Stats NZ
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# Research and development in New Zealand:

# 2018



New Zealand Government

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# Purpose and summary

## Purpose

*Research and Development in New Zealand: 2018* presents an overview of key points of interest about research and development (R&D) carried out in New Zealand, including purpose of R&D, sources of funding, and information on R&D workers. R&D plays a critical role in innovation. It is essentially an investment in technology and future capabilities that results in new products, processes, and services.

Information in this report is based on data from the R&D Survey with a focus on 2016 and 2018. This survey is conducted by Stats NZ and funded by the Ministry of Business, Innovation and Employment (MBIE).

Gross expenditure on R&D (GERD) is the sum of business expenditure on R&D (BERD), higher education expenditure on R&D (HERD), and government expenditure on R&D (GovERD).

This report focuses on the 24 percent increase in GERD from 2016 to 2018, as well as the changes in the types of funding sources, and total wages and workers, for R&D over the same period. GERD was $3,894 million in 2018, up $757 million from 2016. This is the largest growth in total R&D expenditure since collection of this data began.

The 2018 R&D Survey collected information on employment and expenditure by private sector enterprises, government departments, government-owned trading entities, and universities that undertake R&D.

See Research and Development Survey: 2018 for the first release of data from the 2018 survey.

# Summary of key points

In 2018 compared with 2016:

- Total R&D spend was $3,894 million, up $757 million (24 percent) from $3,136 million.
- Large businesses drove growth in R&D expenditure:
  - BERD was $2,150 million, up $548 million (34 percent)
  - large businesses contributed 55 percent ($1,173 million) of BERD, up $305 million.
- R&D as proportion of GDP increased:
  - total R&D expenditure as a proportion of GDP rose to 1.37 percent, from 1.23 percent.
- R&D on health saw largest growth:
  - total R&D expenditure on research for health increased to $528 million, up $171 million
  - the private sector made the largest contribution to this increase, up $113 million (81 percent) to $252 million
  - the main purpose for R&D remained manufacturing, accounting for $670 million of R&D expenditure.
- Funding for R&D rose:
  - overseas funding for BERD increased by $68 million (up 41 percent) to $236 million
  - government funding for BERD increased by $80 million to $256 million.
- Wages for full-time equivalent workers in R&D rose:
  - total full-time equivalent (FTE) R&D researchers (excluding student researchers) rose 3,000 (17 percent) to 23,000
  - total wages and salaries for R&D researchers rose $311 million to $1,971 million
  - average researcher wages rose to $86,541.

# Increase in R&D

In 2018, total R&D spend was $3,894 million, up $757 million (24 percent) from 2016. This report delves into the aspects contributing to this increase, including:

- the size of businesses performing R&D
- the purposes of R&D
- the sources of R&D funds
- the wages and salaries of R&D personnel.

## Business sector R&D rises

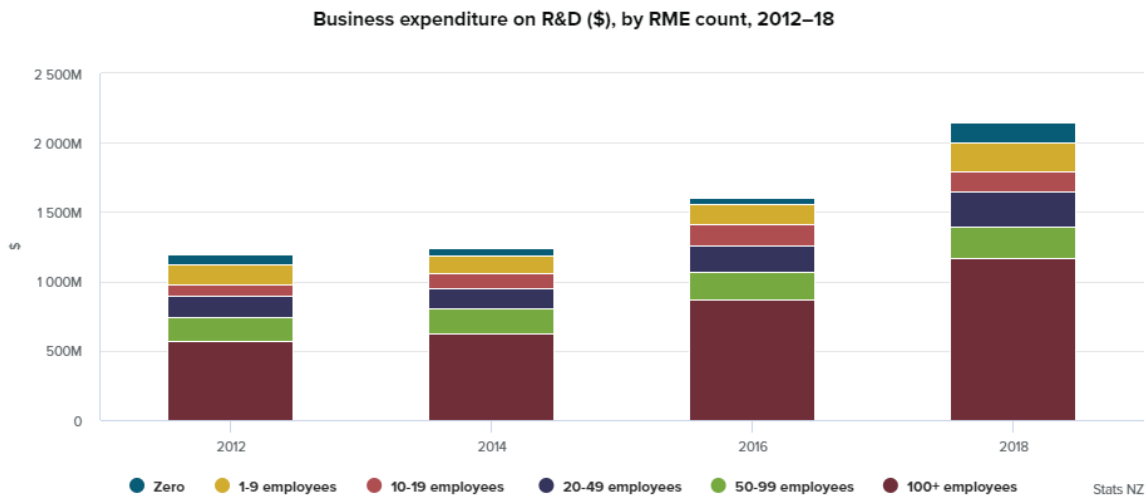
In 2018, BERD rose to $2,150 million, up $548 million (34 percent) from 2016.

The proportion of business expenditure that makes up total GERD increased to 55 percent from 51 percent. Over the same period, the proportion of total enterprises that performed R&D made up by the private sector enterprises stayed steady at 97 percent.

A business's size is determined by its RME count. RME is a 12-month rolling average of the monthly employment count figure. The employment count of a business is obtained from taxation data. Examples of enterprises with an RME count of zero are holding companies, property owning companies, self-employed people with no employed staff, people in professional and management services, or trusts.

The largest increase in BERD by RME came from businesses with an RME of 100 and over (up $305 million between 2016 and 2018). The average amount of R&D expenditure per large business rose by almost a million dollars to $4.6 million in 2018.

**Figure 1**



## R&D expenditure and GDP

The total GERD as a proportion of GDP rose to 1.37 percent in 2018, up from 1.23 percent in 2016. New Zealand ranks 21st in the OECD for its gross R&D spending as a percentage of GDP according to the latest available data for the 34 OECD countries (OECD, nd). From 2016 to 2018 New Zealand's position among OECD countries rose seven places (up from 28th in 2016).

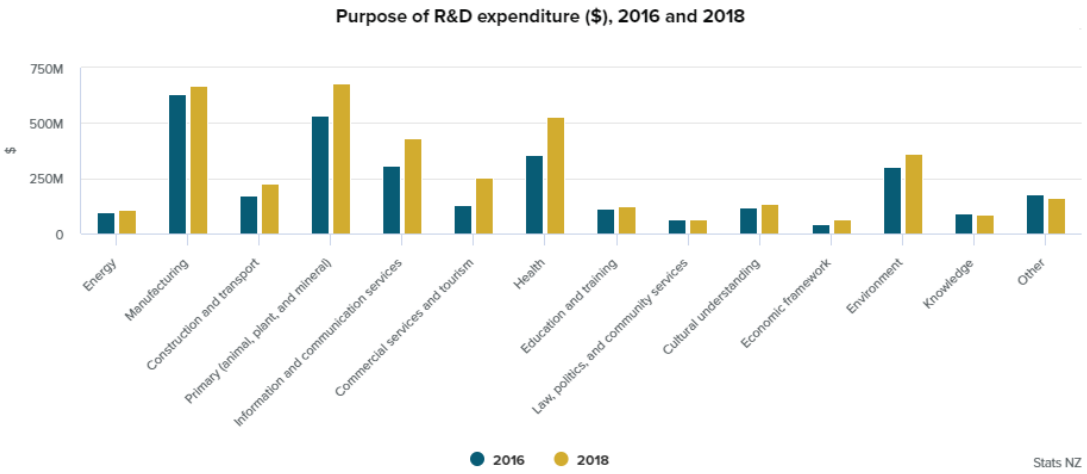
## Purpose of R&D

In the R&D survey, respondents are asked about the purpose of their R&D. The purpose is the area that will ultimately benefit from the results of R&D carried out by this business and is linked closely with the Socioeconomic Objective Classification.

In both 2016 and 2018, more R&D expenditure was for the purpose of manufacturing than for any other purpose. Manufacturing accounted for a 17 percent share of total GERD, or $670 million, in 2018. R&D expenditure on manufacturing increased 7 percent from 2016.

A similar proportion (17 percent) of R&D expenditure in 2018 was for the combined primary purposes of plant production, animal production, and mining.

**Figure 2**




Across all sectors, R&D expenditure on health in 2018 was $528 million, up $171 million (45 percent) from 2016. This was the largest increase by purpose of expenditure over this period.

The higher education sector spent 24 percent of their total R&D expenditure ($960 million) on research on health in 2018, making health the main purpose of research for this sector.

Private sector spending on health increased for most size groups (by RME). However, the largest growth was seen in spending by large businesses (those with 100 or more RME), which increased $65 million or 95 percent from 2016.

## Sources of funding

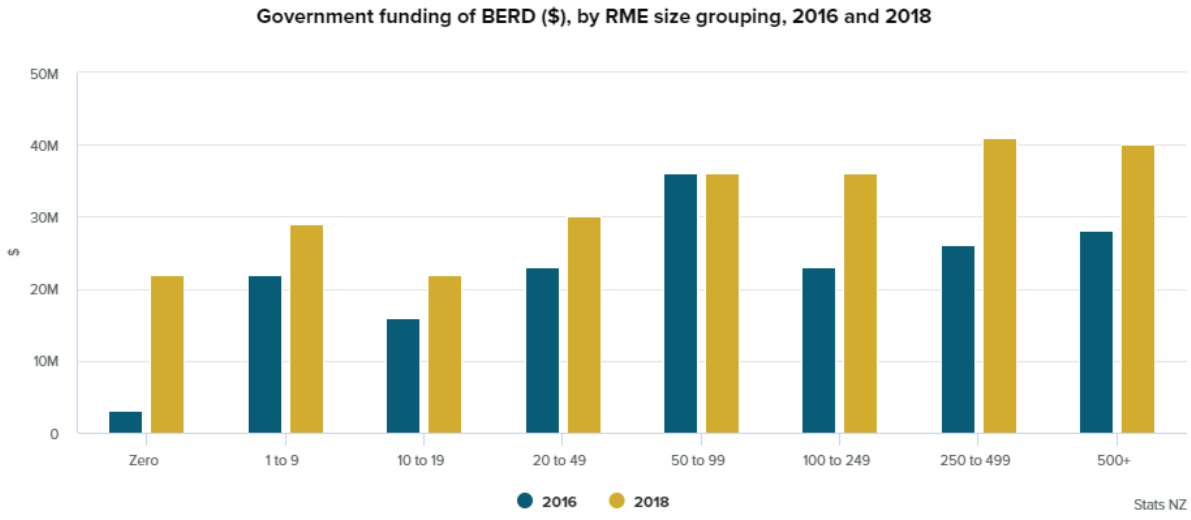
In the R&D survey, private sector businesses are asked about sources of R&D funds. Sources may include New Zealand private sector businesses (either from their own business or another New Zealand business), New Zealand government, overseas, tertiary, or other sources.

Since 2012, around three-quarters of funding for BERD each year has been funded by the business sector, with 97% of this being businesses funding themselves.

Overseas funding for BERD was $236 million in 2018, and made up around 11 percent of all funding, a similar proportion to 2014 and 2016. Over 40 percent of this overseas funding went to businesses with an RME count of between 100 to 249. For these businesses, overseas funding accounted for 30 percent of their total funding.

Government funding of BERD was $256 million in 2018 and made up 12 percent of total funding. Government funded a similar proportion of BERD (between 11 and 12 percent) in 2012, 2014, and 2016. Of all businesses, the largest (500 RME or more) received the smallest proportion of their funding from government sources, at only 8 percent.

**Figure 3**



## Workers and wages

In the R&D survey, respondents are asked for a breakdown of their total internal R&D spending. They are asked for the amount spent on:

- wages and salaries (of R&D personnel only)
- other current expenditure
- capital expenditure – land and buildings
- capital expenditure – equipment, machinery, vehicles, and other assets.

Respondents are also asked about the number of R&D personnel they employ, both in terms of headcounts and FTEs. The survey collects personnel numbers by both qualification and occupation.

The total wages and salaries for R&D personnel was $1,971 million in 2018, up $311 million (19 percent) from 2016. The total R&D FTE increased by 3,000 (17 percent) to 23,000.

The average wages and salaries of R&D personnel across all sectors was $86,541 in 2018, only slightly higher than in 2016.

Researchers in the primary industry had the highest average wage, per FTE, across all industries and sectors at $104,018 for 2018. This figure fell by over $8,000 from 2016. The number of primary industry workers almost doubled, from 280 to 490 FTEs, over the same period.

# Background

R&D is important for economic growth and sustaining a dynamic economy.

The R&D Survey defines R&D as a creative work that:

- is carried out systematically with the goal of increasing knowledge
- is original, and
- has investigation as its primary objective.

Statistics from the survey, which is typically run every two years, measure and evaluate New Zealand's R&D performance. In 2019, an additional iteration of the survey will be run, for business enterprises only. This will enable measurement of the impact of the R&D Tax Incentive and other grants available for enterprises undertaking R&D. These statistics also provide a basis for benchmarking this performance against other countries.

Enterprises may undertake R&D in-house or fund other enterprises to undertake R&D. Similarly, an industry sector may undertake or fund R&D that benefits and occurs in another sector. For example, the government can provide R&D grants to the private sector.

## Reference period and frequency

The most-recent survey relates to the 2017/18 financial year. Those with balance dates falling between 1 October and 31 December supplied financial data for the year ending 2017. Enterprises with balance dates falling between 1 January and 30 September supplied data for the year ending 2018. This report (and the release: *Research and development survey*) has been published every two years since 2002.

## Data quality

The R&D Survey sample is designed to produce estimates at the one-digit ANZSIC (industry) level and some limited estimates at the two-digit level. For example, estimates are produced for services as a total (one-digit level), and computer services as a subtotal (two-digit level). Any lower level breakdowns of these estimates (eg purpose broken down by business size) will have a higher sampling error and should be treated with caution.

## Sampling error

The sampling error of the total GERD figure for 2018 ($3,894 million) was 3.4 percent, at the 95 percent confidence level. This estimate is within plus or minus 3.4 percent ($132 million) of the $3,894 million, with 95 percent confidence.

## Rounding

Business counts are randomly rounded to a base of three. This means that if the estimated number of businesses in a category is 50, the published number will be either 48 or 51 businesses, as those numbers are divisible by three. This rounding ensures that individual businesses are not identifiable from published data.

Due to random rounding to base three, lower counts of business should be treated with caution. For example, a count of one business will be published as either zero or three businesses.

Counts of people are randomly rounded using graduated random rounding; this means that ranges of figures are rounded to specified bases, the rounding base gradually increasing as the range does. The ratio of the rounding base to the figures thus remains constant.

If a value is:

- 0–99 the rounding base is 5
- 100–1,000 the rounding base is 10
- 1,001–10,000 the rounding base is 100
- 10,001–100,000 the rounding base is 1,000.

As an example, an unrounded value of 236 would be randomly rounded to either 220 or 240, while an unrounded value of 19,750 would be rounded to 19,000 or 20,000.

# Reference

OECD (nd). Gross domestic spending on R&D. Retrieved 31 May 2019 from data.oecd.org.

# Glossary

**Business expenditure on research and development (BERD)** – sum of all R&D expenditure by the private sector.

**Full-time equivalent (FTE)** – a unit of measurement that indicates a workload of an individual employed worker.

**Government expenditure on research and development (GovERD)** – sum of all R&D expenditure for the government sector, which includes crown research institutes, government departments and agencies, local government and health boards, but excludes higher education enterprises.

**Gross domestic expenditure on research and development (GERD)** – estimates derived by adding the estimates of R&D performed in the private, higher education, and government sectors.

**Higher education (university) expenditure on research and development (HERD)** – sum of all R&D expenditure for the eight universities of New Zealand.

**Rolling mean employment (RME)** – RME is a 12-month rolling average of the monthly employment count of a business.

# Appendix 1: Population definition and sampling method of the R&D survey

The population of the R&D survey includes enterprises from higher education (universities), crown research institutes, government, and private sectors.

Enterprises (from both the government and private sector) are part of the R&D population if they meet any of the following criteria:

- have applied for a grant from the Ministry of Business, Innovation and Employment
- are on the Intellectual Property Office of New Zealand list
- ticked 'yes' to R&D activity in the previous year's Business Operations Survey
- have had R&D activity in either of the past two years of the R&D survey
- have indicated that they are involved in R&D when answering the Business Register Update Survey.

If an enterprises falls under the following ANZSIC codes, they are automatically excluded from the R&D population due to negligible R&D activity:

- G – Retail trade
- H – Accommodation and food services
- I – Transport, postal and warehousing
- P – Education and training (with the exception of universities).

Enterprises that have the ANZSIC code M691 (Scientific research) are reclassified according to their field of research. This is so that R&D activity is reported in the area that benefits from the activity. An example of this would be if an M691 business was conducting dairy farming research, they would be reclassified under the agriculture ANZSIC code for the R&D survey.

When the R&D population list has been established, the population is stratified by industry (determined by ANZSIC code). This ensures that the R&D survey has sufficient coverage to produce quality industry-level estimates.

Once stratified, the sample is randomly selected from the population list. The R&D survey has a relatively high sampling rate. The 2018 overall sampling rate was 93 percent.

# Appendix 2: Tables of total New Zealand businesses

The following tables use data from business demography statistics. Business demography statistics give an annual snapshot (as at February) of the structure and characteristics of New Zealand businesses.

Business demography statistics are limited to economically significant individual, private-sector, and public-sector enterprises that are engaged in the production of goods and services in New Zealand.

These enterprises are maintained on the Stats NZ Business Register which generally includes all employing units and those enterprises with GST turnover greater than $30,000 per year.

## Table A1

**Total New Zealand businesses**
By rolling mean employment (RME) count
2012–2018

| RME count | 2012 | 2014 | 2016 | 2018 |
|---|---|---|---|---|
| | Count of Businesses | | | |
| Zero | 326,721 | 345,300 | 363,870 | 376,785 |
| 1–9 employees | 118,140 | 119,109 | 120,480 | 123,828 |
| 10–19 employees | 16,059 | 16,554 | 17,271 | 18,243 |
| 20–49 employees | 8,562 | 9,171 | 9,801 | 10,323 |
| 50–99 employees | 2,550 | 2,721 | 2,988 | 3,192 |
| 100+ employees | 2,139 | 2,178 | 2,352 | 2,562 |
| **Total** | **474,171** | **495,030** | **516,762** | **534,933** |

**Note:** Due to rounding, figures may not add to stated totals.
**Source:** Stats NZ

## Table A2

**Total New Zealand businesses**
By business sector
2012–2018

| Sector | 2012 | 2014 | 2016 | 2018 |
|---|---|---|---|---|
| | Count of Businesses | | | |
| Primary | 71,370 | 69,696 | 70,101 | 66,015 |
| Manufacturing | 20,763 | 20,877 | 21,429 | 21,477 |
| Services | 315,453 | 335,370 | 352,569 | 372,636 |
| Not included in R&D survey | 66,585 | 69,081 | 72,663 | 74,805 |
| **Total business sector** | **474,171** | **495,030** | **516,762** | **534,933** |

**Note:** Due to rounding, figures may not add to stated totals.
**Source:** Stats NZ

# Appendix 3: Published Industries

The published industries within the business and government sector are based on the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC06), apart from the reclassification of significant scientific research organisations (M691) to the industry they predominately serve, and the inclusion of local and state-owned trading enterprises. The published industries are listed below, followed by their ANZSIC06 codes.

**Business sector**

The three major business industries referred to in this report are primary, manufacturing, and services. Each of these industries are defined by what sub-industries are included in them. We apply the industry breakdowns using the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC06).

The ANZSIC codes in the primary industries are:

- A – Agriculture, forestry and fishing
- B – Mining

The ANZSIC code in the manufacturing industries is:

- C – Manufacturing

The ANZSIC codes in the services industries are:

- D – Electricity, gas, water, and waste services
- E – Construction
- F – Wholesale trade
- G – Retail trade
- H – Accommodation and food services
- I – Transport, postal and warehousing
- J – Information media and telecommunications
- K – Financial and insurance services
- L – Rental, hiring and real estate services
- M – Professional, scientific and technical services
- N – Administrative and support services
- O – Public administration and safety
- P – Education and training
- Q – Health care and social assistance
- R – Arts and recreation services
- S – Other services

Retail trade; accommodation and food services; transport, postal and warehousing; and education and training are excluded from the R&D survey population but are included in Appendix 2: Tables of total New Zealand businesses.

**Government sector**

The government sector excludes the eight universities, and central and local government trading enterprises, and includes all enterprises with the New Zealand Institutional Sector Classification 1996 (NZISC96) codes. We apply the published industry breakdown using the ANZSIC codes as below:

- Scientific research – M691
- Other government research – All ANZSIC codes except M691

**Higher education (universities) sector**

The higher education (universities) sector includes the eight New Zealand universities that are members of Universities New Zealand – Te Pōkai Tara. These are classified to ANZSIC06 code of P810200 (higher education).

- Total universities, including their commercial arms.