estimate
- Subcontractors are included in 13
- Include a proportion of all overheads in 13. If necessary, estimate from your total overheads in proportion to the full-time equivalents engaged in R&D

11 Wages and salaries for full-time equivalent personnel

Include:

- Other employment related costs (eg overtime, ACC and fringe benefits)

Don't include:

- Redundancy and severance payments (to be included in 12)
- Wages and salaries of personnel indirectly supporting R&D

\$

1101

12 Redundancy and severance payments

\$

1201

13 Other current R&D expenditure

Include:

- All consumables and overheads incurred by direct and indirect support activities (eg materials, rent, and travel)
- Wages and salaries of personnel indirectly supporting R&D. Include only that part of their wages and salaries that is attributable to the indirect support of R&D (eg central finance, personnel services and cleaning)
- On site consultants and contact staff costs
- Operating leasing

Don't include:

- Depreciation
- Wages and salaries etc (included in 11 above)

\$

1301

14 Capital expenditure - land and buildings

Note: If the land and buildings purchased are also used for production, please include only the portion used for R&D.

\$

1401

15 Capital expenditure - plant, equipment, machinery, vehicles, capitalised software and other assets

Note: If the assets purchased are also used for production, please include only the portion used for R&D.

\$

1501

16 Total expenditure on in-house R&D

\$

This is total C

1601



Purpose of research

- 27 Which of the following sectors benefit from the R&D projects carried out? Please allocate to each of the following sectors the relevant percentage of R&D expenditure in the financial year.**

Note: This should relate to the sector that will ultimately benefit from the results, not the nature of the R&D itself. For example, software specifically developed for a food processing factory, should be classified to manufacturing

Primary industries

- 28 Plant production and plant primary products**
Includes: Forestry; horticultural and industrial crops; grains and oil seeds; harvesting and packaging of plant products; environmentally sustainable plant production □ □ □ □ %
 2801
- 29 Animal production and animal primary products**
Includes: Fisheries (aquaculture and wild caught); livestock raising; pasture, browse and fodder crops; primary animal products (including raw wool and unprocessed or minimally processed fish and milk); environmentally sustainable animal production □ □ □ □ %
 2901
- 30 Mineral resources (excluding energy)**
Includes: Mineral exploration; primary mining and extraction of minerals; first-stage treatment of ores and minerals; environmentally sustainable mineral-resource activities □ □ □ □ %
 3001

Industrial and infrastructure development

- 31 Energy**
Includes: Energy exploration; mining and extraction of energy; preparation and production of energy; energy transformation; renewable energy; storage, distribution and supply; energy conservation and efficiency; environmentally sustainable energy activities □ □ □ □ %
 3101
- 32 Manufacturing**
Includes: Processed food products and beverages (incl. dairy products); wood and paper products; leather, fibre and textiles; chemical products; pharmaceuticals; ceramics, glass; metal products; machinery and equipment; electronic and communication equipment; environmentally sustainable manufacturing □ □ □ □ %
 3201
- 33 Construction**
Includes: Construction materials, planning, design and processes; building management and services; environmentally sustainable construction □ □ □ □ %
 3301
- 34 Transport**
Includes: Land, water and aerospace transport; environmentally sustainable transport □ □ □ □ %
 3401
- 35 Information and Communication Services**
Includes: Communication networks and services; computer software and services; information and media services; management of environmental impacts from information and communication services □ □ □ □ %
 3501
- 36 Commercial Services and Tourism**
Includes: Financial services; property and business support services and trade; tourism, water and waste services; environmentally sustainable commercial services and tourism □ □ □ □ %
 3601



Society

37	Health <i>Includes:</i> Clinical health (organs, diseases and abnormal conditions); health and support services; public health	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	3701
38	Education and Training <i>Includes:</i> Learner and learning; teaching and instruction; curriculum; school / institution; education and training systems	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	3801
39	Law, Politics and Community Services <i>Includes:</i> Community service; government and politics; international relations; justice and law; work and institutional development	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	3901
40	Cultural Understanding <i>Includes:</i> Arts and leisure; communication, heritage, religion and ethics, understanding past societies	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	4001
Other purposes			
41	Economic Framework <i>Includes:</i> Macroeconomics and microeconomics; international trade; management and productivity, measurement standards and calibration services	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	4101
42	Environment <i>Includes:</i> Air, atmosphere, weather, climate change; biosecurity; ecosystems; natural resource evaluation; policy, legislation and standards; biodiversity, land and water management; natural hazards; environmental rehabilitation; conservation areas; soils	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	4201
43	Defence <i>Includes:</i> Navy or maritime; army or land, air force or aeronautics; logistics; intelligence; national security (non-military); emerging defence technologies	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	4301
44	Other	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	4401
45	Total	1 0 0 %	



Definition of biotechnology

46 What is biotechnology?

The OECD defines biotechnology as the application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods or services.

The following is an OECD indicative guide to biotechnology:

- **DNA - the coding:** Geonomics, pharmaco-genetics, gene probes, DNA sequencing / synthesis / amplification, genetic modification
- **Proteins and Molecules - the functional blocks:** Protein / peptide sequencing / synthesis, lipid / protein glycoengineering, proteomics, hormones and growth factors, cell receptors / signalling / pheromones
- **Cell and tissue culture and engineering:** Cell / tissue culture, tissue engineering, hybridisation, cellular fusion, vaccine / immune stimulants, embryo manipulation
- **Process biotechnologies:** Bioreactors, fermentation, bioprocessing, bioleaching, bio-pulping, bio-bleaching, biodesulphurisation, bioremediation and biofiltration
- **Sub-cellular organisms:** Gene therapy, viral vectors
- **Other:** Bioinformatics, nanobiotechnology etc

47 Did the R&D reported in total C include any biotechnology?

- ₁ yes → please provide an estimate of the share of R&D expenditure that is attributable to biotechnology.
- ₂ no

%

4700

4701



Type of research carried out

48 Which of the following types of research were carried out?
Please allocate to each type the relevant percentage of R&D expenditure in the financial year.

49 **Experimental development**
Systematic work undertaken using existing knowledge for the purpose of creating new or improved materials, products, processes and / or services. %

5201

50 **Applied research**
• New work undertaken to acquire knowledge for a specific practical aim
• Work to determine possible uses of basic research
• Work to determine new ways of achieving a predetermined objective %

5101

51 **Basic research**
Pursue a planned search for knowledge with either a broad underpinning reference, or no reference to a likely application. %

5301

52 **Total** %

1 0 0 %

R&D funded externally - in addition to in-house R&D

53 In addition to the R&D your organisation carried out in house, in the last financial year, did this organisation fund any R&D carried out at other organisations?

Include: Funding to a subsidiary of this organisation.

Don't include: Subcontractors working on R&D projects carried out by this organisation

₁ yes → go to **55**

₂ no → go to **64**

5500



External R&D funded during the financial year

54 In the last financial year, did this organisation fund any R&D carried out at other organisations?

Include: Funding to a subsidiary of this organisation

Don't include: Subcontractors working on R&D projects carried out by this organisation

₁ yes → go to **55**

₂ no → go to **70**

5401

55 If this organisation paid for R&D but did not do the work itself, where did this business spend the money?

56 NZ private sector

Include:

- Private and publicly listed organisations
- State-owned enterprises
- Producer boards
- Research associations and industry research co-operatives

\$

5601

57 NZ central government sector

For example: Departments, ministries and crown entities

Don't include:

- Crown research institutes
- State-owned enterprises

\$

5701

58 Crown research institutes

For example: NIWA, Landcare Research, Crop & Food Research and AgResearch.

\$

5801

59 NZ local government sector

For example: District councils, city councils and regional councils.

\$

5901

60 NZ tertiary education sector

For example: Universities and polytechnics.

\$

6001

61 Overseas organisations

Include: Funds overseas organisations in the same group.

\$

6101

62 Other (please specify)

\$

6202

6201

63 Total

Do not include this amount in Total C

\$

This is total D

6301



Reporting activities

64 Please give this organisation's total expenditure on R&D and related activities:

in-house R&D (copy any total C from page 6 here)	\$											6401
external R&D (copy any total D from page 12 here)	\$											6402
related activities (eg trials, commercialisation)	\$											6403
Total	\$											6404

This is total E

65 Of total E in question 64 (expenditure on in-house and external R&D and related activities), please estimate what percentage was spent on the following:

software development for internal use				%	6501
R&D performed overseas				%	6502

66 Mark one oval. Which of the following best describes how this organisation documents the R&D activities it undertakes or funds?

1 complete plans and documentation for each project stage

2 partial project plans and documentation

3 no specific process for documenting R&D activity

6601

67 Mark one oval. Which of the following best describes the systems this organisation currently has for reporting expenditure on in-house or external R&D?

1 separate reporting of expenditure and costing methods at each R&D project stage

2 separate reporting of R&D and non R&D-related expenditure

3 R&D and non-R&D related expenditure recorded together under common expense categories

6701

68 Mark one oval. For external reporting, which of the following is the biggest difficulty for this organisation in accurately distinguishing the R&D activities it undertakes or funds?

1 understanding what should or should not be included as 'R&D'

2 unsuitable documentation of R&D activities

3 unsuitable systems for reporting of R&D-related expenditure

4 no difficulties reporting R&D activities

6801

69 Mark one oval. What does this organisation expect to happen to the amount of R&D it undertakes or funds in the next financial year?

1 decrease

2 stay the same

3 increase

4 don't know

6901



Other Details

70 The figures given in this questionnaire:

- ₁ exclude GST
- ₂ include GST

7000

71 How long did it take you to complete this questionnaire?

Include:

- The time spent reading the instructions, working on the questions and obtaining information
- The time spent by all employees in collecting and providing this information

hrs mins

7101

72 Comments

Please make any comments that would help Statistics New Zealand to interpret the information that you have given

7201

73 The main results of this survey are expected to be released in April 2009. If you would like a link to the results sent to the email address in question 74, please mark below.

- yes, I would like to be emailed the main results of this survey

7301

74 Who should we contact if we have any queries about the information you have given? If necessary, please correct errors or provide details in the white boxes below each item.

Name

↳

7401

Position

↳

7402

Email

↳

7403

Phone →

7404

Fax →

7405

Cellphone →

7406

I declare that this questionnaire has been completed to the best of my knowledge.

Signature Date

7407

Day Month Year

Office use: **A B C**

07/2008



Further definitions of R&D

R&D includes:

- Design, construction and operation of prototypes where the main objective is technical testing or to make further improvements
- Construction and operation of pilot plants not operated or intended to be operated as commercial units
- Research into, and original development (or substantial modification) of computer software such as new programming languages and new operating systems
- "Feedback R&D" directed at solving problems occurring beyond the R&D phase, for example technical problems arising during the initial production runs
- Research work in the biological, physical and social sciences, and the humanities
- Social science research includes economic, cultural, educational and sociological research

R&D excludes (except where used primarily for the support of, or as part of, R&D projects):

- General purpose or routine data collection
- Policy related studies, management studies, efficiency studies
- Routine quality control and testing
- Pre-production activities such as demonstration of commercial viability, tooling up and trial production runs
- Prospecting, exploring or drilling for minerals, petroleum or natural gas
- Cosmetic modifications or style changes to existing products
- Scientific and technical information services
- Routine computer programming, systems maintenance or software development and application
- Operational research and mathematical or statistical analysis
- Commercial, legal and administrative aspects of patenting, copyrighting or licensing activities
- Activities associated with standards compliance
- Specialised routine medical care, e.g. routine pathology services

Where does R&D end?

R&D ends when work is no longer experimental and pre-production begins.

If the primary objective is to make further technical improvements, then the work comes within the definition of R&D.

However, if the material, product etc. is substantially developed and the primary objective is to develop markets (i.e. market research), to do pre-production planning or to get production or control systems running smoothly, then the work is no longer R&D.

Borderline between research and studies

Research activities are usually performed in scientific units. Their aim is to produce innovative results which can be generalised or be generally utilised. The activities are often connected to other research, and financed from research funds; the results have a considerable novelty value and they are widely published.

Studies involve collecting, processing and analysing data for decision making and planning. The studies are often made by enterprises as an integral part of planning activities. The results are mainly descriptive, they are not widely published and they cannot easily be generalised or utilised for any other purpose. Income and expenditure on studies should not be included in this questionnaire.



Confidentiality of information supplied

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