# SOUTH AFRICAN NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT

# STATISTICAL REPORT 2015/16

science & technology
Department:
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Produced by the Centre for Science, Technology and Innovation Indicators on behalf of the Department of Science and Technology.

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## User feedback

A User Satisfaction Survey (USS) questionnaire is included as Annexure G of this report. It would be very much appreciated if users could complete the questionnaire and return it by fax to +27 (0)21 461 1255 or by email to cestiidata@hsrc.ac.za. The feedback is analysed following each survey cycle to ensure the continued improvement of the R&D survey.

## Revisions

The Department of Science and Technology (DST), Statistics South Africa (Stats SA) and the Human Sciences Research Council's Centre for Science, Technology and Innovation Indicators (HSRC-CeSTII) jointly reserve the right to revise the data, indicators and analysis contained in this report. Such revisions may result from revisions by Stats SA of socio-economic indicators, such as the gross domestic product (GDP), or population or employment numbers, or amendments in response to internal and external data quality and consistency monitoring such as that carried out by the Organisation for Economic Co-operation and Development (OECD), which conducts quality checks through global comparative analysis, time series analyses and other methods. Explanations of any revisions will be made available and accessible on the DST and HSRC websites.

# FOREWORD

Any modern economy requires adequate levels of investment in research and development (R&D) and innovation. The National Survey of Research and Experimental Development (R&D Survey) is conducted annually to update the series of official statistics on South Africa's performance on key indicators of inputs to R&D – measuring the size, growth and composition of R&D expenditure and the human resources devoted to R&D.

The survey is overseen by the Department of Science and Technology (DST) as a partner within the South African National Statistics System (NSS). R&D statistics are key to informing policy implementation by government and are also of use to the private sector, the international community, media, and researchers.

The Statistics Act (No. 6 of 1999) mandates the Statistician General (SG) to coordinate statistical production in the country, even beyond the confines of Statistics South Africa (Stats SA). Accordingly, each R&D survey is subject to a quality assessment prior to its publication, in terms of the South African Statistical Quality Assessment Framework (SASQAF), to ensure that the survey remains credible and true to its purpose.

The Clearance Committee that conducted the quality assessment noted that the 2015/16 R&D Survey was conducted following good practices, and met most of the set quality requirements. The questionnaire response rate was 73.1%, 1.9 points below the set standard of 75%. The collection rate was 80.8%, which is above the standard of 75%. As in the previous two rounds of the survey, greater focus has been given to expanding the universe of R&D performers, particularly in the business sector and the not-for-profit sector. This led to a higher than targeted out-of-scope rate, i.e. proportion of sampled units that did not perform in-house R&D in the reference year. Intermittent R&D performing units cause this tendency. Also, as in several other economies, R&D in South Africa is concentrated in a few larger R&D performing units across institutional sectors, requiring the survey to purposefully cover such units. Important changes are noted in the higher education sector, with new public institutions established and private higher education institutions growing their research capacity.

The initial phase of incorporating the revisions to the 2015 Frascati Manual (*i.e. Guidelines for Collecting and Reporting Data on Research and Experimental Development*) has started. Minor refinements will be introduced in the 2016/17 round of the R&D Survey questionnaire. Further research and consultations are being undertaken to consider enhancements, both to account for expanded uses of the R&D data in South Africa, and to maintain international comparability.

Given my assessment of the recommendations of the Clearance Committee, I endorse the 2015/16 R&D Survey results and encourage its use by stakeholders.

Risenga Maluleke
STATISTICIAN-GENERAL, REPUBLIC OF SOUTH AFRICA

# ACKNOWLEDGEMENTS

The South African National Survey of Research and Experimental Development is conducted annually by the Human Sciences Research Council's Centre for Science, Technology and Innovation Indicator's (HSRC-CeSTII), on behalf of the Department of Science and Technology (DST).

The project team extends its appreciation to Dr Phil Mjwara, Director-General of the DST, Prof. Crain Soudien, CEO of the HSRC, Prof. Leickness Simbayi, Deputy CEO: Research, HSRC, and Dr Pali Lehohla, Statistician-General, for their support of the R&D survey.

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Technical inputs and advice by the DST and Statistics South Africa teams, as well as the Clearance Committee for Science, Technology and Innovation Statistical Reports, have helped improve the quality of this publication, and are appreciated. In addition, interactions with the OECD Working Party of National Experts on Science and Technology Indicators (NESTI) have provided invaluable assistance in maintaining the quality and standard of the South African R&D surveys and analysis of the results.

We are most grateful for and acknowledge the co-operation of the respondents to the questionnaire.

The HSRC-CeSTII project team for the 2015/16 South African National Survey of Research and Experimental Development comprised: Lindiwe Binda, Yasser Buchana, Mario Clayford, Zinziswa Hlakula, Firdous Khan, Lwando Kondlo, Glenda Kruss, Loyiso Maciko, Nhlanhla Malaza, Maria Maluleke, Hlamulo Makelane, Jerry Mathekga, Neo Molotja, Gina Mshengu, Precious Mudavanhu, Nazeem Mustapha, Ndiyakholwa Ngqulu, Janine Senekal, Saahier Parker, Thembinkosi Zulu, Theodore Sass, Natasha Saunders, Moses Sithole, Sinovuyo Takatshana, Natalie Vlotman, and Gerard Ralphs.

# ABBREVIATIONS

| | |
|---|---|
| **AIDS** | Acquired Immune Deficiency Syndrome |
| **BERD** | Business Expenditure on R&D |
| **CeSTII** | Centre for Science, Technology and Innovation Indicators |
| **DST** | Department of Science and Technology |
| **FTE** | Full-time Equivalent |
| **GDP** | Gross Domestic Product |
| **GERD** | Gross Domestic Expenditure on R&D |
| **GOVERD** | Government Intramural Expenditure on R&D |
| **HEMIS** | Higher Education Management Information System |
| **HERD** | Expenditure on R&D in the Higher Education Sector |
| **HIV** | Human Immunodeficiency Virus |
| **HSRC** | Human Sciences Research Council |
| **ICT** | Information and Communication Technologies |
| **NESTI** | National Experts on Science and Technology Indicators |
| **NPO** | Not-for-profit Organisation |
| **NSI** | National System of Innovation |
| **NSO** | National Statistical Organisation |
| **OECD** | Organisation for Economic Co-operation and Development |
| **R&D** | Research and Experimental Development |
| **RDSMS** | Research and Development Survey Management System |
| **SA** | South Africa |
| **SASQAF** | South African Statistical Quality Assessment Framework |
| **SOE** | State Owned Enterprise |
| **SEO** | Socio-economic Objective |
| **SMU** | Sefako Makgathu Health Sciences University |
| **SIC** | Standard Industrial Classification |
| **SNA** | System of National Accounts |
| **SPII** | Support Programme for Industrial Innovation |
| **Stats SA** | Statistics South Africa |
| **SVC** | Statistical Value Chain |
| **TB** | Tuberculosis |
| **VAT** | Value Added Tax |

# DEFINITIONS AND DESCRIPTIONS

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

**Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.

**Biotechnology** is an 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.

**Capital expenditures** are the annual gross expenditures on fixed assets used in the R&D programmes of statistical units. These are reported in full for the period when they took place and are not registered as an element of depreciation. Capital expenditures on R&D consist of buildings, vehicles, plant machinery and equipment.

**Civil gross expenditure on research and development (Civil GERD)** is the sum of all expenditure by socio-economic objectives, minus expenditure on defence R&D.

**Constant 2010 Rands** is the value of goods and services of a given year using the prices of a determined base reference year, which is 2010 in this case. These values were obtained by deflating with the GDP deflator using data published in the Statistics South Africa GDP survey P0441, 1st Quarter 2017 (Stats SA, 2017).

**Current expenditure** is expenditure on items that generally reoccur after a short period. Current expenditure on R&D activities consists of labour costs and other current expenditures.

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

**Full-time equivalent (FTE)** is an estimate of the time spent on R&D activities. It is the proportion of time spent on R&D activities out of all time spent at work.

**Gross domestic product (GDP)** is the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports. This statistic is obtained from the Statistics South Africa GDP survey P0441, 1st Quarter 2017 (Stats SA, 2017).

**Gross expenditure on research and development (GERD)** covers all expenditures for R&D performed on national territory in a given year. It thus includes domestically performed R&D which is financed from abroad but excludes R&D funds paid abroad, notably to international agencies.

**Headcounts** refers to the number of people directly involved in or supporting R&D (i.e. the total number of R&D personnel within a category).

**In-house or intramural R&D** refers to R&D performed by the unit or entity itself (i.e. by the personnel of the unit or entity). This is R&D performed within the borders of South Africa, even if funded by foreign sources.

**Labour costs** comprise annual wages and salaries and all associated costs or fringe benefits, such as bonus payments, holiday pay, contributions to pension funds and other social security payments, payroll taxes, etc. The labour costs of persons providing indirect services which are not included in the personnel data (such as security and maintenance personnel or the staff of central libraries, computer departments or head offices) are excluded and included in other current costs.

**New materials** pertain to the technology and R&D activities of high-tech companies particularly in the aerospace, construction, electronic, biomedical, renewable energy, environmental remediation, food and packaging, manufacturing and motor car industries. New materials include multi-functional materials, advanced materials, nano-materials, nano-composites and nanotechnology.

**Nanotechnology** is the understanding and control of matter at dimensions of roughly 1 to 100 nanometres, where unique phenomena enable novel applications.

**Open-source software** is computer software that is available in source code form under an open-source licence. The source code and certain other rights normally reserved for copyright holders are provided under a software licence that permits anyone to study, change, improve and at times also to distribute the software.

**Other current expenditure** comprise non-capital purchases of materials, supplies and equipment to support R&D performed by the statistical unit in a given year. These include, but are not limited to running costs, overhead expenses, repairs and maintenance, payments to outside organisations for use of specialised testing facilities, payments to outside organisations for specialised services and on-site consultant expenses in support of R&D projects carried out by the R&D performer.

**Outsourced R&D** refers to R&D done by another entity on behalf of the reporting unit and paid for by the reporting unit.

**R&D intensity** estimated by GERD as a proportion of GDP is the total intramural expenditures on R&D performed in the country in a given year relative to GDP.

**R&D personnel** refers to all persons employed directly on R&D, as well as those providing direct services such as R&D managers, administrators, and clerical staff.

**Researchers** are R&D personnel engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned.

**Research and experimental development (R&D)** comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

**Socio-economic objective (SEO)** classification provides an indication of the R&D activities by main purpose. The SEO classification used in this survey is consistent with the Nomenclature for the Analysis and Comparison of Scientific programs and Budgets (NABS) that was published by Eurostat in 2007.

**Statistical unit** is an entity for which statistical data are collected or derived.

**Standard Industrial Classification (SIC)** codes are used by Statistics South Africa for describing the economic activities of industries.

**State-owned enterprises (SOEs)** are public corporations owned by government units mainly engaged in market production and sale of the kind of goods and services often produced by private enterprises.

**Total employment** is the total employed labour force in the South African economy. This statistic is obtained from Stats SA Labour Force Survey series P0211 (Stats SA, 2016) where employed persons were defined as those aged 15–64 years who, during the reference week, did any work for at least one hour, or had a job or business but were not at work (temporarily absent).

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# A. INTRODUCTION

This Statistical Report presents data tables from the 2015/16 South African National Survey of Research and Experimental Development (R&D survey). The report provides key findings of the survey with commentary and standard summary tables of the overall findings from 2015/16, along with time series data from previous instances of the survey. The Statistical Report is published together with the Main Analysis Report, which provides selected analysis of survey data.

The survey covers the following institutional sectors that perform R&D in South Africa:

- **The business enterprise sector**, comprising all size classes of enterprises, including state-owned enterprises (SOEs).
- **The government sector**, comprising departments in the three spheres of national, provincial and local government with an R&D component, government research institutions and museums.
- **The higher education sector**, comprising all public higher education institutions and private higher education institutions with an R&D component.
- **The not-for-profit sector**, comprising non-governmental and other organisations formally registered as not-for-profit institutions.
- **The science council sector**, comprising the nine science councils established through Acts of Parliament.

This approach is followed in order to maintain consistency with the institutional sector categorisation recommended by the Organisation for Economic Co-operation and Development (OECD) in *The Measurement of Scientific and Technological Activities: Proposed Standard Practice for Surveys on Research and Experimental Development*, known as the Frascati Manual (OECD, 2002), and to adjust for the South African situation, which demands a split of government into a government sector and a science councils sector.

R&D statistics are presented in tables according to the following categories:
- Gross domestic expenditure on research and development (GERD), and R&D expenditure by R&D-performing sectors
- Local and international sources of funding for R&D sectors
- R&D expenditure by field of research and socio-economic objective, and by industrial sector in the business sector
- R&D expenditure by field of research and socio-economic objective, and by industrial sector for SOEs in the business sector
- R&D expenditure in selected areas of policy interest, namely biotechnology, nanotechnology, environment-related, open-source software, new materials, and tuberculosis (TB), HIV/AIDS and malaria research.
- R&D personnel.

GDP values were obtained from the Stats SA GDP statistical release P0441 (Stats SA, 2017), and the total employment level was taken from the Stats SA Quarterly Labour Force Survey statistical release P0211 (Stats SA, 2016).

All financial quantities presented in this report are in current values, unless otherwise indicated. Constant 2010 Rand values were calculated using the GDP deflator.

The headline indicator of GERD/GDP has been recalculated to adjust for ongoing revisions in the Stats SA GDP[1] series.

The classification of main institutional sectors recommended in the System of National Accounts (EC, IMF, OECD, UN and World Bank, 2009) is indicated in terms of those used in the Frascati Manual (OECD, 2002). This is only used indicatively in this report to assist users of data for R&D capitalisation purposes. Full implementation of this procedure will be done once the changes published in the seventh edition of the Frascati Manual have been finalised.

Since the 2014/15 R&D survey, tables have been included to assess the R&D activities of SOEs. This will address new user needs for this type of data.

Section B gives the main findings of the survey, including commentary on key developments. Section C contains a detailed set of tables describing the survey results for 2015/16 and the preceding nine years. The description of the survey methodology is contained in section D, and the higher education sector questionnaire for the 2015/16 survey is reproduced in section F.

[1] The R&D survey has historically used the GDP series calculated according to the production method employed by Statistics South Africa.

# B. KEY FINDINGS FOR 2015/16

## Gross Domestic Expenditure on R&D (GERD) increases in real terms

South Africa's gross expenditure on research and experimental development (GERD) stood at R32.337 billion[2] at current Rand values in 2015/16.

At constant 2010 prices, GERD amounted to R24.458 billion. The year-on-year change in real GERD was 5.0%.

## GERD as a percentage of GDP rose three basis points to 0.80% in 2015/16

As in 2014/15, the increase in GERD was large enough compared to the increase in the level of GDP in current prices to register an increase in R&D intensity[3].

**Table B.1: Summary of key statistics and indicators (2013/14 to 2015/16)**

| KEY INDICATOR | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|
| Expenditure on R&D | | | |
| **Gross domestic expenditure on R&D (GERD) (Rm)** | **25,661** | **29,345** | **32,337** |
| *Business enterprise expenditure on R&D (BERD) (Rm)* | *11,783* | *13,291* | *13,815* |
| *Not-for-profit (NPO) expenditure on R&D (Rm)* | *583* | *779* | *891* |
| *Government expenditure on R&D (GOVERD) (Rm)* | *1,697* | *1,893* | *2,013* |
| *Science council (SCI) expenditure on R&D (Rm)* | *4,305* | *5,005* | *5,741* |
| *Higher education (HE) expenditure on R&D (HERD) (Rm)* | *7,293* | *8,378* | *9,877* |
| Gross domestic expenditure on R&D in constant 2010 prices (Rm) | 21,554 | 23,304 | 24,458 |
| Funding sources | | | |
| Government-funded* R&D (Rm) | 11,007 | 12,873 | 14,426 |
| Business-funded R&D (Rm) | 10,616 | 11,982 | 12,578 |
| Foreign funding of R&D (Rm) | 3,315 | 3,566 | 4,210 |
| *Foreign funding of BERD (Rm)* | *1,227* | *1,419* | *1,533* |
| *Foreign funding of NPO R&D (Rm)* | *333* | *457* | *501* |
| *Foreign funding of GOVERD (Rm)* | *259* | *179* | *500* |
| *Foreign funding of SCI R&D (Rm)* | *455* | *431* | *470* |
| *Foreign funding of HERD (Rm)* | *1,043* | *1,080* | *1,206* |
| R&D personnel | | | |
| Total R&D personnel (FTE**) | 37,956.5 | 38,465.0 | 41,054.5 |
| Total researchers# (FTE**) | 23,346.0 | 23,571.9 | 26,159.4 |
| Total researchers# (headcount) | 45,935 | 48,479 | 51,877 |
| Female researchers# (headcounts) | 20,231 | 21,471 | 23,334 |
| Indicators computed from R&D survey | | | |
| GERD as a percentage of GDP (%) | 0.72 | 0.77 | 0.80 |
| Civil GERD as a percentage of GDP (%) | 0.69 | 0.72 | 0.75 |
| Basic research (R millions) | 6,102 | 7,133 | 8,210 |
| Total R&D personnel (FTE**) per 1 000 in total employment | 2.5 | 2.5 | 2.6 |
| Total researchers† (FTE**) per 1 000 in total employment | 1.6 | 1.5 | 1.7 |
| Female researcher† headcounts as a percentage of total researcher headcounts (%) | 44.0 | 44.3 | 44.4 |
| Indicators obtained from external data sources | | | |
| Gross domestic product (GDP)†† level at current prices (Rm) | 3,539,792 | 3,807,677 | 4,049,760 |
| GDP†† (%) | 2.5 | 1.7 | 1.3 |
| SA employment ('000) | 15,055 | 15,459 | 15,663 |

*Government-funded R&D includes science council funding and university own funds.

**FTE: Full-time equivalent.

†Researchers include doctoral students and post-doctoral fellows.

††GDP values obtained from Stats SA (2017)

[2] A noteworthy portion of this increase in GERD was due to improved responses in the higher education sector in 2015/16.

[3] This increase of three basis points in R&D intensity should not be overstated, because two of these basis points arise from improved fieldwork practices in the higher education sector.

## Notable developments reflected in key indicators

### Economic environment

In 2015, GDP dropped a further 0.4 of a percentage point to 1.3%, after having gone down to 1.7% in 2014. Government's Medium-Term Budget Policy Statement (National Treasury, 2015) trimmed spending by R25 billion for 2015/16 and 2016/17, but government spending was still greater than inflation in 2015.

### Public sector R&D expenditure grew, while business sector R&D expenditure stagnated

Nominal R&D expenditure increased in all sectors in 2015/16 (see Table C.1), with the higher education sector as the biggest contributor to the increase in R&D expenditure[4], after spending R1.499 billion more than it did in 2014/15. Nominally, the business sector increased[5] R&D expenditure by R524 million. However, in real terms, business expenditure on R&D decreased by 1.0% year-on-year in 2015/16, after two consecutive years of growth. This decreased real expenditure in the business sector was accompanied by a loss of 469.7 FTEs in R&D personnel.

The two largest contributors to BERD (since 2009/10) are the financial intermediation, real estate and business services sector, and the manufacturing sector, as illustrated in Table C.51. On the one hand, the financial intermediation, real estate and business services sector increased its proportional share by 2.5 percentage points to comprise 42.8% of BERD in 2015/16. On the other hand, the manufacturing sector decreased its proportional share by 1.7 percentage points to comprise 32.2% of BERD in 2015/16. The other major industrial sectors each contributed less than 9% to BERD.

### Growth in funding of R&D from both Government and Business is slowing down

Government (inclusive of science councils funding and higher education own funds) has increased its funding of R&D (Table C.19) in both nominal and real terms, thereby remaining the largest funder of R&D, funding 44.6% of GERD in 2015/16. However, the growth in government-funded R&D is showing signs of slowing down in 2015/16. The growth in funds from the business sector has been slowing down since at least 2013/14, and now stands at 38.9%. Inasmuch as there appears to be accelerated growth in funding of R&D by foreign sources, the proportion of funding that may be attributed to foreign sources is still at a level that it has been historically, at around 13.0% of GERD, up by 0.8 of a percentage point from 2014/15.

### Researcher FTEs increased by 11.0%

R&D personnel (inclusive of doctoral students and postdoctoral fellows at universities) have increased by 2 531 headcounts[6] to 74 931. Growth in R&D personnel (see C.28 for the trends) was mainly driven by the net intake of researchers, which increased by 3 398 headcounts in 2015/16 to 51 877. The larger part of this increase in researcher headcounts came from 2 666 doctoral students and postdoctoral fellows at universities, as has been the case in previous years.

Researcher FTEs (including post-doctoral fellows and doctoral students) increased from 23 571.9 to 26 159.4. The number of FTE researchers per 1 000 in total employment is at 1.7. This indicator has remained within the range of 1.4 to 1.7 for at least ten years.

The proportion of female researchers increased by 0.1 of a percentage point to 44.3% (Table C.29).

### R&D performed continued to tend towards applied research

Since 2010/11, applied research has dominated the type of research conducted in South Africa. In 2015/16, applied research comprised 47.5% of GERD, whereas experimental development and basic research only contributed 27.1 and 25.4, respectively, to GERD (Table C.5).

The majority of R&D activity in 2015/16 is now taking place in medical and health sciences (19.8%) and the social sciences (18.7%) (Table C.14). The engineering sciences, at (16.8%) has been superseded by the medical and health sciences and social science research fields in 2015/16, with respect to their levels of contribution to R&D expenditure. Information, computer and communication technologies has been increasing since after 2013/14, and stands at 12.0% in 2015/16.

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[4] Of the increase of R1.499 billion in higher education expenditure on R&D (HERD), R773 million was due to improved responses, coverage and imputation methods. The sources and sizes of these effects in the higher education sector are assessed in Section D.3.

[5] A fifth (or R 110 million, amounting to 0.8% of BERD and 0.3% of GERD) of this increase was due to improved coverage.

[6] Improved fieldwork responses within the higher education sector in 2015/16 have resulted in an adjustment of the ratio between researchers, technicians and other R&D personnel, compared to previous years.

Most of the sharp growth in social science research, since 2012/13, has come from the business sector, which contributed 39.2% of R&D expenditure in this field in 2015/16. The business sector performed the bulk (63.0%) of research in the engineering sciences, with SOEs contributing 18.0 percentage points to this proportion.

## R&D in the fields of biotechnology and nanotechnology, open source software, materials, as well as the environment related research maintained growth

In 2015/16, R&D in biotechnology grew 0.3 of a percentage point to 5.7% of GERD, and R&D in nanotechnology decreased by 0.1 of a percentage point to 2.7% of GERD (Table C.10).

The year-on-year growth of R&D expenditure in open source software was 33.3%. R&D expenditure in TB/HIV/AIDS and malaria grew by 9.6% year-on-year, and R&D expenditure in new materials grew by 3.6% year-on-year. Environment and related R&D decreased by 1.9% in real terms from 2014/15 values. (See Table C.11 for the levels of R&D expenditure in current values).

## State-owned enterprises

The contribution of SOEs to R&D activity (see Table C.) in the business sector has decreased by 0.9 of a percentage point to 14.3% in 2015/16.

Out of the 6 128 researchers in the business sector, 14.7% were employed in public enterprises (see Table C.75).

# C. TABLES

**Note:**
Totals in the tables may not add up to the sum of their constituent items due to rounding effects.

## C.1. General survey results

### C.1.1. Expenditure on research and experimental development

**Table C.1: R&D expenditure by sector (2006/07 to 2015/16)**

| YEAR | GERD | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 16 520 584 | 1 021 355 | 2 744 718 | 3 298 808 | 9 243 165 | 212 538 |
| 2007/08 | 18 624 013 | 1 154 399 | 2 886 094 | 3 621 862 | 10 738 456 | 223 202 |
| 2008/09 | 21 041 046 | 1 139 676 | 3 137 343 | 4 191 366 | 12 332 012 | 240 649 |
| 2009/10 | 20 954 677 | 1 067 302 | 3 458 074 | 5 101 224 | 11 139 237 | 188 840 |
| 2010/11 | 20 253 805 | 1 011 340 | 3 596 023 | 5 424 602 | 10 059 010 | 162 830 |
| 2011/12 | 22 209 192 | 1 235 669 | 3 729 680 | 6 609 216 | 10 464 022 | 170 605 |
| 2012/13 | 23 871 219 | 1 437 509 | 4 025 998 | 7 333 153 | 10 570 726 | 503 833 |
| 2013/14 | 25 660 573 | 1 697 151 | 4 304 556 | 7 292 853 | 11 782 848 | 583 165 |
| 2014/15 | 29 344 977 | 1 893 010 | 5 004 669 | 8 377 575 | 13 290 951 | 778 772 |
| 2015/16 | 32 336 679 | 2 013 021 | 5 740 897 | 9 876 623 | 13 814 995 | 891 142 |

**Table C.2: R&D expenditure by sector, constant 2010 Rand values (2006/07 to 2015/16)**

| YEAR | GERD | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 22 375 580 | 1 383 329 | 3 717 463 | 4 467 926 | 12 518 999 | 287 863 |
| 2007/08 | 23 173 765 | 1 436 413 | 3 591 152 | 4 506 664 | 13 361 806 | 277 729 |
| 2008/09 | 24 056 670 | 1 303 016 | 3 586 990 | 4 792 077 | 14 099 448 | 275 139 |
| 2009/10 | 22 285 524 | 1 135 087 | 3 677 699 | 5 425 206 | 11 846 698 | 200 833 |
| 2010/11 | 20 253 805 | 1 011 340 | 3 596 023 | 5 424 602 | 10 059 010 | 162 830 |
| 2011/12 | 20 847 398 | 1 159 902 | 3 500 988 | 6 203 961 | 9 822 403 | 160 144 |
| 2012/13 | 21 283 165 | 1 281 658 | 3 589 510 | 6 538 112 | 9 424 676 | 449 209 |
| 2013/14 | 21 553 925 | 1 425 544 | 3 615 667 | 6 125 725 | 9 897 153 | 489 837 |
| 2014/15 | 23 303 998 | 1 503 314 | 3 974 404 | 6 652 961 | 10 554 866 | 618 453 |
| 2015/16 | 24 458 370 | 1 522 581 | 4 342 220 | 7 470 343 | 10 449 195 | 674 030 |

GDP values were obtained from the Stats SA GDP statistical release P0441 (Stats SA, 2017).

**Table C.3: R&D expenditure composition by sector (2006/07 to 2015/16)**

| YEAR | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|
| | % | % | % | % | % |
| 2006/07 | 6.2 | 16.6 | 20.0 | 55.9 | 1.3 |
| 2007/08 | 6.2 | 15.5 | 19.4 | 57.7 | 1.2 |
| 2008/09 | 5.4 | 14.9 | 19.9 | 58.6 | 1.1 |
| 2009/10 | 5.1 | 16.5 | 24.3 | 53.2 | 0.9 |
| 2010/11 | 5.0 | 17.8 | 26.8 | 49.7 | 0.8 |
| 2011/12 | 5.6 | 16.8 | 29.8 | 47.1 | 0.8 |
| 2012/13 | 6.0 | 16.9 | 30.7 | 44.3 | 2.1 |
| 2013/14 | 6.6 | 16.8 | 28.4 | 45.9 | 2.3 |
| 2014/15 | 6.5 | 17.1 | 28.5 | 45.3 | 2.7 |
| 2015/16 | 6.2 | 17.8 | 30.5 | 42.7 | 2.8 |

**Table C.4: R&D expenditure as a percentage of GDP by sector (2006/07 to 2015/16)**

| YEAR | GERD/GDP | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| | % | % | % | % | % | % |
| 2006/07 | 0.90 | 0.06 | 0.15 | 0.18 | 0.50 | 0.01 |
| 2007/08 | 0.88 | 0.05 | 0.14 | 0.17 | 0.51 | 0.01 |
| 2008/09 | 0.89 | 0.05 | 0.13 | 0.18 | 0.52 | 0.01 |
| 2009/10 | 0.84 | 0.04 | 0.14 | 0.20 | 0.44 | 0.01 |
| 2010/11 | 0.74 | 0.04 | 0.13 | 0.20 | 0.37 | 0.01 |
| 2011/12 | 0.73 | 0.04 | 0.12 | 0.22 | 0.35 | 0.01 |
| 2012/13 | 0.73 | 0.04 | 0.12 | 0.23 | 0.32 | 0.02 |
| 2013/14 | 0.72 | 0.05 | 0.12 | 0.21 | 0.33 | 0.02 |
| 2014/15 | 0.77 | 0.05 | 0.13 | 0.22 | 0.35 | 0.02 |
| 2015/16 | 0.80 | 0.05 | 0.14 | 0.24 | 0.34 | 0.02 |

**Table C.5: R&D expenditure by type of research (2006/07 to 2015/16)**

| YEAR | GERD | BASIC RESEARCH | APPLIED RESEARCH | EXPERIMENTAL DEVELOPMENT |
|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 16 520 728 | 3 075 263 | 5 794 785 | 7 650 671 |
| 2007/08 | 18 624 013 | 3 830 806 | 6 373 681 | 8 419 526 |
| 2008/09 | 21 041 046 | 4 243 156 | 7 013 082 | 9 784 808 |
| 2009/10 | 20 954 676 | 5 553 399 | 6 578 902 | 8 822 375 |
| 2010/11 | 20 253 804 | 4 848 283 | 8 058 799 | 7 346 722 |
| 2011/12 | 22 209 192 | 5 439 561 | 9 388 273 | 7 381 358 |
| 2012/13 | 23 871 219 | 6 030 827 | 11 064 247 | 6 776 146 |
| 2013/14 | 25 660 573 | 6 102 085 | 12 132 211 | 7 426 277 |
| 2014/15 | 29 344 977 | 7 133 213 | 14 331 016 | 7 880 748 |
| 2015/16 | 32 336 679 | 8 209 662 | 15 349 070 | 8 777 948 |

**Table C.6: Proportional R&D expenditure by type of research (2006/07 to 2015/16)**

| YEAR | BASIC RESEARCH | APPLIED RESEARCH | EXPERIMENTAL DEVELOPMENT |
|---|---|---|---|
| | % | % | % |
| 2006/07 | 18.6 | 35.1 | 46.3 |
| 2007/08 | 20.6 | 34.2 | 45.2 |
| 2008/09 | 20.2 | 33.3 | 46.5 |
| 2009/10 | 26.5 | 31.4 | 42.1 |
| 2010/11 | 23.9 | 39.8 | 36.3 |
| 2011/12 | 24.5 | 42.3 | 33.2 |
| 2012/13 | 25.3 | 46.3 | 28.4 |
| 2013/14 | 23.8 | 47.3 | 28.9 |
| 2014/15 | 24.3 | 48.8 | 26.9 |
| 2015/16 | 25.4 | 47.5 | 27.1 |

**Table C.7: R&D expenditure by accounting category (2006/07 to 2015/16)**

| YEAR | | CAPITAL EXPENDITURE ON R&D | | | CURRENT EXPENDITURE ON R&D | | | |
|---|---|---|---|---|---|---|---|---|
| | GERD | LAND: BUILDINGS AND OTHER STRUCTURES | VEHICLES, PLANT, MACHINERY, EQUIPMENT | SUBTOTAL: CAPITAL EXPENDITURE | LABOUR COSTS | TOTAL COST OF R&D POST-GRADUATE STUDENTS* | OTHER CURRENT EXPENDITURE | SUBTOTAL: CURRENT EXPENDITURE |
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 16 520 586 | 319 868 | 1 357 234 | 1 677 102 | 7 526 757 | 438 486 | 6 878 241 | 14 843 484 |
| 2007/08 | 18 624 013 | 367 757 | 1 686 567 | 2 054 324 | 8 171 240 | 495 128 | 7 903 321 | 16 569 689 |
| 2008/09 | 21 041 046 | 326 145 | 3 091 898 | 3 418 043 | 8 661 361 | 532 883 | 8 428 759 | 17 623 003 |
| 2009/10 | 20 954 677 | 623 089 | 2 067 728 | 2 690 817 | 8 909 301 | 581 140 | 8 773 419 | 18 263 860 |
| 2010/11 | 20 253 805 | 472 205 | 1 714 845 | 2 187 050 | 8 353 254 | 756 930 | 8 956 571 | 18 066 755 |
| 2011/12 | 22 209 192 | 454 321 | 2 215 416 | 2 669 737 | 9 534 138 | 1 074 207 | 8 931 110 | 19 539 455 |
| 2012/13 | 23 871 219 | 495 842 | 1 747 183 | 2 243 025 | 11 922 169 | 1 186 653 | 8 519 372 | 21 628 194 |
| 2013/14 | 25 660 573 | 529 575 | 1 857 913 | 2 387 488 | 13 304 413 | 1 224 611 | 8 744 061 | 23 273 085 |
| 2014/15 | 29 344 977 | 805 961 | 2 311 181 | 3 117 142 | 14 443 903 | 1 579 088 | 10 204 844 | 26 227 835 |
| 2015/16 | 32 336 679 | 711 631 | 3 008 992 | 3 720 622 | 14 781 549 | 1 926 301 | 11 908 207 | 28 616 057 |

**Table C.8: Proportional R&D expenditure by accounting category (2006/07 to 2015/16)**

| YEAR | CAPITAL EXPENDITURE ON R&D | | | CURRENT EXPENDITURE ON R&D | | | |
|---|---|---|---|---|---|---|---|
| | LAND: BUILDINGS AND OTHER STRUCTURES | VEHICLES, PLANT, MACHINERY, EQUIPMENT | SUBTOTAL: CAPITAL EXPENDITURE | LABOUR COSTS | TOTAL COST OF R&D POST-GRADUATE STUDENTS | OTHER CURRENT EXPENDITURE | SUBTOTAL: CURRENT EXPENDITURE |
| | % | % | % | % | % | % | % |
| 2006/07 | 1.9 | 8.2 | 10.2 | 45.6 | 2.7 | 41.6 | 89.8 |
| 2007/08 | 2.0 | 9.1 | 11.0 | 43.9 | 2.7 | 42.4 | 89.0 |
| 2008/09 | 1.6 | 14.7 | 16.2 | 41.2 | 2.5 | 40.1 | 83.8 |
| 2009/10 | 3.0 | 9.9 | 12.8 | 42.5 | 2.8 | 41.9 | 87.2 |
| 2010/11 | 2.3 | 8.5 | 10.8 | 41.2 | 3.7 | 44.2 | 89.2 |
| 2011/12 | 2.0 | 10.0 | 12.0 | 42.9 | 4.8 | 40.2 | 88.0 |
| 2012/13 | 2.1 | 7.3 | 9.4 | 49.9 | 5.0 | 35.7 | 90.6 |
| 2013/14 | 2.1 | 7.2 | 9.3 | 51.8 | 4.8 | 34.1 | 90.7 |
| 2014/15 | 2.7 | 7.9 | 10.6 | 49.2 | 5.4 | 34.8 | 89.4 |
| 2015/16 | 2.2 | 9.3 | 11.5 | 45.7 | 6.0 | 36.8 | 88.5 |

**Table C.9: Expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)**

| YEAR | GERD | BIOTECHNOLOGY | NANOTECHNOLOGY |
|---|---|---|---|
| | R'000 | R'000 | R'000 |
| 2006/07 | 16 520 584 | 592 777 | 310 078 |
| 2007/08 | 18 624 014 | 648 704 | 248 521 |
| 2008/09 | 21 041 046 | 801 640 | 388 380 |
| 2009/10 | 20 954 677 | 917 917 | 423 865 |
| 2010/11 | 20 253 805 | 1 142 337 | 414 529 |
| 2011/12 | 22 209 192 | 1 065 286 | 596 072 |
| 2012/13 | 23 871 219 | 1 179 478 | 662 634 |
| 2013/14 | 25 660 573 | 1 266 325 | 664 139 |
| 2014/15 | 29 344 977 | 1 576 727 | 818 919 |
| 2015/16 | 32 336 679 | 1 843 363 | 871 426 |

**Table C.10: Proportional expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)**

| YEAR | BIOTECHNOLOGY | NANOTECHNOLOGY |
|---|---|---|
| | % | % |
| 2006/07 | 3.6 | 1.9 |
| 2007/08 | 3.5 | 1.3 |
| 2008/09 | 3.8 | 1.8 |
| 2009/10 | 4.4 | 2.0 |
| 2010/11 | 5.6 | 2.0 |
| 2011/12 | 4.8 | 2.7 |
| 2012/13 | 4.9 | 2.8 |
| 2013/14 | 4.9 | 2.6 |
| 2014/15 | 5.4 | 2.8 |
| 2015/16 | 5.7 | 2.7 |

**Table C.11: R&D expenditure on selected areas of interest (2006/07 to 2015/16)**

| YEAR | GERD | OPEN SOURCE SOFTWARE | TUBERCULOSIS (TB), HIV/AIDS, MALARIA | ENVIRONMENT / ENVIRONMENT RELATED | NEW MATERIALS |
|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 16 520 584 | 192 786 | 934 760 | N/A | 336 970 |
| 2007/08 | 18 624 013 | 254 808 | 1 120 028 | N/A | 298 746 |
| 2008/09 | 21 041 046 | 218 289 | 1 616 410 | N/A | 514 242 |
| 2009/10 | 20 954 677 | 172 712 | 1 816 901 | N/A | 559 021 |
| 2010/11 | 20 253 805 | 157 790 | 2 052 521 | N/A | 722 167 |
| 2011/12 | 22 209 192 | 181 320 | 2 006 625 | 1 215 855 | 783 232 |
| 2012/13 | 23 871 219 | 211 264 | 2 478 422 | 1 051 035 | 1 327 832 |
| 2013/14 | 25 660 573 | 339 065 | 2 867 954 | 1 088 094 | 794 016 |
| 2014/15 | 29 344 977 | 818 735 | 3 008 176 | 1 996 195 | 1 053 783 |
| 2015/16 | 32 336 679 | 1 145 590 | 3 462 704 | 2 056 659 | 1 146 470 |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.12: Proportional R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| YEAR | OPEN SOURCE SOFTWARE | TUBERCULOSIS (TB), HIV/AIDS, MALARIA | ENVIRONMENT / ENVIRONMENT RELATED | NEW MATERIALS |
|---|---|---|---|---|
| | % | % | % | % |
| 2006/07 | 1.2 | 5.7 | N/A | 2.0 |
| 2007/08 | 1.4 | 6.0 | N/A | 1.6 |
| 2008/09 | 1.0 | 7.7 | N/A | 2.4 |
| 2009/10 | 0.8 | 8.7 | N/A | 2.7 |
| 2010/11 | 0.8 | 10.1 | N/A | 3.6 |
| 2011/12 | 0.8 | 9.0 | 5.5 | 3.5 |
| 2012/13 | 0.9 | 10.4 | 4.4 | 5.6 |
| 2013/14 | 1.3 | 11.2 | 4.2 | 3.1 |
| 2014/15 | 2.8 | 10.3 | 6.8 | 3.6 |
| 2015/16 | 3.5 | 10.7 | 6.4 | 3.5 |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.13: R&D expenditure by research field (2006/07 to 2015/16)

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural sciences, technology and engineering** | **14 568 971** | **16 306 332** | **18 419 289** | **18 236 046** | **17 274 483** | **18 924 485** | **19 384 947** | **20 587 093** | **23 687 304** | **25 562 694** |
| Mathematical sciences | 315 773 | 341 624 | 397 512 | 414 234 | 530 693 | 636 153 | 634 658 | 627 017 | 636 084 | 646 870 |
| Physical sciences | 655 378 | 793 006 | 952 441 | 648 657 | 305 701 | 338 098 | 370 616 | 379 813 | 582 267 | 769 739 |
| Chemical sciences | 595 579 | 784 145 | 1 056 848 | 860 745 | 865 345 | 1 273 588 | 1 460 180 | 1 305 139 | 1 299 969 | 1 491 410 |
| Earth sciences | 426 950 | 524 133 | 563 619 | 402 949 | 403 848 | 409 212 | 499 210 | 498 427 | 690 040 | 635 291 |
| Information, computer and communication technologies | 2 314 243 | 2 598 218 | 2 763 320 | 3 272 679 | 2 808 681 | 2 852 251 | 2 000 453 | 1 994 502 | 2 946 625 | 3 877 852 |
| Applied sciences and technologies | 1 812 402 | 1 832 546 | 1 905 397 | 1 740 755 | 2 151 557 | 2 114 322 | 2 252 175 | 2 164 025 | 1 555 897 | 1 525 646 |
| Engineering sciences | 3 457 912 | 4 189 408 | 5 135 032 | 4 580 166 | 3 600 159 | 3 775 247 | 3 903 931 | 4 315 051 | 5 485 812 | 5 444 740 |
| Biological sciences | 798 835 | 723 280 | 744 144 | 800 435 | 1 326 076 | 1 350 716 | 1 555 035 | 1 578 516 | 1 398 611 | 1 452 763 |
| Agricultural sciences | 1 138 873 | 1 264 628 | 1 147 706 | 1 445 847 | 1 307 191 | 1 710 860 | 1 810 114 | 2 196 122 | 2 656 038 | 2 573 509 |
| Medical and health sciences | 2 489 242 | 2 616 439 | 3 139 245 | 3 506 472 | 3 461 304 | 3 819 180 | 4 107 641 | 4 668 417 | 5 459 721 | 6 389 455 |
| Environmental sciences | 216 710 | 222 514 | 248 625 | 229 186 | 352 139 | 439 719 | 587 113 | 611 007 | 533 065 | 375 455 |
| Material sciences | 284 530 | 365 813 | 306 828 | 254 092 | 109 551 | 166 411 | 155 379 | 192 199 | 368 315 | 299 069 |
| Marine sciences | 62 544 | 50 579 | 58 573 | 79 830 | 52 238 | 38 726 | 48 442 | 56 857 | 74 858 | 80 897 |
| **Division 2: Social sciences and humanities** | **1 951 613** | **2 317 681** | **2 621 757** | **2 718 631** | **2 979 322** | **3 284 707** | **4 486 272** | **5 073 480** | **5 657 674** | **6 773 985** |
| Social sciences | 1 559 043 | 1 809 308 | 2 024 801 | 2 233 521 | 2 512 714 | 2 790 339 | 3 999 853 | 4 489 054 | 5 000 339 | 6 043 806 |
| Humanities | 392 570 | 508 373 | 596 956 | 485 110 | 466 608 | 494 368 | 486 420 | 584 426 | 657 335 | 730 179 |
| **Total** | **16 520 584** | **18 624 013** | **21 041 046** | **20 954 677** | **20 253 805** | **22 209 192** | **23 871 219** | **25 660 573** | **29 344 977** | **32 336 672** |

**Table C.14: Proportional R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural sciences, technology and engineering** | **88.2** | **87.6** | **87.5** | **87.0** | **85.3** | **85.2** | **81.2** | **80.2** | **80.7** | **79.1** |
| Mathematical sciences | 1.9 | 1.8 | 1.9 | 2.0 | 2.6 | 2.9 | 2.7 | 2.4 | 2.2 | 2.0 |
| Physical sciences | 4.0 | 4.3 | 4.5 | 3.1 | 1.5 | 1.5 | 1.6 | 1.5 | 2.0 | 2.4 |
| Chemical sciences | 3.6 | 4.2 | 5.0 | 4.1 | 4.3 | 5.7 | 6.1 | 5.1 | 4.4 | 4.6 |
| Earth sciences | 2.6 | 2.8 | 2.7 | 1.9 | 2.0 | 1.8 | 2.1 | 1.9 | 2.4 | 2.0 |
| Information, computer and communication technologies | 14.0 | 14.0 | 13.1 | 15.6 | 13.9 | 12.8 | 8.4 | 7.8 | 10.0 | 12.0 |
| Applied sciences and technologies | 11.0 | 9.8 | 9.1 | 8.3 | 10.6 | 9.5 | 9.4 | 8.4 | 5.3 | 4.7 |
| Engineering sciences | 20.9 | 22.5 | 24.4 | 21.9 | 17.8 | 17.0 | 16.4 | 16.8 | 18.7 | 16.8 |
| Biological sciences | 4.8 | 3.9 | 3.5 | 3.8 | 6.5 | 6.1 | 6.5 | 6.2 | 4.8 | 4.5 |
| Agricultural sciences | 6.9 | 6.8 | 5.5 | 6.9 | 6.5 | 7.7 | 7.6 | 8.6 | 9.1 | 8.0 |
| Medical and health sciences | 15.1 | 14.0 | 14.9 | 16.7 | 17.1 | 17.2 | 17.2 | 18.2 | 18.6 | 19.8 |
| Environmental sciences | 1.3 | 1.2 | 1.2 | 1.1 | 1.7 | 2.0 | 2.5 | 2.4 | 1.8 | 1.2 |
| Material sciences | 1.7 | 2.0 | 1.5 | 1.2 | 0.5 | 0.7 | 0.7 | 0.7 | 1.3 | 0.9 |
| Marine sciences | 0.4 | 0.3 | 0.3 | 0.4 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 |
| **Division 2: Social sciences and humanities** | **11.8** | **12.4** | **12.5** | **13.0** | **14.7** | **14.8** | **18.8** | **19.8** | **19.3** | **20.9** |
| Social sciences | 9.4 | 9.7 | 9.6 | 10.7 | 12.4 | 12.6 | 16.8 | 17.5 | 17.0 | 18.7 |
| Humanities | 2.4 | 2.7 | 2.8 | 2.3 | 2.3 | 2.2 | 2.0 | 2.3 | 2.2 | 2.3 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.15: R&D expenditure by socio-economic objectives (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVES | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **1 091 516** | **1 135 278** | **1 196 200** | **1 276 269** | **1 341 460** | **1 069 289** | **1 351 337** | **1 386 428** | **1 826 784** | **1 814 789** |
| Defence | 1 091 516 | 1 135 278 | 1 196 200 | 1 276 269 | 1 341 460 | 1 069 289 | 1 351 337 | 1 386 428 | 1 826 784 | 1 814 789 |
| **Division 2: Economic development** | **10 017 805** | **11 724 590** | **13 312 043** | **12 341 036** | **11 231 879** | **12 174 897** | **12 223 017** | **14 166 615** | **15 359 534** | **16 644 668** |
| Economic development unclassified | 150 668 | 171 520 | 209 400 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plant production and plant primary products | 792 487 | 931 733 | 853 243 | 1 055 316 | 1 045 114 | 1 137 706 | 1 218 852 | 1 739 038 | 1 364 018 | 1 426 609 |

| SOCIO-ECONOMIC OBJECTIVES | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Animal production and animal primary products | 337 029 | 279 914 | 289 909 | 354 639 | 293 873 | 565 729 | 598 602 | 803 403 | 694 423 | 655 059 |
| Mineral resources (excluding energy) | 931 909 | 1 075 821 | 995 552 | 1 212 226 | 1 123 063 | 1 065 384 | 1 143 762 | 1 351 239 | 1 779 068 | 1 759 268 |
| Energy resources | 574 570 | 709 891 | 1 185 455 | 407 091 | 274 220 | 273 390 | 294 820 | 288 314 | 197 072 | 178 434 |
| Energy supply | 347 632 | 364 876 | 515 216 | 540 463 | 623 953 | 676 490 | 509 128 | 590 980 | 778 805 | 636 596 |
| Manufacturing | 2 187 583 | 2 676 911 | 2 998 301 | 2 602 319 | 2 374 657 | 2 489 799 | 2 394 239 | 2 608 207 | 2 619 974 | 2 665 871 |
| Construction | 937 406 | 1 150 733 | 1 461 157 | 521 289 | 311 897 | 392 439 | 426 960 | 450 907 | 270 226 | 229 284 |
| Transport | 515 262 | 595 065 | 704 404 | 924 183 | 905 571 | 984 225 | 992 504 | 1 115 027 | 998 136 | 1 115 349 |
| Information and communication services | 1 035 459 | 1 240 972 | 1 274 761 | 1 381 989 | 1 104 273 | 1 271 591 | 1 159 823 | 1 124 614 | 1 661 660 | 2 347 021 |
| Commercial services | 1 380 085 | 1 457 410 | 1 499 495 | 2 045 919 | 1 849 534 | 1 866 449 | 1 895 734 | 2 443 529 | 2 701 523 | 2 789 611 |
| Economic framework | 349 517 | 548 517 | 604 404 | 598 312 | 600 662 | 611 868 | 715 759 | 689 386 | 1 331 844 | 1 797 751 |
| Natural resources | 478 198 | 521 228 | 720 746 | 697 290 | 725 062 | 839 825 | 872 835 | 961 971 | 962 787 | 1 043 816 |
| **Division 3: Society** | **2 731 152** | **2 827 775** | **3 225 179** | **3 276 198** | **3 247 428** | **3 861 888** | **4 473 657** | **4 585 825** | **5 885 267** | **6 815 987** |
| Society unclassified | 150 668 | 171 520 | 209 400 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health | 1 725 977 | 1 790 225 | 2 013 993 | 2 247 629 | 2 089 570 | 2 301 764 | 2 942 262 | 2 859 623 | 3 638 036 | 4 154 557 |
| Education and training | 418 971 | 389 138 | 465 475 | 458 060 | 442 181 | 554 462 | 672 473 | 882 976 | 1 346 974 | 1 603 117 |
| Social development and community services | 435 536 | 476 892 | 536 312 | 570 508 | 715 677 | 1 005 662 | 858 922 | 843 226 | 900 257 | 1 058 313 |
| **Division 4: Environment** | **711 134** | **854 997** | **1 006 106** | **992 840** | **735 909** | **905 570** | **979 981** | **861 976** | **1 414 524** | **1 475 053** |
| Environment unclassified | 50 223 | 57 173 | 69 800 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Environmental knowledge | 348 158 | 375 069 | 488 204 | 463 786 | 310 888 | 398 977 | 443 987 | 388 688 | 828 768 | 853 071 |
| Environmental aspects of development | 130 144 | 195 300 | 176 503 | 181 907 | 189 344 | 216 406 | 258 144 | 226 299 | 288 823 | 304 008 |
| Environmental and other aspects | 182 609 | 227 455 | 271 599 | 347 147 | 235 677 | 290 186 | 277 849 | 246 989 | 296 934 | 317 975 |
| **Division 5: Advancement of knowledge** | **1 968 977** | **2 081 375** | **2 301 517** | **3 068 334** | **3 697 128** | **4 197 547** | **4 843 227** | **4 659 729** | **4 858 868** | **5 586 182** |
| Advancement of knowledge unclassified | 150 668 | 171 520 | 209 400 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural sciences, technologies and engineering | 1 372 203 | 1 456 357 | 1 604 035 | 2 036 622 | 2 672 224 | 3 025 841 | 3 497 129 | 3 407 325 | 3 445 842 | 3 891 834 |
| Social sciences and humanities | 446 107 | 453 498 | 488 082 | 1 031 712 | 1 024 904 | 1 171 706 | 1 346 098 | 1 252 404 | 1 413 026 | 1 694 348 |
| **Total** | **16 520 584** | **18 624 015** | **21 041 046** | **20 954 677** | **20 253 805** | **22 209 192** | **23 871 219** | **25 660 573** | **29 344 977** | **32 336 679** |

**Table C.16: Proportional R&D expenditure by socio-economic objectives (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVES | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **6.6** | **6.1** | **5.7** | **6.1** | **6.6** | **4.8** | **5.7** | **5.4** | **6.2** | **5.6** |
| Defence | 6.6 | 6.1 | 5.7 | 6.1 | 6.6 | 4.8 | 5.7 | 5.4 | 6.2 | 5.6 |
| **Division 2: Economic development** | **60.6** | **63.0** | **63.3** | **58.9** | **55.5** | **54.8** | **51.2** | **55.2** | **52.3** | **51.5** |
| Economic development unclassified | 0.9 | 0.9 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plant production and plant primary products | 4.8 | 5.0 | 4.1 | 5.0 | 5.2 | 5.1 | 5.1 | 6.8 | 4.6 | 4.4 |
| Animal production and animal primary products | 2.0 | 1.5 | 1.4 | 1.7 | 1.5 | 2.5 | 2.5 | 3.1 | 2.4 | 2.0 |
| Mineral resources (excluding energy) | 5.6 | 5.8 | 4.7 | 5.8 | 5.5 | 4.8 | 4.8 | 5.3 | 6.1 | 5.4 |
| Energy resources | 3.5 | 3.8 | 5.6 | 1.9 | 1.4 | 1.2 | 1.2 | 1.1 | 0.7 | 0.6 |
| Energy supply | 2.1 | 2.0 | 2.4 | 2.6 | 3.1 | 3.0 | 2.1 | 2.3 | 2.7 | 2.0 |
| Manufacturing | 13.2 | 14.4 | 14.2 | 12.4 | 11.7 | 11.2 | 10.0 | 10.2 | 8.9 | 8.2 |
| Construction | 5.7 | 6.2 | 6.9 | 2.5 | 1.5 | 1.8 | 1.8 | 1.8 | 0.9 | 0.7 |
| Transport | 3.1 | 3.2 | 3.3 | 4.4 | 4.5 | 4.4 | 4.2 | 4.3 | 3.4 | 3.4 |
| Information and communication services | 6.3 | 6.7 | 6.1 | 6.6 | 5.5 | 5.7 | 4.9 | 4.4 | 5.7 | 7.3 |
| Commercial services | 8.4 | 7.8 | 7.1 | 9.8 | 9.1 | 8.4 | 7.9 | 9.5 | 9.2 | 8.6 |
| Economic framework | 2.1 | 2.9 | 2.9 | 2.9 | 3.0 | 2.8 | 3.0 | 2.7 | 4.5 | 5.6 |
| Natural resources | 2.9 | 2.8 | 3.4 | 3.3 | 3.6 | 3.8 | 3.7 | 3.7 | 3.3 | 3.2 |
| **Division 3: Society** | **16.5** | **15.2** | **15.3** | **15.6** | **16.0** | **17.4** | **18.7** | **17.9** | **20.1** | **21.1** |
| Society unclassified | 0.9 | 0.9 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health | 10.4 | 9.6 | 9.6 | 10.7 | 10.3 | 10.4 | 12.3 | 11.1 | 12.4 | 12.8 |
| Education and training | 2.5 | 2.1 | 2.2 | 2.2 | 2.2 | 2.5 | 2.8 | 3.4 | 4.6 | 5.0 |
| Social development and community services | 2.6 | 2.6 | 2.5 | 2.7 | 3.5 | 4.5 | 3.6 | 3.3 | 3.1 | 3.3 |
| **Division 4: Environment** | **4.3** | **4.6** | **4.8** | **4.7** | **3.6** | **4.1** | **4.1** | **3.4** | **4.8** | **4.6** |
| Environment unclassified | 0.3 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Environmental knowledge | 2.1 | 2.0 | 2.3 | 2.2 | 1.5 | 1.8 | 1.9 | 1.5 | 2.8 | 2.6 |
| Environmental aspects of development | 0.8 | 1.0 | 0.8 | 0.9 | 0.9 | 1.0 | 1.1 | 0.9 | 1.0 | 0.9 |

| SOCIO-ECONOMIC OBJECTIVES | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Environmental and other aspects | 1.1 | 1.2 | 1.3 | 1.7 | 1.2 | 1.3 | 1.2 | 1.0 | 1.0 | 1.0 |
| **Division 5: Advancement of knowledge** | **11.9** | **11.2** | **10.9** | **14.6** | **18.3** | **18.9** | **20.3** | **18.2** | **16.6** | **17.3** |
| Advancement of knowledge unclassified | 0.9 | 0.9 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural sciences, technologies and engineering | 8.3 | 7.8 | 7.6 | 9.7 | 13.2 | 13.6 | 14.6 | 13.3 | 11.7 | 12.0 |
| Social sciences and humanities | 2.7 | 2.4 | 2.3 | 4.9 | 5.1 | 5.3 | 5.6 | 4.9 | 4.8 | 5.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.17: R&D expenditure by province (2006/07 to 2015/16)**

| YEAR | GERD | EASTERN CAPE | FREE STATE | GAUTENG | KWAZULU-NATAL | LIMPOPO | MPUMA-LANGA | NORTHERN CAPE | NORTH-WEST | WESTERN CAPE |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 16 520 584 | 752 303 | 944 829 | 8 447 470 | 1 809 013 | 197 054 | 340 773 | 138 426 | 323 838 | 3 052 483 |
| 2007/08 | 18 624 014 | 826 925 | 1 098 210 | 9 620 752 | 2 081 166 | 240 952 | 369 535 | 180 923 | 402 461 | 3 373 098 |
| 2008/09 | 21 041 046 | 889 081 | 1 562 720 | 10 981 587 | 2 210 336 | 263 784 | 452 950 | 169 937 | 453 574 | 3 656 717 |
| 2009/10 | 20 954 677 | 1 121 484 | 1 370 779 | 10 377 381 | 2 167 048 | 286 157 | 379 123 | 174 453 | 487 376 | 4 070 214 |
| 2010/11 | 20 253 805 | 1 048 959 | 1 332 224 | 9 772 806 | 2 290 711 | 340 379 | 393 822 | 217 774 | 540 951 | 4 425 059 |
| 2011/12 | 22 209 192 | 1 278 870 | 1 718 602 | 10 391 272 | 2 515 736 | 395 042 | 397 878 | 250 320 | 532 456 | 4 233 409 |
| 2012/13 | 23 871 219 | 1 463 589 | 1 714 473 | 10 602 434 | 3 013 372 | 583 857 | 522 963 | 341 136 | 732 363 | 4 124 394 |
| 2013/14 | 25 660 573 | 1 478 850 | 1 943 131 | 11 975 916 | 2 752 543 | 619 437 | 612 031 | 400 974 | 890 364 | 4 554 545 |
| 2014/15 | 29 344 977 | 1 734 411 | 1 456 461 | 13 686 734 | 3 187 481 | 444 015 | 615 773 | 473 722 | 1 027 448 | 4 949 174 |
| 2015/16 | 32 336 679 | 2 142 919 | 1 778 469 | 14 666 111 | 3 335 141 | 628 607 | 859 201 | 575 584 | 1 402 742 | 5 813 758 |

**Table C.18: Proportional R&D expenditure by province (2006/07 to 2015/16)**

| YEAR | EASTERN CAPE | FREE STATE | GAUTENG | KWAZULU-NATAL | LIMPOPO | MPUMA-LANGA | NORTHERN CAPE | NORTH-WEST | WESTERN CAPE |
|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % |
| 2006/07 | 4.6 | 5.7 | 51.1 | 11.0 | 1.5 | 2.2 | 1.1 | 2.4 | 20.4 |
| 2007/08 | 4.4 | 5.9 | 51.7 | 11.2 | 1.4 | 2.4 | 0.9 | 2.4 | 19.6 |
| 2008/09 | 4.2 | 7.4 | 52.2 | 10.5 | 1.4 | 1.8 | 0.8 | 2.3 | 19.3 |
| 2009/10 | 5.4 | 6.5 | 49.5 | 10.3 | 1.6 | 1.9 | 1.0 | 2.6 | 21.1 |
| 2010/11 | 5.2 | 6.6 | 48.3 | 11.3 | 2.0 | 2.0 | 1.2 | 2.6 | 20.9 |
| 2011/12 | 5.8 | 7.7 | 46.8 | 11.3 | 2.6 | 2.4 | 1.5 | 3.3 | 18.6 |
| 2012/13 | 6.1 | 7.2 | 44.4 | 12.6 | 2.6 | 2.6 | 1.7 | 3.7 | 19.1 |
| 2013/14 | 5.8 | 7.6 | 46.7 | 10.7 | 1.7 | 2.4 | 1.8 | 4.0 | 19.3 |
| 2014/15 | 5.9 | 5.0 | 46.6 | 10.9 | 2.1 | 2.9 | 2.0 | 4.8 | 19.8 |
| 2015/16 | 6.6 | 5.5 | 45.4 | 10.3 | 1.9 | 2.4 | 2.0 | 3.7 | 22.0 |

## C.1.2. Source of R&D funds

### Table C.19: Funding for R&D by source (2006/07 to 2015/16)

| YEAR | TOTAL FUNDS | GOVERNMENT* | BUSINESS | OTHER SOUTH AFRICAN SOURCES** | FOREIGN SOURCES |
|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 16 520 570 | 6 672 138 | 7 399 660 | 701 907 | 1 746 865 |
| 2007/08 | 18 624 059 | 8 510 101 | 7 945 949 | 180 927 | 1 987 082 |
| 2008/09 | 21 041 046 | 9 497 510 | 8 973 490 | 175 219 | 2 394 827 |
| 2009/10 | 20 954 676 | 9 313 028 | 8 907 527 | 195 682 | 2 538 439 |
| 2010/11 | 20 253 805 | 9 018 874 | 8 128 246 | 661 676 | 2 445 009 |
| 2011/12 | 22 209 192 | 9 561 917 | 8 663 105 | 653 674 | 3 330 496 |
| 2012/13 | 23 871 219 | 10 831 893 | 9 152 042 | 770 300 | 3 116 984 |
| 2013/14 | 25 660 573 | 11 007 083 | 10 615 902 | 722 361 | 3 315 227 |
| 2014/15 | 29 344 977 | 12 873 458 | 11 981 974 | 923 530 | 3 566 015 |
| 2015/16 | 32 336 679 | 14 425 992 | 12 578 499 | 1 122 328 | 4 209 861 |

*Includes science council and university own funds.

**Includes funds from higher education institutions, not-for-profit organisations and individual donations disbursed to all sectors.

### Table C.20: Proportional funding for R&D by source (2006/07 to 2015/16)

| YEAR | GOVERNMENT* | BUSINESS | OTHER SOUTH AFRICAN SOURCES** | FOREIGN SOURCES |
|---|---|---|---|---|
| | % | % | % | % |
| 2006/07 | 40.4 | 44.8 | 4.2 | 10.6 |
| 2007/08 | 45.7 | 42.7 | 1.0 | 10.7 |
| 2008/09 | 45.1 | 42.6 | 0.8 | 11.4 |
| 2009/10 | 44.4 | 42.5 | 0.9 | 12.1 |
| 2010/11 | 44.5 | 40.1 | 3.3 | 12.1 |
| 2011/12 | 43.1 | 39.0 | 2.9 | 15.0 |
| 2012/13 | 45.4 | 38.3 | 3.2 | 13.1 |
| 2013/14 | 42.9 | 41.4 | 2.8 | 12.9 |
| 2014/15 | 43.9 | 40.8 | 3.1 | 12.2 |
| 2015/16 | 44.6 | 38.9 | 3.5 | 13.0 |

*Includes science council and university own funds.

**Includes funds from higher education institutions, not-for-profit organisations and individual donations disbursed to all sectors.

### Table C.21: Sources of R&D funding by sector, amount and as a percentage of total funds (2015/16)

| SOURCE OF FUNDS | TOTAL | | GOVERNMENT | | SCIENCE COUNCILS | | HIGHER EDUCATION | | BUSINESS | | NOT-FOR-PROFIT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | % | R'000 | % | R'000 | % | R'000 | % | R'000 | % | R'000 | % |
| **Own funds** | **17 719 467** | **54.8** | **995 252** | **49.4** | **250 446** | **4.4** | **5 209 112** | **52.7** | **11 122 965** | **80.5** | **141 692** | **15.9** |
| Internal sources | 17 719 467 | 54.8 | 995 252 | 49.4 | 250 446 | 4.4 | 5 209 112 | 52.7 | 11 122 965 | 80.5 | 141 692 | 15.9 |
| **Government** | **7 971 181** | **24.7** | **430 346** | **21.4** | **4 671 777** | **81.4** | **2 184 745** | **22.1** | **522 631** | **3.8** | **161 682** | **18.1** |
| Grants | 3 564 802 | 11.0 | 395 117 | 19.6 | 2 982 722 | 52.0 | N/A | N/A | 134 005 | 1.0 | 52 959 | 5.9 |
| Contracts | 2 221 634 | 6.9 | 35 230 | 1.8 | 1 689 055 | 29.4 | N/A | N/A | 388 627 | 2.8 | 108 723 | 12.2 |
| All other | 2 184 745 | 6.8 | N/A | N/A | N/A | N/A | 2 184 745 | 22.1 | N/A | N/A | N/A | N/A |
| **Business** | **1 455 534** | **4.5** | **41109** | **2.0** | **326 648** | **5.7** | **770 448** | **7.8** | **261 745** | **1.9** | **55 585** | **6.2** |
| Local business | 1 455 534 | 4.5 | 41109 | 2.0 | 326 648 | 5.7 | 770 448 | 7.8 | 261 745 | 1.9 | 55 585 | 6.2 |
| **Other SA sources** | **980 636** | **3.0** | **46 348** | **2.3** | **22 520** | **0.4** | **506 126** | **5.1** | **374 888** | **2.7** | **30 754** | **3.5** |
| Higher education | 46 521 | 0.1 | 10 | 0.0 | 3 313 | 0.1 | 31 128 | 0.3 | 1.0 | 0.0 | 12 070 | 1.4 |
| Not-for-profit | 560 747 | 1.7 | 46 322 | 2.3 | 19 207 | 0.3 | 107 226 | 1.1 | 372 776 | 2.7 | 15 216 | 1.7 |
| Individual donations | 373 368 | 1.2 | 16 | 0.0 | 0.0 | 0.0 | 367 772 | 3.7 | 2 111 | 0.0 | 3469 | 0.4 |
| **Foreign** | **4 209 861** | **13.0** | **499 966** | **24.8** | **469 507** | **8.2** | **1 206 192** | **12.2** | **1 532 766** | **11.1** | **501 430** | **56.3** |
| All sources | 4 209 861 | 13.0 | 499 966 | 24.8 | 469 507 | 8.2 | 1 206 192 | 12.2 | 1 532 766 | 11.1 | 501 430 | 56.3 |
| **Total** | **32 336 679** | **100.0** | **2 013 021** | **100.0** | **5 740 897** | **100.0** | **9 876 623** | **100.0** | **13 814 995** | **100.0** | **891 142** | **100.0** |

Note: N/A indicates that data were not collected.

### Table C.22: Government-funded R&D by sector (2006/07 to 2015/16)

| YEAR | TOTAL | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 7 193 363 | 937 005 | 2 134 960 | 2 327 134 | 1 764 448 | 29 816 |
| 2007/08 | 8 510 055 | 1 091 049 | 2 297 322 | 2 761 557 | 2 326 728 | 33 399 |
| 2008/09 | 9 497 510 | 1 068 527 | 2 602 458 | 3 226 674 | 2 567 140 | 32 711 |
| 2009/10 | 9 313 028 | 1 008 475 | 2 917 683 | 3 918 620 | 1 429 766 | 38 484 |
| 2010/11 | 9 018 874 | 990 290 | 2 932 489 | 4 222 092 | 832 173 | 41 830 |
| 2011/12 | 9 561 917 | 1 112 307 | 3 310 894 | 4 598 426 | 499 298 | 40 992 |
| 2012/13 | 10 831 893 | 1 269 337 | 3 368 555 | 5 395 871 | 683 669 | 114 461 |
| 2013/14 | 11 007 083 | 1 436 141 | 3 412 790 | 5 369 334 | 685 670 | 103 148 |
| 2014/15 | 12 873 458 | 1 711 809 | 4 319 393 | 6 020 572 | 690 396 | 131 288 |
| 2015/16 | 14 425 992 | 1 425 598 | 4 922 223 | 7 393 857 | 522 631 | 161 682 |

Note: Includes science council and university own funds.

### Table C.23: Proportional government-funded R&D by sector (2006/07 to 2015/16)

| YEAR | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|
| | % | % | % | % | % |
| 2006/07 | 13.0 | 29.7 | 32.4 | 24.5 | 0.4 |
| 2007/08 | 12.8 | 27.0 | 32.5 | 27.3 | 0.4 |
| 2008/09 | 11.3 | 27.4 | 34.0 | 27.0 | 0.3 |
| 2009/10 | 10.8 | 31.3 | 42.1 | 15.4 | 0.4 |
| 2010/11 | 11.0 | 32.5 | 46.8 | 9.2 | 0.5 |
| 2011/12 | 11.6 | 34.6 | 48.1 | 5.2 | 0.4 |
| 2012/13 | 11.7 | 31.1 | 49.8 | 6.3 | 1.1 |
| 2013/14 | 13.0 | 31.0 | 48.8 | 6.2 | 0.9 |
| 2014/15 | 13.3 | 33.6 | 46.8 | 5.4 | 1.0 |
| 2015/16 | 9.9 | 34.1 | 51.3 | 3.6 | 1.1 |

Note: Includes science council and university own funds.

**Table C.24: Business-funded R&D by sector (2006/07 to 2015/16)**

| YEAR | TOTAL | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 7 399 659 | 13 067 | 265 441 | 682 493 | 6 414 319 | 24 339 |
| 2007/08 | 7 945 949 | 5 343 | 263 098 | 519 804 | 7 133 913 | 23 791 |
| 2008/09 | 8 973 490 | 15 980 | 137 356 | 454 184 | 8 339 379 | 26 591 |
| 2009/10 | 8 907 527 | 2 326 | 120 528 | 609 250 | 8 142 996 | 32 427 |
| 2010/11 | 8 128 246 | 2 406 | 198 206 | 367 340 | 7 528 667 | 31 627 |
| 2011/12 | 8 663 105 | 1 355 | 67 614 | 505 510 | 8 056 545 | 32 081 |
| 2012/13 | 9 152 042 | 11 552 | 135 729 | 577 527 | 8 402 340 | 24 894 |
| 2013/14 | 10 615 902 | 1 759 | 419 469 | 588 598 | 9 552 717 | 53 359 |
| 2014/15 | 11 981 974 | 290 | 222 892 | 885 280 | 10 810 428 | 63 084 |
| 2015/16 | 12 578 499 | 41 109 | 326 648 | 770 448 | 11 384 710 | 55 585 |

**Table C.25: Proportional business-funded R&D by sector (2006/07 to 2015/16)**

| YEAR | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|
| | % | % | % | % | % |
| 2006/07 | 0.2 | 3.6 | 9.2 | 86.7 | 0.3 |
| 2007/08 | 0.1 | 3.3 | 6.5 | 89.8 | 0.3 |
| 2008/09 | 0.2 | 1.5 | 5.1 | 92.9 | 0.3 |
| 2009/10 | 0.0 | 1.4 | 6.8 | 91.4 | 0.4 |
| 2010/11 | 0.0 | 2.4 | 4.5 | 92.6 | 0.4 |
| 2011/12 | 0.0 | 0.8 | 5.8 | 93.0 | 0.4 |
| 2012/13 | 0.1 | 1.5 | 6.3 | 91.8 | 0.3 |
| 2013/14 | 0.0 | 4.0 | 5.5 | 90.0 | 0.5 |
| 2014/15 | 0.0 | 1.9 | 7.4 | 90.2 | 0.5 |
| 2015/16 | 0.3 | 2.6 | 6.1 | 90.5 | 0.4 |

**Table C.26: Foreign-funded R&D by sector (2006/07 to 2015/16)**

| YEAR | TOTAL | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| 2006/07 | 1 746 996 | 51 660 | 320 868 | 278 708 | 977 087 | 118 673 |
| 2007/08 | 1 987 082 | 56 172 | 298 906 | 320 286 | 1 180 193 | 131 525 |
| 2008/09 | 2 394 827 | 53 348 | 392 008 | 410 038 | 1 396 033 | 143 400 |
| 2009/10 | 2 538 439 | 54 129 | 416 571 | 443 109 | 1 538 917 | 85 713 |
| 2010/11 | 2 445 009 | 16 236 | 460 580 | 473 145 | 1 442 334 | 52 714 |
| 2011/12 | 3 330 496 | 118 127 | 321 257 | 1 272 173 | 1 562 277 | 56 662 |
| 2012/13 | 3 116 984 | 143 994 | 510 846 | 1 010 244 | 1 189 865 | 262 035 |
| 2013/14 | 3 315 227 | 258 531 | 454 527 | 1 042 627 | 1 226 966 | 332 576 |
| 2014/15 | 3 566 015 | 179 473 | 431 215 | 1 079 732 | 1 418 823 | 456 772 |
| 2015/16 | 4 209 861 | 499 966 | 469 507 | 1 206 192 | 1 532 766 | 501 430 |

**Table C.27: Proportional foreign-funded R&D by sector (2006/07 to 2015/16)**

| YEAR | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|
| | % | % | % | % | % |
| 2006/07 | 3.0 | 18.4 | 16.0 | 55.9 | 6.8 |
| 2007/08 | 2.8 | 15.0 | 16.1 | 59.4 | 6.6 |
| 2008/09 | 2.2 | 16.4 | 17.1 | 58.3 | 6.0 |
| 2009/10 | 2.1 | 16.4 | 17.5 | 60.6 | 3.4 |
| 2010/11 | 0.7 | 18.8 | 19.4 | 59.0 | 2.2 |
| 2011/12 | 3.5 | 9.6 | 38.2 | 46.9 | 1.7 |
| 2012/13 | 4.6 | 16.4 | 32.4 | 38.2 | 8.4 |
| 2013/14 | 7.8 | 13.7 | 31.4 | 37.0 | 10.0 |
| 2014/15 | 5.0 | 12.1 | 30.3 | 39.8 | 12.8 |
| 2015/16 | 11.9 | 11.2 | 28.7 | 36.4 | 11.9 |

## C.1.3. R&D personnel

**Table C.28: R&D personnel in headcounts and full-time equivalents by occupation (2006/07 to 2015/16)**

| YEAR | R&D PERSONNEL | | | RESEARCHERS | | | TECHNICIANS | | OTHER R&D PERSONNEL | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (HEAD-COUNTS*) | (FTEs) | (FTEs) PER 1000 IN TOTAL EM-PLOYMENT | (HEAD-COUNTS) | (FTEs) | (FTEs) PER 1000 IN TOTAL EM-PLOYMENT | (HEAD-COUNTS) | (FTEs) | (HEAD-COUNTS) | (FTEs) |
| 2006/07 | 58 706 | 30 984.4 | 2.5 | 39 591 | 18573.5 | 1.5 | 9 761 | 6 331.8 | 9 354 | 6 080.0 |
| 2007/08 | 59 334 | 31 354.4 | 2.4 | 40 084 | 19320.3 | 1.5 | 9 476 | 6 060.5 | 9 784 | 5 973.7 |
| 2008/09 | 58 895 | 30 801.6 | 2.2 | 39 955 | 19384.3 | 1.4 | 9 761 | 6 022.4 | 9 179 | 5 394.8 |
| 2009/10 | 59 494 | 30 891.3 | 2.3 | 40 797 | 19793.1 | 1.5 | 9 443 | 5 792.2 | 9 254 | 5 306.0 |
| 2010/11 | 55 531 | 29 486.4 | 2.2 | 37 901 | 18719.6 | 1.4 | 8 559 | 5 409.6 | 9 071 | 5 357.3 |
| 2011/12 | 59 487 | 30 978.4 | 2.3 | 40 653 | 20115.1 | 1.5 | 9 260 | 5 566.9 | 9 574 | 5 296.5 |
| 2012/13 | 64 917 | 35 050.3 | 2.4 | 42 828 | 21382.4 | 1.5 | 10 790 | 6 582.3 | 11 299 | 7 085.5 |
| 2013/14 | 68 838 | 37 956.5 | 2.5 | 45 935 | 23346.0 | 1.6 | 10 800 | 6 905.5 | 12 103 | 7 705.0 |
| 2014/15 | 72 400 | 38 465.0 | 2.5 | 48 479 | 23571.9 | 1.5 | 12 183 | 7 731.3 | 11 738 | 7 161.9 |
| 2015/16 | 74 931 | 41 054.5 | 2.6 | 51 877 | 26 159.4 | 1.7 | 11 518 | 7 688.3 | 11 536 | 7 206.9 |

### Table C.29: R&D personnel in headcounts and full-time equivalents by occupation and gender (2013/14, 2014/15 and 2015/16)

| YEAR | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | | | |
|---|---|---|---|---|---|---|---|
| **2013/14** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 45 935 | 25 704 | 20 231 | 23 346.0 | 13 180.8 | 10 165.2 | 50.8 |
| Technicians directly supporting R&D | 10 800 | 6 900 | 3 900 | 6 905.5 | 4 340.3 | 2 565.2 | 63.9 |
| Other personnel directly supporting R&D | 12 103 | 6 003 | 6 100 | 7 705.0 | 3 947.7 | 3 757.3 | 63.7 |
| **Total** | **68 838** | **38 607** | **30 231** | **37 956.5** | **21 468.7** | **16 487.8** | **55.1** |
| **2014/15** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 48 479 | 27 008 | 21 471 | 23 571.9 | 13 184.7 | 10 387.2 | 48.6 |
| Technicians directly supporting R&D | 12 183 | 7 688 | 4 495 | 7 731.3 | 4 867.9 | 2 863.4 | 63.5 |
| Other personnel directly supporting R&D | 11 738 | 5 915 | 5 823 | 7 161.9 | 3 833.0 | 3 328.9 | 61.0 |
| **Total** | **72 400** | **40 611** | **31 789** | **38 465.0** | **21 885.6** | **16 579.5** | **53.1** |
| **2015/16** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 51 877 | 28 543 | 23 334 | 26 159.4 | 14 623.2 | 11 536.1 | 50.4 |
| Technicians directly supporting R&D | 11 518 | 7 319 | 4 199 | 7 688.3 | 4 844.6 | 2 843.8 | 66.8 |
| Other personnel directly supporting R&D | 11 536 | 5 774 | 5 762 | 7 206.9 | 36 63.7 | 3 543.2 | 62.5 |
| **Total** | **74 931** | **41 636** | **33 295** | **41 054.5** | **23 131.4** | **17 923.1** | **54.8** |

*Including doctoral students and post-doctoral fellows.

### Table C.30: R&D personnel in headcounts by sector (2006/07 to 2015/16)

| YEAR | TOTAL R&D PERSONNEL (HEADCOUNTS) | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| 2006/07 | 58 706 | 2 924 | 5 798 | 32 033 | 17 467 | 484 |
| 2007/08 | 59 344 | 2 794 | 5 988 | 32 109 | 17 951 | 502 |
| 2008/09 | 58 895 | 2 963 | 5 609 | 31 226 | 18 595 | 502 |
| 2009/10 | 59 494 | 2 580 | 5 926 | 32 392 | 18 216 | 380 |
| 2010/11 | 55 531 | 2 704 | 4 923 | 32 571 | 14 933 | 400 |
| 2011/12 | 59 487 | 3 143 | 4 494 | 36 157 | 15 288 | 405 |
| 2012/13 | 64 917 | 3 252 | 5 399 | 38 205 | 17 155 | 906 |
| 2013/14 | 68 838 | 2 874 | 5 884 | 41 464 | 17 599 | 1 017 |
| 2014/15 | 72 400 | 2 893 | 4 836 | 44 457 | 18 743 | 1 471 |
| 2015/16 | 74 931 | 2 997 | 5 162 | 48 034 | 17 245 | 1 493 |

Note: Includes doctoral students and post-doctoral fellows at higher education institutes.

### Table C.31: R&D personnel full-time equivalents by sector (2006/07 to 2015/16)

| YEAR | TOTAL R&D PERSONNEL (FTEs) | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| 2006/07 | 30 984.4 | 2 068.3 | 4 956.1 | 11 002.0 | 12 595.3 | 362.7 |
| 2007/08 | 31 354.4 | 1 950.0 | 5 058.8 | 11 505.3 | 12 461.3 | 379.1 |
| 2008/09 | 30 801.6 | 2 073.9 | 4 699.9 | 11 169.0 | 12 492.5 | 366.4 |
| 2009/10 | 30 891.3 | 1 903.9 | 4 782.7 | 11 870.4 | 12 024.6 | 309.7 |
| 2010/11 | 29 486.4 | 2 178.6 | 4 312.4 | 12 477.3 | 10 205.1 | 313.1 |
| 2011/12 | 30 978.4 | 2 404.5 | 3 803.5 | 14 563.4 | 9 894.9 | 312.1 |
| 2012/13 | 35 050.3 | 2 597.0 | 4 748.5 | 15 614.4 | 11 322.3 | 768.0 |
| 2013/14 | 37 956.5 | 2 245.5 | 5 164.5 | 17 777.7 | 11 877.4 | 891.4 |
| 2014/15 | 38 465.0 | 2 181.5 | 4 180.4 | 17 944.4 | 12 927.5 | 1 231.2 |
| 2015/16 | 41 054.5 | 2 056.2 | 4 361.2 | 20 812.0 | 12 457.8 | 1 367.3 |

Note: Includes doctoral students and post-doctoral fellows at higher education institutes.

### Table C.32: Researcher headcounts by sector (2006/07 to 2015/16)

| YEAR | TOTAL RESEARCHERS (HEADCOUNTS) | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION | BUSINESS | NOT-FOR-PROFIT |
|---|---|---|---|---|---|---|
| 2006/07 | 39 591 | 1 111 | 2 255 | 27 746 | 8 227 | 252 |
| 2007/08 | 40 084 | 1 138 | 2 594 | 27 752 | 8 336 | 264 |
| 2008/09 | 39 955 | 1 169 | 2 648 | 27 316 | 8 560 | 262 |
| 2009/10 | 40 797 | 986 | 2 669 | 28 552 | 8 366 | 224 |
| 2010/11 | 37 901 | 1 184 | 1 941 | 28 154 | 6 372 | 250 |
| 2011/12 | 40 653 | 1 411 | 1 803 | 30 993 | 6 192 | 254 |
| 2012/13 | 42 828 | 1 409 | 1 879 | 32 955 | 6 191 | 394 |
| 2013/14 | 45 935 | 1 229 | 1 956 | 36 133 | 6 182 | 435 |
| 2014/15 | 48 479 | 1 343 | 1 988 | 38 381 | 6 261 | 506 |
| 2015/16 | 51 877 | 1 573 | 2 072 | 41 639 | 6 128 | 465 |

Note: Includes doctoral students and post-doctoral fellows at higher education institutes.

### Table C.33: Researcher headcounts by gender (2006/07 to 2015/16)

| YEAR | TOTAL RESEARCHERS* (HEADCOUNTS) | MALE | FEMALE |
|---|---|---|---|
| 2006/07 | 29 303 | 6 058 | 1 396 |
| 2007/08 | 29 327 | 6 566 | 1 398 |
| 2008/09 | 28 952 | 6 595 | 1 505 |
| 2009/10 | 29 255 | 7 210 | 1 573 |
| 2010/11 | 25 300 | 6 756 | 1 316 |
| 2011/12 | 25 954 | 7 201 | 1 438 |
| 2012/13 | 27 314 | 8 101 | 1 591 |
| 2013/14 | 28 014 | 8 024 | 1 685 |
| 2014/15 | 28 723 | 8 468 | 1 815 |
| 2015/16 | 29 454 | 9 548 | 1 881 |

* Excludes doctoral students and post-doctoral fellows.

### Table C.34: Researcher headcounts by race (2006/07 to 2015/16)

| YEAR | TOTAL RESEARCHERS* (HEADCOUNTS) | AFRICAN | COLOURED | INDIAN | WHITE |
|---|---|---|---|---|---|
| 2006/07 | 29 303 | 6 058 | 1 396 | 2 402 | 19 447 |
| 2007/08 | 29 327 | 6 566 | 1 398 | 2 434 | 18 929 |
| 2008/09 | 28 952 | 6 595 | 1 505 | 2 588 | 18 265 |
| 2009/10 | 29 255 | 7 210 | 1 573 | 2 448 | 18 024 |
| 2010/11 | 25 300 | 6 756 | 1 316 | 2 438 | 14 789 |
| 2011/12 | 25 954 | 7 201 | 1 438 | 2 202 | 15 113 |
| 2012/13 | 27 314 | 8 101 | 1 591 | 2 514 | 15 108 |
| 2013/14 | 28 014 | 8 024 | 1 685 | 2 530 | 15 775 |
| 2014/15 | 28 723 | 8 468 | 1 815 | 2 522 | 15 919 |
| 2015/16 | 29 454 | 9 548 | 1 881 | 2 629 | 15 396 |

Note: Non-SA student data are not collected by population group.

*Excludes doctoral students and post-doctoral fellows.

### Table C.35: R&D personnel in headcounts (2015/16)

| OCCUPATION AND QUALIFICATION | TOTAL R&D PERSONNEL (HEADCOUNTS) | SUBTOTAL | | AFRICAN | | COLOURED | | INDIAN | | WHITE | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE |
| **Researchers** | **43 008** | **22 642** | **20 366** | **8 367** | **6 499** | **1 351** | **1 575** | **1 805** | **2 124** | **11 119** | **10 168** |
| *Doctoral degree or equivalent | 23 814 | 12 575 | 11 239 | 4 684 | 3 231 | 799 | 878 | 914 | 1 189 | 6 178 | 5 941 |
| Masters, honours, bachelor or equivalent | 16 644 | 8 667 | 7 977 | 3 180 | 2 804 | 483 | 601 | 789 | 836 | 4 215 | 3 736 |
| Diplomas | 2 550 | 1 400 | 1 150 | 503 | 464 | 69 | 96 | 102 | 99 | 726 | 491 |
| **Technicians directly supporting R&D** | **11 517** | **7 317** | **4 200** | **2 543** | **1 997** | **703** | **349** | **733** | **418** | **3 338** | **1 436** |
| Doctoral degree or equivalent | 339 | 209 | 130 | 32 | 12 | 5 | 4 | 6 | 7 | 166 | 107 |
| Masters, honours, bachelor or equivalent | 4 280 | 2 499 | 1 781 | 866 | 751 | 150 | 147 | 283 | 230 | 1 200 | 653 |
| Diplomas | 6 898 | 4 609 | 2 289 | 1 645 | 1 234 | 548 | 198 | 444 | 181 | 1 972 | 676 |
| **Other personnel directly supporting R&D** | **11 538** | **5 775** | **5 763** | **2 643** | **2 360** | **560** | **787** | **805** | **456** | **1 767** | **2 160** |
| Doctoral degree or equivalent | 380 | 210 | 170 | 61 | 54 | 10 | 10 | 18 | 16 | 121 | 90 |
| Masters, honours, bachelor or equivalent | 3 685 | 1 667 | 2 018 | 592 | 662 | 118 | 182 | 149 | 169 | 808 | 1005 |
| Diplomas | 7 473 | 3 898 | 3 575 | 1 990 | 1 644 | 432 | 595 | 638 | 271 | 838 | 1 065 |
| **Total** | **66 063** | **35 734** | **30 329** | **13 553** | **10 856** | **2 614** | **2 711** | **3 343** | **2 998** | **16 224** | **13 764** |

Note: Non-SA student data are not collected by population group.

*Doctoral degree or equivalent includes South African doctoral students and post-doctoral fellows (excludes non-SA students).

## C.2. Sector tables

### C.2.1. Business sector

**Table C.36: Business sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic research | 800 085 | 929 134 | 1 073 117 | 1 267 759 | 1 025 389 | 922 888 | 802 753 | 968 504 | 845 527 | 906 730 |
| Applied research | 2 550 483 | 3 077 341 | 3 426 651 | 3 301 773 | 3 949 410 | 4 461 770 | 5 569 024 | 6 087 791 | 7 541 596 | 7 492 229 |
| Experimental research | 5 892 597 | 6 731 981 | 7 832 244 | 6 569 705 | 5 084 210 | 5 079 364 | 4 198 949 | 4 726 553 | 4 903 827 | 5 416 037 |
| **Total** | **9 243 165** | **10 738 456** | **12 332 012** | **11 139 237** | **10 059 010** | **10 464 022** | **10 570 726** | **11 782 848** | **13 290 951** | **13 814 995** |

**Table C.37: Proportional business sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic research | 8.7 | 8.7 | 8.7 | 11.4 | 10.2 | 8.8 | 7.6 | 8.2 | 6.4 | 6.6 |
| Applied research | 27.6 | 28.7 | 27.8 | 29.6 | 39.3 | 42.6 | 52.7 | 51.7 | 56.7 | 54.2 |
| Experimental research | 63.8 | 62.7 | 63.5 | 59.0 | 50.5 | 48.5 | 39.7 | 40.1 | 36.9 | 39.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.38: Business sector R&D expenditure by accounting category (2006/07 to 2015/16)**

| TYPE OF EXPENDITURE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 1 120 589 | 1 445 305 | 2 658 738 | 1 638 994 | 1 306 444 | 1 650 541 | 1 072 556 | 1 132 520 | 1 397 243 | 1 289 228 |
| Land: buildings & other structures | 154 129 | 262 994 | 207 473 | 285 285 | 202 835 | 217 126 | 140 053 | 159 162 | 117 656 | 186 396 |
| Vehicles, plant, machinery, equipment | 966 460 | 1 182 311 | 2 451 265 | 1 353 709 | 1 103 609 | 1 433 415 | 932 503 | 973 358 | 1 279 587 | 1 102 833 |
| Current expenditure | 8 122 576 | 9 293 151 | 9 673 274 | 9 500 243 | 8 752 566 | 8 813 481 | 9 498 170 | 10 650 328 | 11 893 708 | 12 525 767 |
| Labour costs | 4 461 218 | 4 881 074 | 5 279 507 | 5 207 695 | 4 467 214 | 4 723 488 | 5 821 884 | 6 768 527 | 7 659 365 | 7 821 865 |
| Other current expenditure | 3 661 358 | 4 412 077 | 4 393 767 | 4 292 548 | 4 285 352 | 4 089 993 | 3 676 286 | 3 881 801 | 4 234 343 | 4 703 901 |
| **Total** | **9 243 165** | **10 738 456** | **12 332 012** | **11 139 237** | **10 059 010** | **10 464 022** | **10 570 726** | **11 782 848** | **13 290 951** | **13 814 995** |

### Table C.39: Proportional business sector R&D expenditure by accounting category (2006/07 to 2015/16)

| TYPE OF EXPENDITURE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 12.1 | 13.5 | 21.6 | 14.7 | 13.0 | 15.8 | 10.1 | 9.6 | 10.5 | 9.3 |
| Land: buildings & other structures | 1.7 | 2.4 | 1.7 | 2.6 | 2.0 | 2.1 | 1.3 | 1.4 | 0.9 | 1.3 |
| Vehicles, plant, machinery, equipment | 10.5 | 11.0 | 19.9 | 12.2 | 11.0 | 13.7 | 8.8 | 8.3 | 9.6 | 8.0 |
| Current expenditure | 87.9 | 86.5 | 78.4 | 85.3 | 87.0 | 84.2 | 89.9 | 90.4 | 89.5 | 90.7 |
| Labour costs | 48.3 | 45.5 | 42.8 | 46.8 | 44.4 | 45.1 | 55.1 | 57.4 | 57.6 | 56.6 |
| Other current expenditure | 39.6 | 41.1 | 35.6 | 38.5 | 42.6 | 39.1 | 34.8 | 32.9 | 31.9 | 34.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.40: Business sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 132 641 | 169 410 | 268 923 | 330 232 | 341 695 | 422 121 | 499 589 | 556 275 | 578 747 | 729 299 |
| Nanotechnology | 155 049 | 30 314 | 56 881 | 150 474 | 102 670 | 171 808 | 225 557 | 170 479 | 217 216 | 134 063 |
| **Total** | **287 690** | **199 724** | **325 804** | **480 706** | **444 366** | **593 929** | **725 145** | **726 754** | **795 963** | **863 362** |
| Business expenditure on R&D | 9 243 165 | 10 738 456 | 12 332 012 | 11 139 237 | 10 059 010 | 10 464 022 | 10 570 726 | 11 782 848 | 13 290 951 | 13 814 995 |

### Table C.41: Proportional business sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 1.4 | 1.6 | 2.2 | 3.0 | 3.4 | 4.0 | 4.7 | 4.7 | 4.4 | 5.3 |
| Nanotechnology | 1.7 | 0.3 | 0.5 | 1.4 | 1.0 | 1.6 | 2.1 | 1.4 | 1.6 | 1.0 |
| **Total** | **3.1** | **1.9** | **2.6** | **4.3** | **4.4** | **5.7** | **6.9** | **6.2** | **6.0** | **6.2** |

### Table C.42: Business sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF INTEREST | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 31 349 | 183 921 | 228 905 | 176 463 | 173 356 |
| Open source software | 118 858 | 114 195 | 96 266 | 91 818 | 68 105 | 85 787 | 87 200 | 233 576 | 241 710 | 326 856 |
| New materials | 115 339 | 72 992 | 154 140 | 173 308 | 227 682 | 277 152 | 225 897 | 151 890 | 245 752 | 224 433 |
| Tuberculosis (TB), HIV/AIDS, malaria | 294 689 | 302 122 | 466 161 | 460 233 | 631 996 | 812 580 | 929 121 | 992 538 | 1 082 646 | 1 176 149 |
| **Total** | **528 886** | **489 309** | **716 567** | **725 359** | **927 783** | **1 206 869** | **1 426 139** | **1 606 909** | **1 746 571** | **1 900 794** |
| Business expenditure on R&D | 9 243 165 | 10 738 456 | 12 332 012 | 11 139 237 | 10 059 010 | 10 464 022 | 10 570 726 | 11 782 848 | 13 290 951 | 13 814 995 |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.43: Proportional business sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF INTEREST | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 0.3 | 1.7 | 1.9 | 1.3 | 1.3 |
| Open source software | 1.3 | 1.1 | 0.8 | 0.8 | 0.7 | 0.8 | 0.8 | 2.0 | 1.8 | 2.4 |
| New materials | 1.2 | 0.7 | 1.2 | 1.6 | 2.3 | 2.6 | 2.1 | 1.3 | 1.8 | 1.6 |
| Tuberculosis (TB), HIV/AIDS, malaria | 3.2 | 2.8 | 3.8 | 4.1 | 6.3 | 7.8 | 8.8 | 8.4 | 8.1 | 8.5 |
| **Total** | **5.7** | **4.6** | **5.8** | **6.5** | **9.2** | **11.5** | **13.5** | **13.6** | **13.1** | **13.8** |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.44: Business sector R&D expenditure by research field (2006/07 to 2015/16)

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **8 881 904** | **10 357 433** | **11 902 551** | **10 743 523** | **9 612 221** | **9 992 916** | **9 127 446** | **9 765 859** | **10 977 250** | **11 447 693** |
| Mathematical sciences | 159 496 | 176 077 | 183 255 | 183 426 | 110 543 | 204 594 | 149 220 | 209 344 | 211 324 | 119 900 |
| Physical sciences | 382 551 | 507 646 | 655 898 | 190 292 | 32 669 | 28 489 | 47 672 | 50 708 | 56 997 | 35 616 |
| Chemical sciences | 438 969 | 580 146 | 859 041 | 627 729 | 687 843 | 934 005 | 980 021 | 979 760 | 847 321 | 972 398 |
| Earth sciences | 66 244 | 93 014 | 95 034 | 90 098 | 106 759 | 92 439 | 102 892 | 109 665 | 118 539 | 93 302 |
| Information, computer and communication technologies | 1 980 630 | 2 182 253 | 2 412 430 | 2 855 355 | 2 502 454 | 2 481 028 | 1 576 163 | 1 610 718 | 1 908 985 | 2 572 364 |
| Applied sciences and technologies | 1 551 885 | 1 581 438 | 1 671 375 | 1 271 414 | 1 132 538 | 902 425 | 872 014 | 808 899 | 955 119 | 903 958 |
| Engineering sciences | 2 439 092 | 3 237 265 | 3 908 347 | 3 311 902 | 2 768 035 | 2 751 145 | 2 827 677 | 3 093 088 | 3 548 019 | 3 429 786 |

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Biological sciences | 160 584 | 161 058 | 162 776 | 194 671 | 207 456 | 212 632 | 210 627 | 213 124 | 248 838 | 254 071 |
| Agricultural sciences | 277 889 | 311 287 | 293 357 | 323 603 | 371 310 | 471 529 | 444 593 | 593 315 | 665 703 | 671 194 |
| Medical and health sciences | 1 225 114 | 1 268 551 | 1 509 109 | 1 567 493 | 1 622 215 | 1 843 005 | 1 812 411 | 1 974 213 | 2 170 317 | 2 300 587 |
| Environmental sciences | 42 315 | 62 355 | 57 764 | 47 692 | 5 818 | 2 206 | 44 563 | 50 909 | 85 932 | 21 920 |
| Material sciences | 146 588 | 184 625 | 82 192 | 70 949 | 59 723 | 65 092 | 53 855 | 64 090 | 154 500 | 71 967 |
| Marine sciences | 10 547 | 11 719 | 11 975 | 8 899 | 4 859 | 4 324 | 5 738 | 8 026 | 5 655 | 630 |
| **Division 2: Social Sciences and Humanities** | **361 261** | **381 023** | **429 461** | **395 714** | **446 789** | **471 106** | **1 443 280** | **2 016 989** | **2 313 701** | **2 367 302** |
| Social sciences | 360 856 | 380 554 | 428 969 | 395 115 | 446 789 | 471 106 | 1 443 280 | 2 016 989 | 2 313 701 | 2 367 302 |
| Humanities | 405 | 469 | 491 | 599 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **9 243 165** | **10 738 456** | **12 332 012** | **11 139 237** | **10 059 010** | **10 464 022** | **10 570 726** | **11 782 848** | **13 290 951** | **13 814 995** |

**Table C.45: Proportional business sector R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **96.1** | **96.5** | **96.5** | **96.4** | **95.6** | **95.5** | **86.3** | **82.9** | **82.6** | **82.9** |
| Mathematical sciences | 1.7 | 1.6 | 1.5 | 1.6 | 1.1 | 2.0 | 1.4 | 1.8 | 1.6 | 0.9 |
| Physical sciences | 4.1 | 4.7 | 5.3 | 1.7 | 0.3 | 0.3 | 0.5 | 0.4 | 0.4 | 0.3 |
| Chemical sciences | 4.7 | 5.4 | 7.0 | 5.6 | 6.8 | 8.9 | 9.3 | 8.3 | 6.4 | 7.0 |
| Earth sciences | 0.7 | 0.9 | 0.8 | 0.8 | 1.1 | 0.9 | 1.0 | 0.9 | 0.9 | 0.7 |
| Information, computer and communication technologies | 21.4 | 20.3 | 19.6 | 25.6 | 24.9 | 23.7 | 14.9 | 13.7 | 14.4 | 18.6 |
| Applied sciences and technologies | 16.8 | 14.7 | 13.6 | 11.4 | 11.3 | 8.6 | 8.2 | 6.9 | 7.2 | 6.5 |
| Engineering sciences | 26.4 | 30.1 | 31.7 | 29.7 | 27.5 | 26.3 | 26.8 | 26.3 | 26.7 | 24.8 |
| Biological sciences | 1.7 | 1.5 | 1.3 | 1.7 | 2.1 | 2.0 | 2.0 | 1.8 | 1.9 | 1.8 |
| Agricultural sciences | 3.0 | 2.9 | 2.4 | 2.9 | 3.7 | 4.5 | 4.2 | 5.0 | 5.0 | 4.9 |
| Medical and health sciences | 13.3 | 11.8 | 12.2 | 14.1 | 16.1 | 17.6 | 17.1 | 16.8 | 16.3 | 16.7 |
| Environmental sciences | 0.5 | 0.6 | 0.5 | 0.4 | 0.1 | 0.0 | 0.4 | 0.4 | 0.6 | 0.2 |
| Material sciences | 1.6 | 1.7 | 0.7 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 1.2 | 0.5 |
| Marine sciences | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 |
| **Division 2: Social Sciences and Humanities** | **3.9** | **3.5** | **3.5** | **3.6** | **4.4** | **4.5** | **13.7** | **17.1** | **17.4** | **17.1** |
| Social sciences | 3.9 | 3.5 | 3.5 | 3.5 | 4.4 | 4.5 | 13.7 | 17.1 | 17.4 | 17.1 |
| Humanities | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.46: Business sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **777 139** | **900 909** | **908 781** | **959 761** | **1 103 510** | **813 259** | **1 040 025** | **1 096 986** | **1 034 893** | **937 964** |
| Defence | 777 139 | 900 909 | 908 781 | 959 761 | 1 103 510 | 813 259 | 1 040 025 | 1 096 986 | 1 034 893 | 937 964 |
| **Division 2: Economic Development** | **7 233 003** | **8 399 187** | **9 737 338** | **8 258 491** | **7 012 272** | **7 381 289** | **7 234 533** | **8 308 177** | **9 663 402** | **10 362 668** |
| Economic Development unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plant production and plant primary products | 279 937 | 279 437 | 266 259 | 309 370 | 288 323 | 315 806 | 374 327 | 454 990 | 593 610 | 622 367 |
| Animal production and animal primary products | 67 619 | 78 657 | 74 302 | 110 295 | 46 709 | 46 316 | 38 484 | 69 916 | 74 045 | 74 267 |
| Mineral resources (excluding Energy) | 779 765 | 937 628 | 839 558 | 741 401 | 728 130 | 733 280 | 853 544 | 977 365 | 1 405 074 | 1 348 618 |
| Energy resources | 470 735 | 585 453 | 732 188 | 290 662 | 93 532 | 90 377 | 90 975 | 95 375 | 100 061 | 79 210 |
| Energy supply | 239 018 | 252 064 | 393 798 | 426 407 | 470 030 | 490 490 | 321 456 | 349 710 | 503 222 | 362 656 |
| Manufacturing | 1 846 199 | 2 117 823 | 2 562 745 | 2 037 129 | 1 747 369 | 1 863 289 | 1 639 077 | 1 869 926 | 2 096 271 | 2 106 255 |
| Construction | 756 166 | 1 017 969 | 1 295 717 | 367 510 | 16 284 | 46 158 | 96 071 | 125 059 | 138 237 | 55 625 |
| Transport | 446 162 | 523 022 | 621 479 | 843 301 | 872 149 | 920 081 | 951 435 | 1 080 427 | 935 483 | 1 046 235 |
| Information and communication services | 895 714 | 1 087 198 | 1 151 637 | 1 189 650 | 851 392 | 978 187 | 908 640 | 842 341 | 1 097 649 | 1 685 124 |
| Commercial services | 1 329 972 | 1 347 470 | 1 422 123 | 1 747 450 | 1 773 253 | 1 739 933 | 1 755 506 | 2 255 642 | 2 555 783 | 2 643 503 |
| Economic framework | 16 243 | 41 756 | 160 562 | 106 693 | 70 795 | 57 474 | 103 240 | 91 464 | 79 065 | 273 497 |
| Natural resources | 105 475 | 130 711 | 216 971 | 88 624 | 54 306 | 99 898 | 101 778 | 95 962 | 84 901 | 65 312 |
| **Division 3: Society** | **839 908** | **915 567** | **1 019 848** | **1 224 481** | **1 041 616** | **1 232 867** | **1 242 066** | **1 303 321** | **1 435 870** | **1 433 935** |
| Society unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Health | 799 201 | 857 364 | 930 645 | 1 103 816 | 880 549 | 1 054 182 | 1 045 048 | 1 097 446 | 1 212 844 | 1 216 127 |
| Education and training | 12 913 | 12 204 | 27 232 | 26 444 | 32 486 | 32 767 | 29 566 | 33 913 | 35 728 | 33 707 |
| Social development and community services | 27 794 | 45 999 | 61 971 | 94 220 | 128 581 | 145 918 | 167 452 | 171 962 | 187 298 | 184 102 |
| **Division 4: Environment** | **113 821** | **164 552** | **221 747** | **211 208** | **211 025** | **220 698** | **173 535** | **171 747** | **219 212** | **196 802** |
| Environment unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Environmental knowledge | 39 233 | 62 551 | 91 953 | 53 022 | 51 845 | 58 565 | 46 213 | 43 935 | 55 885 | 62 471 |
| Environmental aspects of development | 28 327 | 33 901 | 31 493 | 22 456 | 55 577 | 42 226 | 17 957 | 14 344 | 38 437 | 18 915 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Environmental and other aspects | 46 261 | 68 100 | 98 301 | 135 730 | 103 602 | 119 907 | 109 365 | 113 468 | 124 889 | 115 415 |
| **Division 5: Advancement of Knowledge** | **279 295** | **358 242** | **444 298** | **485 296** | **690 587** | **815 909** | **880 567** | **902 617** | **937 575** | **883 626** |
| Advancement of Knowledge unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Natural sciences, technologies and engineering | 275 446 | 353 694 | 439 330 | 479 999 | 682 401 | 813 150 | 877 557 | 899 840 | 932 030 | 880 474 |
| Social sciences and humanities | 3 848 | 4 548 | 4 968 | 5 298 | 8 186 | 2 758 | 3 010 | 2 776 | 5 545 | 3 152 |
| **Total** | **9 243 165** | **10 738 457** | **12 332 012** | **11 139 237** | **10 059 010** | **10 464 022** | **10 570 726** | **11 782 848** | **13 290 951** | **13 814 995** |

**Table C.47: Proportional business sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **8.4** | **8.4** | **7.4** | **8.6** | **11.0** | **7.8** | **9.8** | **9.3** | **7.8** | **6.8** |
| Defence | 8.4 | 8.4 | 7.4 | 8.6 | 11.0 | 7.8 | 9.8 | 9.3 | 7.8 | 6.8 |
| **Division 2: Economic Development** | **78.3** | **78.2** | **79.0** | **74.1** | **69.7** | **70.5** | **68.4** | **70.5** | **72.7** | **75.0** |
| Economic Development unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plant production and plant primary products | 3.0 | 2.6 | 2.2 | 2.8 | 2.9 | 3.0 | 3.5 | 3.9 | 4.5 | 4.5 |
| Animal production and animal primary products | 0.7 | 0.7 | 0.6 | 1.0 | 0.5 | 0.4 | 0.4 | 0.6 | 0.6 | 0.5 |
| Mineral resources (excluding Energy) | 8.4 | 8.7 | 6.8 | 6.7 | 7.2 | 7.0 | 8.1 | 8.3 | 10.6 | 9.8 |
| Energy resources | 5.1 | 5.5 | 5.9 | 2.6 | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 | 0.6 |
| Energy supply | 2.6 | 2.3 | 3.2 | 3.8 | 4.7 | 4.7 | 3.0 | 3.0 | 3.8 | 2.6 |
| Manufacturing | 20.0 | 19.7 | 20.8 | 18.3 | 17.4 | 17.8 | 15.5 | 15.9 | 15.8 | 15.2 |
| Construction | 8.2 | 9.5 | 10.5 | 3.3 | 0.2 | 0.4 | 0.9 | 1.1 | 1.0 | 0.4 |
| Transport | 4.8 | 4.9 | 5.0 | 7.6 | 8.7 | 8.8 | 9.0 | 9.2 | 7.0 | 7.6 |
| Information and communication services | 9.7 | 10.1 | 9.3 | 10.7 | 8.5 | 9.3 | 8.6 | 7.1 | 8.3 | 12.2 |
| Commercial services | 14.4 | 12.5 | 11.5 | 15.7 | 17.6 | 16.6 | 16.6 | 19.1 | 19.2 | 19.1 |
| Economic framework | 0.2 | 0.4 | 1.3 | 1.0 | 0.7 | 0.5 | 1.0 | 0.8 | 0.6 | 2.0 |
| Natural resources | 1.1 | 1.2 | 1.8 | 0.8 | 0.5 | 1.0 | 1.0 | 0.8 | 0.6 | 0.5 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 3: Society** | **9.1** | **8.5** | **8.3** | **11.0** | **10.4** | **11.8** | **11.8** | **11.1** | **10.8** | **10.4** |
| Society unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health | 8.6 | 8.0 | 7.5 | 9.9 | 8.8 | 10.1 | 9.9 | 9.3 | 9.1 | 8.8 |
| Education and training | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 |
| Social development and community services | 0.3 | 0.4 | 0.5 | 0.8 | 1.3 | 1.4 | 1.6 | 1.5 | 1.4 | 1.3 |
| **Division 4: Environment** | **1.2** | **1.5** | **1.8** | **1.9** | **2.1** | **2.1** | **1.6** | **1.5** | **1.6** | **1.4** |
| Environment unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Environmental knowledge | 0.4 | 0.6 | 0.7 | 0.5 | 0.5 | 0.6 | 0.4 | 0.4 | 0.4 | 0.5 |
| Environmental aspects of development | 0.3 | 0.3 | 0.3 | 0.2 | 0.6 | 0.4 | 0.2 | 0.1 | 0.3 | 0.1 |
| Environmental and other aspects | 0.5 | 0.6 | 0.8 | 1.2 | 1.0 | 1.1 | 1.0 | 1.0 | 0.9 | 0.8 |
| **Division 5: Advancement of Knowledge** | **3.0** | **3.3** | **3.6** | **4.4** | **6.9** | **7.8** | **8.3** | **7.7** | **7.1** | **6.4** |
| Advancement of Knowledge unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural sciences, technologies and engineering | 3.0 | 3.3 | 3.6 | 4.3 | 6.8 | 7.8 | 8.3 | 7.6 | 7.0 | 6.4 |
| Social sciences and humanities | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.48: Business sector R&D expenditure by province (2006/07 to 2015/16)**

| PROVINCE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Eastern Cape | 247 295 | 283 488 | 316 089 | 320 955 | 217 880 | 354 553 | 468 197 | 646 497 | 608 398 | 651 533 |
| Free State | 665 443 | 786 225 | 1 213 808 | 999 554 | 943 508 | 1 308 833 | 1 265 285 | 1 374 960 | 831 575 | 1 124 042 |
| Gauteng | 5 263 546 | 6 142 233 | 7 131 411 | 6 120 062 | 5 439 718 | 5 558 409 | 5 356 550 | 5 813 673 | 7 160 280 | 7 183 557 |
| KwaZulu-Natal | 962 308 | 1 302 260 | 1 255 509 | 1 183 636 | 1 280 014 | 1 160 507 | 1 237 563 | 1 434 084 | 1 501 659 | 1 436 737 |
| Limpopo | 72 813 | 71 687 | 75 675 | 49 375 | 41 850 | 62 728 | 127 451 | 140 026 | 161 331 | 145 736 |
| Mpumalanga | 172 948 | 196 368 | 201 550 | 161 154 | 139 771 | 157 158 | 222 974 | 301 831 | 435 770 | 339 985 |
| North-West | 197 383 | 193 339 | 222 630 | 267 528 | 256 428 | 302 164 | 380 144 | 435 849 | 681 634 | 451 891 |
| Northern Cape | 15 834 | 7 450 | 7 319 | 7 988 | 17 017 | 45 267 | 78 471 | 124 150 | 226 303 | 206 786 |
| Western Cape | 1 645 595 | 1 755 404 | 1 908 020 | 2 028 984 | 1 722 823 | 1 514 404 | 1 434 090 | 1 511 778 | 1 684 001 | 2 274 728 |
| **Total** | **9 243 165** | **10 738 456** | **12 332 012** | **11 139 237** | **10 059 010** | **10 464 022** | **10 570 726** | **11 782 848** | **13 290 951** | **13 814 995** |

### Table C.49: Proportional business sector R&D expenditure by province (2006/07 to 2015/16)

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Eastern Cape | 2.7 | 2.6 | 2.6 | 2.9 | 2.2 | 3.4 | 4.4 | 5.5 | 4.6 | 4.7 |
| Free State | 7.2 | 7.3 | 9.8 | 9.0 | 9.4 | 12.5 | 12.0 | 11.7 | 6.3 | 8.1 |
| Gauteng | 56.9 | 57.2 | 57.8 | 54.9 | 54.1 | 53.1 | 50.7 | 49.3 | 53.9 | 52.0 |
| KwaZulu-Natal | 10.4 | 12.1 | 10.2 | 10.6 | 12.7 | 11.1 | 11.7 | 12.2 | 11.3 | 10.4 |
| Limpopo | 0.8 | 0.7 | 0.6 | 0.4 | 0.4 | 0.6 | 1.2 | 1.2 | 1.2 | 1.1 |
| Mpumalanga | 1.9 | 1.8 | 1.6 | 1.4 | 1.4 | 1.5 | 2.1 | 2.6 | 3.3 | 2.5 |
| North-West | 2.1 | 1.8 | 1.8 | 2.4 | 2.5 | 2.9 | 3.6 | 3.7 | 5.1 | 3.3 |
| Northern Cape | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.4 | 0.7 | 1.1 | 1.7 | 1.5 |
| Western Cape | 17.8 | 16.3 | 15.5 | 18.2 | 17.1 | 14.5 | 13.6 | 12.8 | 12.7 | 16.5 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

### Table C.50: Business sector R&D expenditure by Standard Industrial Classification Code (SIC) (2006/07 to 2015/16)

| STANDARD INDUSTRIAL CLASSIFICATION | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| Agriculture, Hunting, Forestry and Fishing | 199 959 | 213 808 | 220 757 | 208 447 | 157 916 | 211 132 | 286 832 | 364 424 | 460 464 | 484 384 |
| Mining and Quarrying | 518 262 | 559 332 | 578 825 | 499 286 | 1 055 963 | 1 352 877 | 1 554 284 | 1 675 153 | 1 340 103 | 1 220 985 |
| **Manufacturing** | **3 537 433** | **4 222 127** | **4 787 581** | **4 321 327** | **3 592 204** | **3 551 234** | **3 476 647** | **3 793 066** | **4 501 146** | **4 442 466** |
| Manufacture of Food Products, Beverages and Tobacco Products | 183 391 | 196 238 | 215 876 | 162 851 | 221 370 | 283 262 | 319 143 | 340 427 | 364 178 | 376 884 |
| Manufacture of Textiles, Clothing and Leather Goods | 21 899 | 17 888 | 13 755 | 16 946 | 2 437 | 0 | 2 073 | 32 091 | 34 609 | 9 335 |
| Manufacture of Wood and Products of Wood and Cork, except furniture; Manufacture of Articles of Straw and Plaiting Materials; Manufacture of Paper and Paper Products; Manufacture of Publishing, Printing and Reproduction of Recorded Material | 110 631 | 118 535 | 118 016 | 111 255 | 106 448 | 80 255 | 50 531 | 60 437 | 72 870 | 95 555 |
| Manufacture of Refined Petroleum, Coke and Nuclear Fuel; Manufacture of Chemicals and Chemical Products (incl. Pharmaceuticals); Manufacture of Rubber and Plastic Products | 1 301 947 | 1 579 382 | 2 267 063 | 1 758 353 | 1 197 179 | 1 381 001 | 1 139 617 | 1 256 313 | 1 835 837 | 1 800 420 |
| Manufacture of Non-Metallic Mineral Products | 127 714 | 183 758 | 134 638 | 120 508 | 87 037 | 72 039 | 49 974 | 52 263 | 51 097 | 28 095 |
| Manufacture of Basic Metals, Fabricated Metal Products, Machinery & Equipment; Manufacture of Office, Accounting and Computing Machinery | 386 605 | 500 715 | 315 295 | 330 137 | 240 408 | 392 800 | 585 635 | 620 923 | 607 574 | 660 205 |
| Manufacture of Electrical Machinery and Apparatus | 189 554 | 187 612 | 166 498 | 146 169 | 207 954 | 310 599 | 312 102 | 254 042 | 302 575 | 381 971 |

| STANDARD INDUSTRIAL CLASSIFICATION | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Manufacture of Radio, Television and Communication Equipment and Apparatus; Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 425 585 | 506 497 | 511 356 | 591 774 | 590 174 | 639 217 | 656 639 | 742 033 | 706 308 | 569 127 |
| Manufacture of Transport Equipment | 784 209 | 924 053 | 984 235 | 1 022 589 | 881 958 | 310 145 | 267 788 | 334 276 | 408 448 | 402 772 |
| Manufacture of Furniture; Recycling; Manufacturing not elsewhere classified | 5 898 | 7 449 | 60 849 | 60 743 | 57 240 | 81 914 | 93 145 | 100 261 | 117 649 | 118 102 |
| Electricity, Gas & Water Supply | 1 292 925 | 1 737 511 | 2 306 297 | 955 690 | 536 050 | 494 745 | 385 770 | 355 720 | 548 015 | 439 157 |
| Construction | 4 559 | 6 043 | 6 105 | 3 490 | 3 213 | 6 495 | 9 051 | 8 037 | 6 637 | 5 613 |
| Wholesale and Retail | 324 666 | 317 780 | 334 131 | 434 522 | 620 541 | 547 194 | 179 383 | 100 176 | 85 491 | 42 977 |
| Transport, Storage and Communication | 453 715 | 490 138 | 425 235 | 415 243 | 354 311 | 484 222 | 467 411 | 451 336 | 632 243 | 897 359 |
| Financial Intermediation, Real Estate and Business Services | 2 477 423 | 2 759 550 | 3 377 896 | 3 777 124 | 3 326 985 | 3 645 625 | 3 914 543 | 4 724 439 | 5 357 151 | 5 910 332 |
| Community, Social and Personal Services | 434 223 | 432 167 | 295 185 | 524 108 | 411 826 | 170 499 | 296 805 | 310 498 | 359 701 | 371 723 |
| **Total** | **9 243 165** | **10 738 456** | **12 332 012** | **11 139 237** | **10 059 010** | **10 464 022** | **10 570 726** | **11 782 848** | **13 290 951** | **13 814 995** |

**Table C.51: Proportional business sector R&D expenditure by Standard Industrial Classification Code (SIC) (2006/07 to 2015/16)**

| STANDARD INDUSTRIAL CLASSIFICATION | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture, Hunting, Forestry and Fishing | 2.2 | 2. | 1.8 | 1.9 | 1.6 | 2.0 | 2.7 | 3.1 | 3.5 | 3.5 |
| Mining and Quarrying | 5.6 | 5.2 | 4.7 | 4.5 | 10.5 | 12.9 | 14.7 | 14.2 | 10.1 | 8.8 |
| **Manufacturing** | **38.3** | **39.3** | **38.8** | **38.8** | **35.7** | **33.9** | **32.9** | **32.2** | **33.9** | **32.2** |
| Manufacture of Food Products, Beverages and Tobacco Products | 2.00 | 1.8 | 1.8 | 1.5 | 2.2 | 2.7 | 3.0 | 2.9 | 2.7 | 2.7 |
| Manufacture of Textiles, Clothing and Leather Goods | 0.2 | 0.2 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.3 | 0.3 | 0.1 |
| Manufacture of Wood and Products of Wood and Cork, except furniture; Manufacture of Articles of Straw and Plaiting Materials; Manufacture of Paper and Paper Products; Manufacture of Publishing, Printing and Reproduction of Recorded Material | 1.2 | 1.1 | 1.0 | 1.0 | 1.1 | 0.8 | 0.5 | 0.5 | 0.5 | 0.7 |
| Manufacture of Refined Petroleum, Coke and Nuclear Fuel; Manufacture of Chemicals and Chemical Products (incl. Pharmaceuticals); Manufacture of Rubber and Plastic Products | 14.1 | 14.7 | 18.4 | 15.8 | 11.9 | 13.2 | 10.8 | 10.7 | 13.8 | 13.0 |
| Manufacture of Non-Metallic Mineral Products | 1.4 | 1.7 | 1.1 | 1.1 | 0.9 | 0.7 | 0.5 | 0.4 | 0.4 | 0.2 |
| Manufacture of Basic Metals, Fabricated Metal Products, Machinery & Equipment; Manufacture of Office, Accounting and Computing Machinery | 4.2 | 4.7 | 2.6 | 3.0 | 2.4 | 3.8 | 5.5 | 5.3 | 4.6 | 4.8 |

| STANDARD INDUSTRIAL CLASSIFICATION | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Manufacture of Electrical Machinery and Apparatus | 2.1 | 1.7 | 1.4 | 1.3 | 2.1 | 3.0 | 3.0 | 2.2 | 2.3 | 2.8 |
| Manufacture of Radio, Television and Communication Equipment and Apparatus; Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 4.6 | 4.7 | 4.1 | 5.3 | 5.9 | 6.1 | 6.2 | 6.3 | 5.3 | 4.1 |
| Manufacture of Transport Equipment | 8.5 | 8.6 | 8.0 | 9.2 | 8.8 | 3.0 | 2.5 | 2.8 | 3.1 | 2.9 |
| Manufacture of Furniture; Recycling; Manufacturing not elsewhere classified | 0.1 | 0.1 | 0.5 | 0.5 | 0.6 | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 |
| Electricity, Gas & Water Supply | 14 | 16.2 | 18.7 | 8.6 | 5.3 | 4.7 | 3.6 | 3.0 | 4.1 | 3.2 |
| Construction | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 |
| Wholesale and Retail | 3.5 | 3.0 | 2.7 | 3.9 | 6.2 | 5.2 | 1.7 | 0.9 | 0.6 | 0.3 |
| Transport, Storage and Communication | 4.9 | 4.6 | 3.4 | 3.7 | 3.5 | 4.6 | 4.4 | 3.8 | 4.8 | 6.5 |
| Financial Intermediation, Real Estate and Business Services | 26.8 | 25.7 | 27.4 | 33.9 | 33.1 | 34.8 | 37 | 40.1 | 40.3 | 42.8 |
| Community, Social and Personal Services | 4.7 | 4.0 | 2.4 | 4.7 | 4.1 | 1.6 | 2.8 | 2.6 | 2.7 | 2.7 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.52: Business sector R&D personnel in headcounts and full-time equivalents by occupation (2006/07 to 2015/16)**

| YEAR | HEADCOUNTS | | | | FULL-TIME EQUIVALENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL |
| 2006/07 | 17 467 | 8 227 | 5 113 | 4 127 | 12 595.3 | 6 110.9 | 3 735.0 | 2 749.4 |
| 2007/08 | 17 951 | 8 336 | 5 303 | 4 312 | 12 461.3 | 6 047.5 | 3 796.4 | 2 617.4 |
| 2008/09 | 18 595 | 8 560 | 5 584 | 4 451 | 12 492.5 | 6 172.0 | 3 809.9 | 2 510.6 |
| 2009/10 | 18 216 | 8 366 | 5 362 | 4 488 | 12 024.6 | 6 059.5 | 3 612.6 | 2 352.6 |
| 2010/11 | 14 933 | 6 372 | 4 630 | 3 931 | 10 205.1 | 4 804.0 | 3 318.7 | 2 082.3 |
| 2011/12 | 15 288 | 6 192 | 5 095 | 4 001 | 9 894.9 | 4 451.9 | 3 343.5 | 2 099.5 |
| 2012/13 | 17 155 | 6 191 | 6 394 | 4 570 | 11 322.3 | 4 555.9 | 4 065.5 | 2 700.9 |
| 2013/14 | 17 599 | 6 182 | 6 397 | 5 020 | 11 877.4 | 4 530.1 | 4 253.1 | 3 094.2 |
| 2014/15 | 18 743 | 6 261 | 6 912 | 5 570 | 12 927.5 | 4 636.2 | 4 494.4 | 3 796.9 |
| 2015/16 | 17 245 | 6 128 | 6 090 | 5 027 | 12 457.8 | 4 626.8 | 4 227.4 | 3 603.6 |

**Table C.53: Business sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2013/14, 2014/15 and 2015/16)**

| OCCUPATION | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | | | |
|---|---|---|---|---|---|---|---|
| **2013/14** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 6 182 | 3 895 | 2 287 | 4 530 | 2 749 | 1 781 | 73.3 |
| Technicians directly supporting R&D | 6 397 | 4 418 | 1 979 | 4 253 | 2 876 | 1 377 | 66.5 |
| Other personnel directly supporting R&D | 5 020 | 2 879 | 2 141 | 3 094 | 1 817 | 1 277 | 61.6 |
| **Total** | **17 599** | **11 192** | **6 407** | **11 877** | **7 443** | **4 435** | **67.5** |
| **2014/15** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 6 261 | 3 945 | 2 316 | 4 636 | 2 799 | 1 837 | 74.0 |
| Technicians directly supporting R&D | 6 912 | 4 816 | 2 096 | 4 494 | 3 088 | 1 406 | 65.0 |
| Other personnel directly supporting R&D | 5 570 | 3 328 | 2 242 | 3 797 | 2 352 | 1 444 | 68.2 |
| **Total** | **18 743** | **12 089** | **6 654** | **12 928** | **8 240** | **4 688** | **69.0** |
| **2015/16** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 6 128 | 3 945 | 2 183 | 4 626.8 | 2 835.0 | 1 791.8 | 75.5 |
| Technicians directly supporting R&D | 6 090 | 4 314 | 1 776 | 4 227.4 | 2 928.0 | 1 299.4 | 69.4 |
| Other personnel directly supporting R&D | 5 027 | 3 148 | 1 879 | 3 603.6 | 2 194.1 | 1 409.5 | 71.7 |
| **Total** | **17 245** | **11 407** | **5 838** | **12 457.8** | **7 957.1** | **4 500.7** | **72.2** |

**Table C.54: Business sector R&D personnel in headcounts by occupation, qualification, population group and gender (2015/16)**

| OCCUPATION AND QUALIFICATION | TOTAL | SUBTOTAL | | AFRICAN | | COLOURED | | INDIAN | | WHITE | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE |
| **Researchers** | **6 128** | **3 945** | **2 183** | **676** | **567** | **166** | **144** | **390** | **239** | **2 713** | **1 234** |
| Doctoral degree or equivalent | 618 | 444 | 174 | 91 | 24 | 16 | 17 | 26 | 20 | 311 | 113 |
| Masters, honours, bachelor or equivalent | 4 323 | 2 780 | 1 543 | 439 | 377 | 110 | 78 | 307 | 174 | 1 924 | 914 |
| Diplomas | 1 187 | 721 | 465 | 146 | 166 | 41 | 49 | 57 | 44 | 477 | 206 |
| **Technicians directly supporting R&D** | **6 090** | **4 314** | **1 776** | **1 104** | **706** | **327** | **148** | **564** | **209** | **2 319** | **713** |
| Doctoral degree or equivalent | 30 | 20 | 10 | 3 | 1 | 0 | 1 | 1 | 0 | 16 | 7 |
| Masters, honours, bachelor or equivalent | 2 152 | 1 416 | 736 | 314 | 264 | 79 | 51 | 205 | 117 | 817 | 305 |
| Diplomas | 3 908 | 2 878 | 1 030 | 787 | 441 | 247 | 96 | 358 | 92 | 1 485 | 402 |
| **Other personnel directly supporting R&D** | **5 027** | **3 148** | **1 879** | **1 069** | **613** | **220** | **174** | **695** | **280** | **1 164** | **812** |
| Doctoral degree or equivalent | 77 | 54 | 23 | 17 | 7 | 0 | 0 | 3 | 4 | 35 | 12 |
| Masters, honours, bachelor or equivalent | 1 518 | 879 | 639 | 200 | 148 | 54 | 27 | 93 | 71 | 532 | 393 |
| Diplomas | 3 433 | 2 215 | 1 218 | 852 | 459 | 166 | 148 | 600 | 205 | 597 | 406 |
| **Total** | **17 245** | **11 407** | **5 838** | **2 849** | **1 886** | **713** | **466** | **1 650** | **728** | **6 196** | **2 758** |

**Table C.55: Number of foreign and local business sector partners engaged in collaborative R&D, and total R&D collaboration expenditure (2013/14, 2014/15 and 2015/16)**

| COLLABORATION PARTNERS | 2013/14 | | 2014/15 | | 2015/16 | |
|---|---|---|---|---|---|---|
| | WITHIN SOUTH AFRICA | OUTSIDE SOUTH AFRICA | WITHIN SOUTH AFRICA | OUTSIDE SOUTH AFRICA | WITHIN SOUTH AFRICA | OUTSIDE SOUTH AFRICA |
| Government research institutes | 22 | 8 | 14 | 10 | 17 | 8 |
| Higher education institutions | 69 | 16 | 66 | 19 | 64 | 18 |
| Members of own company | 28 | 11 | 25 | 8 | 25 | 14 |
| Not-for-profit organisations | 6 | 0 | 6 | 3 | 7 | 1 |
| Other companies | 48 | 26 | 56 | 30 | 66 | 32 |
| Science councils | 43 | 6 | 44 | 9 | 41 | 10 |
| Total number of R&D collaborations | 216 | 67 | 211 | 79 | 220 | 83 |
| No collaboration | N/A | N/A | 20 | 21 | 8 | 11 |
| **R&D EXPENDITURE*** | **R'000** | **R'000** | **R'000** | **R'000** | **R'000** | **R'000** |
| Total in-house plus outsourced R&D collaboration expenditure (excl. VAT) | 3 445 916 | 670 854 | 2 653 929 | 1 357 157 | 2 193 307 | 306 449 |

*R&D Expenditure includes both internal and outsourced R&D.

Note: Collaborative R&D entails partnerships, alliances and collaborations.

## *Business sector: State-owned enterprises*

The list of SOEs was revised in the 2015/16 reference year. Estimates have been revised based on this expanded list. The list of SOEs will be updated in future as the need arises.

**Table C.56: Business sector: SOEs - Number, R&D expenditure, and R&D expenditure as a proportion of BERD (2006/07 to 2015/16)**

| YEAR | NUMBER OF R&D PERFORMERS | R&D EXPENDITURE | PROPORTION OF BERD |
|---|---|---|---|
| | | R'000 | % |
| 2006/07 | 19 | 2 195 052 | 23.7 |
| 2007/08 | 19 | 2 765 729 | 25.8 |
| 2008/09 | 21 | 3 438 543 | 27.9 |
| 2009/10 | 21 | 2 158 238 | 19.4 |
| 2010/11 | 19 | 1 685 520 | 16.8 |
| 2011/12 | 18 | 1 318 492 | 12.6 |
| 2012/13 | 19 | 1 512 021 | 14.3 |
| 2013/14 | 19 | 1 609 771 | 13.7 |
| 2014/15 | 19 | 2 019 919 | 15.2 |
| 2015/16 | 18 | 1 973 416 | 14.3 |

* The average number of state-owned enterprises active within a reference period in the survey from 2006/07 to 2015/16 was 19.

**Table C.57: Business sector: SOEs - R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| Basic research | 166 643 | 206 464 | 260 468 | 131 212 | 68 838 | 55 107 | 59 187 | 263 523 | 65 489 | 65 556 |
| Applied research | 677 998 | 913 054 | 1 130 064 | 866 097 | 835 262 | 832 505 | 805 106 | 641 358 | 1 216 953 | 860 904 |
| Experimental research | 1 350 411 | 1 646 211 | 2 048 011 | 1 160 929 | 781 421 | 430 880 | 647 728 | 704 890 | 737 477 | 1 046 956 |
| **Total** | **2 195 052** | **2 765 729** | **3 438 543** | **2 158 238** | **1 685 520** | **1 318 492** | **1 512 021** | **1 609 771** | **2 019 919** | **1 973 416** |

### Table C.58: Business sector: SOEs - Proportional R&D expenditure by type of research (2006/07 to 2015/16)

| TYPE OF RESEARCH | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic research | 7.6 | 7.5 | 7.6 | 6.1 | 4.1 | 4.2 | 3.9 | 16.4 | 3.2 | 3.3 |
| Applied research | 30.9 | 33.0 | 32.9 | 40.1 | 49.6 | 63.1 | 53.2 | 39.8 | 60.2 | 43.6 |
| Experimental research | 61.5 | 59.5 | 59.6 | 53.8 | 46.4 | 32.7 | 42.8 | 43.8 | 36.5 | 53.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

### Table C.59: Business sector: SOEs - R&D expenditure by accounting category (2006/07 to 2015/16)

| TYPE OF EXPENDITURE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 137 020 | 480 108 | 1 422 478 | 401 776 | 408 927 | 333 325 | 179 959 | 245 077 | 355 725 | 122 272 |
| Land: buildings & other structures | 12 318 | 107 001 | 37 655 | 60 525 | 47 672 | 14 032 | 11 195 | 12 920 | 16 307 | 31 884 |
| Vehicles, plant, machinery, equipment | 124 702 | 373 107 | 1 384 823 | 341 251 | 361 255 | 319 293 | 168 764 | 232 157 | 339 418 | 90 388 |
| Current expenditure | 2 058 035 | 2 285 621 | 2 016 066 | 1 756 460 | 1 276 593 | 985 167 | 1 332 062 | 1 364 694 | 1 664 194 | 1 851 145 |
| Labour costs | 1 083 291 | 1 147 839 | 1 262 273 | 1 033 378 | 692 407 | 658 509 | 795 414 | 849 371 | 922 321 | 976 713 |
| Other current expenditure | 974 744 | 1 137 782 | 753 793 | 723 082 | 584 186 | 326 658 | 536 648 | 515 323 | 741 873 | 874 432 |
| Total | 2 195 055 | 2 765 729 | 3 438 544 | 2 158 236 | 1 685 520 | 1 318 492 | 1 512 021 | 1 609 771 | 2 019 919 | 1 973 417 |

### Table C.60: Business sector: SOEs – Proportional R&D expenditure by accounting category (2006/07 to 2015/16)

| TYPE OF EXPENDITURE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 6.2 | 17.4 | 41.4 | 18.6 | 24.3 | 25.3 | 11.9 | 15.2 | 17.6 | 6.2 |
| Land: buildings & other structures | 0.6 | 3.9 | 1.1 | 2.8 | 2.8 | 1.1 | 0.7 | 0.8 | 0.8 | 1.6 |
| Vehicles, plant, machinery, equipment | 5.7 | 13.5 | 40.3 | 15.8 | 21.4 | 24.2 | 11.2 | 14.4 | 16.8 | 4.6 |
| Current expenditure | 93.8 | 82.6 | 58.6 | 81.4 | 75.7 | 74.7 | 88.1 | 84.8 | 82.4 | 93.8 |
| Labour costs | 49.4 | 41.5 | 36.7 | 47.9 | 41.1 | 49.9 | 52.6 | 52.8 | 45.7 | 49.5 |
| Other current expenditure | 44.4 | 41.1 | 21.9 | 33.5 | 34.7 | 24.8 | 35.5 | 32.0 | 36.7 | 44.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

### Table C.61: Business sector: SOEs - Expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 7 853 | 11 729 | 11 236 | 6 834 | 15 100 | 14 615 | 23 479 | 21 845 | 16 591 | 12 278 |
| Nanotechnology | 5 565 | 1 993 | 1 045 | 2 553 | 2 995 | 7 103 | 3 768 | 654.135 | 699.57945 | 144 |
| **Total** | **13 417** | **13 722** | **12 281** | **9 386** | **18 095** | **21 717** | **27 247** | **22 499** | **17 290** | **12 422** |
| Business expenditure on R&D | 2 195 052 | 2 765 729 | 3 438 543 | 2 158 238 | 1 685 520 | 1 318 492 | 1 512 021 | 1 609 771 | 2 019 919 | 1 973 416 |

### Table C.62: Business sector: SOEs - Proportional expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 0.4 | 0.4 | 0.3 | 0.3 | 0.9 | 1.1 | 1.6 | 1.4 | 0.8 | 0.6 |
| Nanotechnology | 0.3 | 0.1 | 0.0 | 0.1 | 0.2 | 0.5 | 0.2 | 0.0 | 0.0 | 0.0 |
| **Total** | **0.6** | **0.5** | **0.4** | **0.4** | **1.1** | **1.6** | **1.8** | **1.4** | **0.9** | **0.6** |

### Table C.63: Business sector: SOEs - R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF INTEREST | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 10 029 | 15 284 | 22 448 | 51 522 | 30 864 |
| Open source software | 3 104 | 2 566 | 3 190 | 5 597 | 9 087 | 8 736 | 7 599 | 4 124 | 0 | 50 589 |
| New materials | 4 835 | 2 919 | 6 673 | 17 054 | 14 598 | 14 872 | 12 082 | 12 233 | 11 111 | 64 021 |
| Tuberculosis (TB), HIV/AIDS, malaria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **7 939** | **5 484** | **9 863** | **22 652** | **23 684** | **33 636** | **34 965** | **38 806** | **62 633** | **145 474** |
| Business expenditure on R&D | 2 195 052 | 2 765 729 | 3 438 543 | 2 158 238 | 1 685 520 | 1 318 492 | 1 512 021 | 1 609 771 | 2 019 919 | 1 973 416 |

N/A: Environment related data was collected from the 2011/12 R&D survey onward.

### Table C.64: Business sector: SOEs - Proportional R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF INTEREST | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 0.8 | 1.0 | 1.4 | 2.6 | 1.6 |
| Open source software | 0.1 | 0.1 | 0.1 | 0.3 | 0.5 | 0.7 | 0.5 | 0.3 | 0.0 | 2.6 |
| New materials | 0.2 | 0.1 | 0.2 | 0.8 | 0.9 | 1.1 | 0.8 | 0.8 | 0.6 | 3.2 |
| Tuberculosis (TB), HIV/AIDS, malaria | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **0.4** | **0.2** | **0.3** | **1.0** | **1.4** | **2.6** | **2.3** | **2.4** | **3.1** | **7.4** |

N/A: Environment related data was collected from the 2011/12 R&D survey onward.

**Table C.65: Business sector: SOEs - R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **2 184 790** | **2 753 974** | **3 426 021** | **2 145 037** | **1 670 869** | **1 318 492** | **1 512 021** | **1 609 771** | **1 963 779** | **1 963 821** |
| Mathematical sciences | 25 561 | 29 281 | 31 148 | 34 896 | 38 311 | 142 930 | 86 576 | 93 820 | 137 076 | 87 387 |
| Physical sciences | 375 678 | 499 480 | 649 338 | 174 483 | 21 123 | 14 992 | 40 742 | 44 460 | 46 559 | 32 100 |
| Chemical sciences | 63 739 | 71 947 | 58 062 | 57 109 | 66 503 | 80 556 | 133 867 | 132 399 | 86 408 | 64 230 |
| Earth sciences | 19 500 | 22 338 | 28 149 | 25 151 | 27 912 | 0 | 44 006 | 48 671 | 24 356 | 12 254 |
| Information, computer and communication technologies | 55 969 | 62 425 | 98 303 | 88 484 | 64 163 | 126 456 | 155 601 | 168 174 | 304 806 | 541 009 |
| Applied sciences and technologies | 920 326 | 899 041 | 1 033 245 | 616 089 | 493 368 | 151 475 | 176 600 | 176 391 | 165 214 | 133 687 |
| Engineering sciences | 672 753 | 1 112 617 | 1 473 247 | 1 091 019 | 926 729 | 769 357 | 781 073 | 824 057 | 1 034 900 | 981 683 |
| Biological sciences | 2 484 | 4 020 | 2 889 | 2 727 | 0 | 0 | 13 496 | 30 701 | 29 183 | 33 874 |
| Agricultural sciences | 3 526 | 3 194 | 863.1 | 718.8 | 6 816 | 8 137 | 5 343 | 11 711 | 12 507 | 12 665 |
| Medical and health sciences | 3 526 | 0 | 0 | 0 | 15 614 | 17 491 | 18 012 | 18 316 | 49 357 | 36 548 |
| Environmental sciences | 33 019 | 37 822 | 39 093 | 41 092 | 3 052 | 0 | 42 440 | 45 772 | 59 270 | 16 310 |
| Material sciences | 4 591 | 7 092 | 6 967 | 8 296 | 7 279 | 7 780 | 8 605 | 9 198 | 9 849 | 12 073 |
| Marine sciences | 4 118 | 4 716 | 4 716 | 4 972 | 0 | 0 | 5659 | 6103 | 4294 | 0 |
| **Division 2: Social Sciences and Humanities** | **10 262** | **11 755** | **12 522** | **13 201** | **14 651** | **0** | **0** | **0** | **56 140** | **9 595** |
| Social sciences | 10 262 | 11 755 | 12 522 | 13 201 | 14 651 | 0 | 0 | 0 | 56 140 | 9 595 |
| Humanities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **2 195 052** | **2 765 729** | **3 438 543** | **2 158 238** | **1 685 520** | **1 318 492** | **1 512 021** | **1 609 771** | **2 019 919** | **1 973 416** |

**Table C.66: Business sector: SOEs - Proportional R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **99.5** | **99.6** | **99.6** | **99.4** | **99.1** | **100.0** | **100.0** | **100.0** | **97.2** | **99.5** |
| Mathematical sciences | 1.2 | 1.1 | 0.9 | 1.6 | 2.3 | 10.8 | 5.7 | 5.8 | 6.8 | 4.4 |
| Physical sciences | 17.1 | 18.1 | 18.9 | 8.1 | 1.3 | 1.1 | 2.7 | 2.8 | 2.3 | 1.6 |
| Chemical sciences | 2.9 | 2.6 | 1.7 | 2.6 | 3.9 | 6.1 | 8.9 | 8.2 | 4.3 | 3.3 |
| Earth sciences | 0.9 | 0.8 | 0.8 | 1.2 | 1.7 | 0.0 | 2.9 | 3.0 | 1.2 | 0.6 |

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Information, computer and communication technologies | 2.5 | 2.3 | 2.9 | 4.1 | 3.8 | 9.6 | 10.3 | 10.4 | 15.1 | 27.4 |
| Applied sciences and technologies | 41.9 | 32.5 | 30.0 | 28.5 | 29.3 | 11.5 | 11.7 | 11.0 | 8.2 | 6.8 |
| Engineering sciences | 30.6 | 40.2 | 42.8 | 50.6 | 55.0 | 58.4 | 51.7 | 51.2 | 51.2 | 49.7 |
| Biological sciences | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.9 | 1.9 | 1.4 | 1.7 |
| Agricultural sciences | 0.2 | 0.1 | 0.0 | 0.0 | 0.4 | 0.6 | 0.4 | 0.7 | 0.6 | 0.6 |
| Medical and health sciences | 0.2 | 0.0 | 0.0 | 0.0 | 0.9 | 1.3 | 1.2 | 1.1 | 2.4 | 1.9 |
| Environmental sciences | 1.5 | 1.4 | 1.1 | 1.9 | 0.2 | 0.0 | 2.8 | 2.8 | 2.9 | 0.8 |
| Material sciences | 0.2 | 0.3 | 0.2 | 0.4 | 0.4 | 0.6 | 0.6 | 0.6 | 0.5 | 0.6 |
| Marine sciences | 0.2 | 0.2 | 0.1 | 0.2 | 0.0 | 0.0 | 0.4 | 0.4 | 0.2 | 0.0 |
| **Division 2: Social Sciences and Humanities** | **0.5** | **0.4** | **0.4** | **0.6** | **0.9** | **0.0** | **0.0** | **0.0** | **2.8** | **0.5** |
| Social sciences | 0.5 | 0.4 | 0.4 | 0.6 | 0.9 | 0.0 | 0.0 | 0.0 | 2.8 | 0.5 |
| Humanities | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.67: Business sector: SOEs - R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **560 704** | **642 320** | **730 541** | **696 861** | **718 698** | **356 627** | **485 487** | **512 440** | **563 927** | **399 183** |
| Defence | 560 704 | 642 320 | 730 541 | 696 861 | 718 698 | 356 627 | 485 487 | 512 440 | 563 927 | 399 183 |
| **Division 2: Economic Development** | **1 576 946** | **1 983 888** | **2 535 114** | **1 271 859** | **765 929** | **770 791** | **831 597** | **887 024** | **1187718.471** | **1360119.532** |
| Economic Development unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plant production and plant primary products | 0 | 0 | 0 | 0 | 0 | 0 | 9030 | 9380 | 10075.639 | 10203.2 |
| Animal production and animal primary products | 8 814 | 6 388 | 2 877 | 2 396 | 1 704 | 4 069 | 0 | 0 | 0 | 0 |
| Mineral resources (excluding Energy) | 2 334 | 2 674 | 0 | 0 | 5 576 | 6 247 | 6 433 | 6 541 | 6 996 | 7 743 |
| Energy resources | 374 502 | 505 453 | 650 325 | 185 159 | 20 372 | 22 488 | 23 158 | 23 549 | 25 185 | 27 874 |
| Energy supply | 203 000 | 213 649 | 334 360 | 355 509 | 405 120 | 367 866 | 249 963 | 253 757 | 419 084 | 316 868 |
| Manufacturing | 36 108 | 22 089 | 21 896 | 43 790 | 26 828 | 57 794 | 77 574 | 105 372 | 178 376 | 103 757 |
| Construction | 743 252 | 997 680 | 1 272 653 | 342 212 | 603 | 26 433 | 70 899 | 99 484 | 81 944 | 0 |
| Transport | 143 562 | 164 445 | 180 028 | 266 227 | 250 553 | 60 839 | 125 965 | 122 633 | 126 069 | 253 742 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Information and communication services | 44 654 | 47 776 | 44 360 | 46 766 | 35 131 | 179 318 | 193 815 | 191 811 | 270 175 | 609 251 |
| Commercial services | 12 485 | 14 301 | 19 183 | 19 856 | 19 290 | 1 504 | 9 893 | 10 644 | 11 434 | 16 235 |
| Economic framework | 8 235 | 9 433 | 9 433 | 9 944 | 0 | 17 049 | 36 408 | 40 833 | 37 065 | 14 447 |
| Natural resources | 0 | | 0 | 0 | 751.8 | 27 185 | 28 459 | 23 019 | 21 316 | 0 |
| **Division 3: Society** | **9 603** | **37 707** | **50 665** | **55 826** | **61 017** | **57 479** | **46 872** | **59 171** | **67371.1975** | **54783.8642** |
| Society unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Health | 0 | 13 353 | 20 898 | 24 288 | 25 320 | 22 992 | 19 743 | 29 360 | 26 193 | 19 804 |
| Education and training | 2 138 | 2 449 | 2 609 | 2 750 | 3 052 | 11 496 | 10 862 | 13 281 | 14 266 | 14 447 |
| Social development and community services | 7 465 | 21 905 | 27 159 | 28 788 | 32 645 | 22 992 | 16 268 | 16 530 | 26 912 | 20 533 |
| **Division 4: Environment** | **1 497** | **28 420** | **43 621** | **46 300** | **55 984** | **47 487** | **31 245** | **31 720** | **68425.459** | **56760.157** |
| Environment unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Environmental knowledge | 0 | 13 353 | 20 898 | 22 188 | 25 696 | 23 368 | 15 623 | 15 860 | 26 193 | 33 494 |
| Environmental aspects of development | 1 497 | 1 714 | 1 826 | 1 925 | 3 841 | 0 | 0 | 0 | 16 040 | 2 741 |
| Environmental and other aspects | 0 | 13 353 | 20 898 | 22 188 | 26 448 | 24 119 | 15 623 | 15 860 | 26 193 | 20 525 |
| **Division 5: Advancement of Knowledge** | **46 302** | **73 394** | **78 602** | **87 391** | **83 891** | **86 108** | **116 819** | **119 417** | **132476.301** | **102570.014** |
| Advancement of Knowledge unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Natural sciences, technologies and engineering | 42 454 | 68 986 | 73 906 | 82 441 | 75 716 | 83 349 | 113 836 | 116 668 | 129 393 | 99 448 |
| Social sciences and humanities | 3 848 | 4 408 | 4 696 | 4 951 | 8 176 | 2 758 | 2 983 | 2 750 | 3 083 | 3 122 |
| **Total** | **2 195 052** | **2 765 729** | **3 438 543** | **2 158 238** | **1 685 520** | **1 318 492** | **1 512 021** | **1 609 771** | **2 019 919** | **1 973 416** |

**Table C.68: Business sector: SOEs - Proportional R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **25.5** | **49.1** | **21.2** | **32.3** | **42.6** | **27.0** | **32.1** | **31.8** | **27.9** | **20.2** |
| Defence | 25.5 | 49.1 | 21.2 | 32.3 | 42.6 | 27.0 | 32.1 | 31.8 | 27.9 | 20.2 |
| **Division 2: Economic Development** | **71.8** | **40.2** | **73.7** | **58.9** | **45.4** | **58.5** | **55.0** | **55.1** | **58.8** | **68.9** |
| Economic Development unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plant production and plant primary products | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 0.5 | 0.5 |
| Animal production and animal primary products | 0.4 | 0.5 | 0.1 | 0.1 | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mineral resources (excluding Energy) | 0.1 | 0.2 | 0.0 | 0.0 | 0.3 | 0.5 | 0.4 | 0.4 | 0.3 | 0.4 |
| Energy resources | 17.1 | 0.7 | 18.9 | 8.6 | 1.2 | 1.7 | 1.5 | 1.5 | 1.2 | 1.4 |
| Energy supply | 9.2 | 16.3 | 9.7 | 16.5 | 24.0 | 27.9 | 16.5 | 15.8 | 20.7 | 16.1 |
| Manufacturing | 1.6 | 1.7 | 0.6 | 2.0 | 1.6 | 4.4 | 5.1 | 6.5 | 8.8 | 5.3 |
| Construction | 33.9 | 2.7 | 37.0 | 15.9 | 0.0 | 2.0 | 4.7 | 6.2 | 4.1 | 0.0 |
| Transport | 6.5 | 12.6 | 5.2 | 12.3 | 14.9 | 4.6 | 8.3 | 7.6 | 6.2 | 12.9 |
| Information and communication services | 2.0 | 3.7 | 1.3 | 2.2 | 2.1 | 13.6 | 12.8 | 11.9 | 13.4 | 30.9 |
| Commercial services | 0.6 | 1.1 | 0.6 | 0.9 | 1.1 | 0.1 | 0.7 | 0.7 | 0.6 | 0.8 |
| Economic framework | 0.4 | 0.7 | 0.3 | 0.5 | 0.0 | 1.3 | 2.4 | 2.5 | 1.8 | 0.7 |
| Natural resources | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 | 1.9 | 1.4 | 1.1 | 0.0 |
| **Division 3: Society** | **0.4** | **2.9** | **1.5** | **2.6** | **3.6** | **4.4** | **3.1** | **3.7** | **3.3** | **2.8** |
| Society unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health | 0.0 | 1.0 | 0.6 | 1.1 | 1.5 | 1.7 | 1.3 | 1.8 | 1.3 | 1.0 |
| Education and training | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.9 | 0.7 | 0.8 | 0.7 | 0.7 |
| Social development and community services | 0.3 | 1.7 | 0.8 | 1.3 | 1.9 | 1.7 | 1.1 | 1.0 | 1.3 | 1.0 |
| **Division 4: Environment** | **0.1** | **2.2** | **1.3** | **2.1** | **3.3** | **3.6** | **2.1** | **2.0** | **3.4** | **2.9** |
| Environment unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Environmental knowledge | 0.0 | 1.0 | 0.6 | 1.0 | 1.5 | 1.8 | 1.0 | 1.0 | 1.3 | 1.7 |
| Environmental aspects of development | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.8 | 0.1 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Environmental and other aspects | 0.0 | 1.0 | 0.6 | 1.0 | 1.6 | 1.8 | 1.0 | 1.0 | 1.3 | 1.0 |
| **Division 5: Advancement of Knowledge** | **2.1** | **5.6** | **2.3** | **4.0** | **5.0** | **6.5** | **7.7** | **7.4** | **6.6** | **5.2** |
| Advancement of Knowledge unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural sciences, technologies and engineering | 1.9 | 5.3 | 2.1 | 3.8 | 4.5 | 6.3 | 7.5 | 7.2 | 6.4 | 5.0 |
| Social sciences and humanities | 0.2 | 0.3 | 0.1 | 0.2 | 0.5 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.69: Business sector: SOEs - R&D expenditure by province (2006/07 to 2015/16)**

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| Eastern Cape | 8 235 | 12 103 | 16 648 | 17 582 | 12 562 | 21 897 | 33 436 | 38 634 | 37 244 | 10 854 |
| Free State | 7 956 | 9 242 | 3 938 | 17 432 | 24 865 | 31 842 | 28 367 | 26 428 | 25 193 | 10 854 |
| Gauteng | 1 931 375 | 2 439 748 | 3 015 137 | 1 603 650 | 1 169 019 | 915 824 | 1 014 194 | 1 012 556 | 1 448 092 | 1 558 538 |
| KwaZulu-Natal | 12 689 | 27 888 | 45 057 | 66 955 | 54 716 | 61 139 | 66 477 | 91 406 | 45 588 | 86 565 |
| Limpopo | 0 | 127.76 | 0 | 0 | 7 157 | 15 917 | 19 724 | 19 596 | 18 612 | 3 019 |
| Mpumalanga | 0 | 0 | 0 | 0 | 7 157 | 15 917 | 27 038 | 28 976 | 33 927 | 13 222 |
| North-West | 79 895 | 93 832 | 109 981 | 138 305 | 118 682 | 140 853 | 151 514 | 160 739 | 289 990 | 170 118 |
| Northern Cape | 0 | 0 | 0 | 0 | 7 157 | 17 446 | 18 630 | 52 104 | 17 998 | 2 397 |
| Western Cape | 154 902 | 182 788 | 247 782 | 314 314 | 284 206 | 97 655 | 152 641 | 179 332 | 103 275 | 117 850 |
| **Total** | **2 195 052** | **2 765 729** | **3 438 543** | **2 158 238** | **1 685 520** | **1 318 492** | **1 512 021** | **1 609 771** | **2 019 919** | **1 973 416** |

**Table C.70: Business sector: SOEs - Proportional R&D expenditure by province (2006/07 to 2015/16)**

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Eastern Cape | 0.4 | 0.4 | 0.5 | 0.8 | 0.7 | 1.7 | 2.2 | 2.4 | 1.8 | 0.5 |
| Free State | 0.4 | 0.3 | 0.1 | 0.8 | 1.5 | 2.4 | 1.9 | 1.6 | 1.2 | 0.5 |
| Gauteng | 88.0 | 88.2 | 87.7 | 74.3 | 69.4 | 69.5 | 67.1 | 62.9 | 71.7 | 79.0 |
| KwaZulu-Natal | 0.6 | 1.0 | 1.3 | 3.1 | 3.2 | 4.6 | 4.4 | 5.7 | 2.3 | 4.4 |
| Limpopo | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.2 | 1.3 | 1.2 | 0.9 | 0.2 |
| Mpumalanga | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.2 | 1.8 | 1.8 | 1.7 | 0.7 |
| North-West | 3.6 | 3.4 | 3.2 | 6.4 | 7.0 | 10.7 | 10.0 | 10.0 | 14.4 | 8.6 |
| Northern Cape | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.3 | 1.2 | 3.2 | 0.9 | 0.1 |
| Western Cape | 7.1 | 6.6 | 7.2 | 14.6 | 16.9 | 7.4 | 10.1 | 11.1 | 5.1 | 6.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.71: Business sector: SOEs - R&D expenditure by Standard Industrial Classification code (2006/07 to 2015/16)**

| STANDARD INDUSTRIAL CLASSIFICATION | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture, Hunting, Forestry and Fishing | 0 | 1 278 | 575 | 479 | 0 | 0 | 12 592 | 17 187 | 18 413 | 18 646 |
| Mining and Quarrying | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Manufacturing** | **442 852** | **493 453** | **552 419** | **547 593** | **530 635** | **248 309** | **444 185** | **475 294** | **480 601** | **370 407** |
| Manufacture of Food Products, Beverages and Tobacco Products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Manufacture of Textiles, Clothing and Leather Goods | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Manufacture of Wood and Products of Wood and Cork, except furniture; Manufacture of Articles of Straw and Plaiting Materials; Manufacture of Paper and Paper Products; Manufacture of Publishing, Printing and Reproduction of Recorded Material | 0 | 0 | 0 | 0 | 0 | 0 | 1 290 | 1 340 | 1 439 | 1 458 |
| Manufacture of Refined Petroleum, Coke and Nuclear Fuel; Manufacture of Chemicals and Chemical Products (incl. Pharmaceuticals); Manufacture of Rubber and Plastic Products | 57 344 | 57 797 | 74 080 | 99 411 | 61 654 | 58 362 | 69 607 | 72 216 | 77 350 | 8 616 |
| Manufacture of Non-Metallic Mineral Products | 7 523 | 2 651 | 0 | 0 | 6 692 | 7 496 | 7 719 | 7 850 | 8 395 | 0 |
| Manufacture of Basic Metals, Fabricated Metal Products, Machinery & Equipment; Manufacture of Office, Accounting and Computing Machinery | 28 011 | 32 089 | 20 798 | 21 252 | 0 | 84 285 | 224 661 | 272 253 | 293 575 | 297 289 |
| Manufacture of Electrical Machinery and Apparatus | 45 200 | 51 780 | 54 943 | 0 | 0 | 88 159 | 76 590 | 63 824 | 52 760 | 20 430 |
| Manufacture of Radio, Television and Communication Equipment and Apparatus; Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Manufacture of Transport Equipment | 304 774 | 349 136 | 402 599 | 426 930 | 462 290 | 10 007 | 64 318 | 57 812 | 47 081 | 42 614 |
| Manufacture of Furniture; Recycling; Manufacturing not elsewhere classified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electricity, Gas & Water Supply | 1 291 610 | 1 735 709 | 2 303 869 | 936 310 | 521 665 | 463 592 | 325 822 | 340 670 | 534 569 | 424 561 |
| Construction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wholesale and Retail | 2 138 | 2 449 | 2 609 | 2 750 | 3 052 | 0 | 0 | 0 | 0 | 0 |
| Transport, Storage and Communication | 193 367 | 218 121 | 176 362 | 179 602 | 164 337 | 304 346 | 371 495 | 397 326 | 565 363 | 826 532 |
| Financial Intermediation, Real Estate and Business Services | 111 098 | 138 320 | 222 490 | 259 855 | 204 455 | 302 245 | 137 898 | 158 060 | 150 347 | 196 661 |
| Community, Social and Personal Services | 153 987 | 176 401 | 180 218 | 231 648 | 261 375 | 0 | 220 029 | 221 233 | 270 626 | 136 609 |
| **Total** | **2 195 052** | **2 765 729** | **3 438 543** | **2 158 238** | **1 685 520** | **1 318 492** | **1 512 021** | **1 609 771** | **2 019 919** | **1 973 416** |



**Table C.72: Business sector: SOEs - Proportional R&D expenditure by Standard Industrial Classification code (2006/07 to 2015/16)**

| STANDARD INDUSTRIAL CLASSIFICATION | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture, Hunting, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 1.1 | 0.9 | 0.9 |
| Mining and Quarrying | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | **20.2** | **17.8** | **16.1** | **25.4** | **31.5** | **18.8** | **29.4** | **29.5** | **23.8** | **18.8** |
| Manufacture of Food Products, Beverages and Tobacco Products | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacture of Textiles, Clothing and Leather Goods | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacture of Wood and Products of Wood and Cork, except furniture; Manufacture of Articles of Straw and Plaiting Materials; Manufacture of Paper and Paper Products; Manufacture of Publishing, Printing and Reproduction of Recorded Material | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| Manufacture of Refined Petroleum, Coke and Nuclear Fuel; Manufacture of Chemicals and Chemical Products (incl. Pharmaceuticals); Manufacture of Rubber and Plastic Products | 2.6 | 2.1 | 2.2 | 4.6 | 3.7 | 4.4 | 4.6 | 4.5 | 3.8 | 0.4 |
| Manufacture of Non-Metallic Mineral Products | 0.3 | 0.1 | 0.0 | 0.0 | 0.4 | 0.6 | 0.5 | 0.5 | 0.4 | 0.0 |
| Manufacture of Basic Metals, Fabricated Metal Products, Machinery & Equipment; Manufacture of Office, Accounting and Computing Machinery | 1.3 | 1.2 | 0.6 | 1.0 | 0.0 | 6.4 | 14.9 | 16.9 | 14.5 | 15.1 |
| Manufacture of Electrical Machinery and Apparatus | 2.1 | 1.9 | 1.6 | 0.0 | 0.0 | 6.7 | 5.1 | 4.0 | 2.6 | 1.0 |
| Manufacture of Radio, Television and Communication Equipment and Apparatus; Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacture of Transport Equipment | 13.9 | 12.6 | 11.7 | 19.8 | 27.4 | 0.8 | 4.3 | 3.6 | 2.3 | 2.2 |
| Manufacture of Furniture; Recycling; Manufacturing not elsewhere classified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Electricity, Gas & Water Supply | 58.8 | 62.8 | 67.0 | 43.4 | 30.9 | 35.2 | 21.5 | 21.2 | 26.5 | 21.5 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale and Retail | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Storage and Communication | 8.8 | 7.9 | 5.1 | 8.3 | 9.7 | 23.1 | 24.6 | 24.7 | 28.0 | 41.9 |
| Financial Intermediation, Real Estate and Business Services | 5.1 | 5.0 | 6.5 | 12.0 | 12.1 | 22.9 | 9.1 | 9.8 | 7.4 | 10.0 |
| Community, Social and Personal Services | 7.0 | 6.4 | 5.2 | 10.7 | 15.5 | 0.0 | 14.6 | 13.7 | 13.4 | 6.9 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.73: Business sector: SOEs - R&D personnel in headcounts and full-time equivalents by occupation (2006/07 to 2015/16)**

| YEAR | HEADCOUNTS | | | | FULL-TIME EQUIVALENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL |
| 2006/07 | 2 568 | 1130 | 735 | 703 | 2 304.9 | 1 031.5 | 649.7 | 623.7 |
| 2007/08 | 2 822 | 1217 | 777 | 828 | 2 242.4 | 1 006.5 | 642.2 | 593.7 |
| 2008/09 | 2 955 | 1301 | 863 | 791 | 2 348.1 | 1 075.5 | 703.3 | 569.3 |
| 2009/10 | 2 550 | 1115 | 752 | 683 | 1 981.2 | 915.8 | 593.3 | 472.2 |
| 2010/11 | 1 878 | 773 | 681 | 424 | 1 366.3 | 598.0 | 493.0 | 275.3 |
| 2011/12 | 2 336 | 841 | 1 018 | 477 | 1 068.6 | 458.2 | 431.0 | 179.4 |
| 2012/13 | 2 699 | 890 | 1 351 | 458 | 1 307.1 | 548.4 | 563.8 | 194.9 |
| 2013/14 | 2 674 | 892 | 1 334 | 448 | 1 301.1 | 541.8 | 573.0 | 186.3 |
| 2014/15 | 2 760 | 918 | 1479 | 363 | 1 335.3 | 541.5 | 593.2 | 200.7 |
| 2015/16 | 2 476 | 959 | 1163 | 354 | 1 150.1 | 477.7 | 587.9 | 84.5 |

**Table C.74: Business sector: SOEs - R&D personnel in headcounts and full-time equivalents by occupation and gender (2013/14, 2014/15 and 2015/16)**

| YEAR | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | | | |
|---|---|---|---|---|---|---|---|
| 2013/14 | TOTAL | MALE | FEMALE | TOTAL | MALE | FEMALE | FTEs AS % OF HEADCOUNTS |
| Researchers | 892 | 732 | 160 | 541.8 | 442.1 | 99.7 | 60.7 |
| Technicians directly supporting R&D | 1 334 | 1 042 | 292 | 573.0 | 472.0 | 101.0 | 43.0 |
| Other personnel directly supporting R&D | 448 | 205 | 243 | 186.3 | 82.4 | 103.9 | 41.6 |
| **Total** | **2 674** | **1 979** | **695** | **1301.1** | **996.5** | **304.6** | **48.7** |
| **2014/15** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 918 | 751 | 167 | 541.5 | 433.7 | 107.8 | 59.0 |
| Technicians directly supporting R&D | 1 479 | 1 113 | 366 | 593.2 | 483.2 | 110.0 | 40.1 |
| Other personnel directly supporting R&D | 363 | 179 | 184 | 200.7 | 86.2 | 114.5 | 55.3 |
| **Total** | **2 760** | **2 043** | **717** | **1 335.3** | **1 003.1** | **332.3** | **48.4** |
| **2015/16** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 959 | 764 | 195 | 477.7 | 375.8 | 101.9 | 49.8 |
| Technicians directly supporting R&D | 1 163 | 863 | 300 | 587.9 | 425.7 | 162.2 | 50.5 |
| Other personnel directly supporting R&D | 354 | 191 | 163 | 84.5 | 40.2 | 44.3 | 23.9 |
| **Total** | **2 476** | **1 818** | **658** | **1 150.1** | **841.7** | **308.4** | **46.4** |

**Table C.75: Business sector: SOEs - R&D personnel in headcounts by occupation, qualification, population group and gender (2015/16)**

| OCCUPATION AND QUALIFICATION | TOTAL | SUBTOTAL | | AFRICAN | | COLOURED | | INDIAN | | WHITE | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE |
| **Researchers** | **903** | **720** | **184** | **237** | **86** | **38** | **12** | **91** | **25** | **354** | **61** |
| Doctoral degree or equivalent | 109 | 101 | 8 | 22 | 5 | 6 | 0 | 8 | 0 | 65 | 3 |
| Masters, honours, bachelor or equivalent | 692 | 532 | 161 | 200 | 76 | 32 | 12 | 71 | 22 | 229 | 51 |
| Diplomas | 102 | 87 | 15 | 16 | 5 | 0 | 0 | 12 | 3 | 59 | 7 |
| **Technicians directly supporting R&D** | **1 096** | **813** | **283** | **234** | **132** | **22** | **7** | **18** | **11** | **539** | **133** |
| Doctoral degree or equivalent | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| Masters, honours, bachelor or equivalent | 200 | 135 | 65 | 68 | 49 | 3 | 2 | 8 | 6 | 57 | 7 |
| Diplomas | 893 | 675 | 218 | 166 | 82 | 19 | 5 | 10 | 5 | 480 | 126 |
| **Other personnel directly supporting R&D** | **477** | **267** | **210** | **185** | **143** | **14** | **10** | **9** | **3** | **59** | **53** |
| Doctoral degree or equivalent | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Masters, honours, bachelor or equivalent | 85 | 54 | 31 | 28 | 20 | 2 | 2 | 5 | 3 | 19 | 5 |
| Diplomas | 392 | 213 | 179 | 157 | 123 | 12 | 9 | 3 | 0 | 40 | 48 |
| **Total** | **2 476** | **1 800** | **676** | **656** | **361** | **74** | **29** | **118** | **39** | **952** | **247** |

**Table C.76: Business sector: SOEs - Number of foreign and local business sector partners engaged in collaborative R&D*, and total R&D collaboration expenditure (2015/16)**

| COLLABORATION PARTNERS | 2015/16 | |
|---|---|---|
| | WITHIN SOUTH AFRICA | OUTSIDE SOUTH AFRICA |
| Government research institutes | 2 | 2 |
| Higher education institutions | 7 | 1 |
| Members of own company | 2 | 0 |
| Not-for-profit organisations | 2 | 1 |
| Other companies | 3 | 1 |
| Science councils | 5 | 1 |
| Total number of R&D collaborations | 21 | 6 |
| No collaboration | 0 | 1 |
| **R&D EXPENDITURE** | **R'000** | **R'000** |
| Total in-house plus outsourced R&D collaboration expenditure (excl. VAT) | 164 075 | 60 861 |

*R&D Expenditure includes both internal and outsourced R&D.

Note: Collaborative R&D entails partnerships, alliances and collaborations.

## C.2.2. Not-for-profit sector

The NPO sector in 2014/15 improved coverage by R185 million contributing 23.8% of NPO R&D expenditure. Care is advised when making inferences on trends in the NPO sector.

**Table C.77: Not-for-profit sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic research | 54 915 | 65 337 | 70 725 | 111 377 | 59 302 | 62 134 | 114 755 | 132 478 | 181 492 | 200 040 |
| Applied research | 110 698 | 119 982 | 131 259 | 53 530 | 87 435 | 79 105 | 346 179 | 322 295 | 426 132 | 508 738 |
| Experimental research | 46 925 | 37 883 | 38 665 | 23 933 | 16 092 | 29 366 | 42 898 | 128 391 | 171 149 | 182 365 |
| **Total** | **212 538** | **223 202** | **240 649** | **188 840** | **162 830** | **170 605** | **503 833** | **583 165** | **778 772** | **891 142** |

**Table C.78: Proportional not-for-profit sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic research | 25.8 | 29.3 | 29.4 | 59.0 | 36.4 | 36.4 | 22.8 | 22.7 | 23.3 | 22.4 |
| Applied research | 52.1 | 53.8 | 54.5 | 28.3 | 53.7 | 46.4 | 68.7 | 55.3 | 54.7 | 57.1 |
| Experimental research | 22.1 | 17.0 | 16.1 | 12.7 | 9.9 | 17.2 | 8.5 | 22.0 | 22.0 | 20.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.79: Not-for-profit sector R&D expenditure by accounting category (2006/07 to 2015/16)**

| TYPE OF EXPENDITURE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 6 974 | 7 025 | 7 249 | 8 564 | 8 820 | 18 702 | 37 564 | 39 983 | 49 647 | 53 800 |
| Land: buildings & other structures | 2 624 | 2 959 | 3 137 | 3 486 | 4 447 | 6 905 | 11 152 | 19 047 | 18 794 | 18 391 |
| Vehicles, plant, machinery, equipment | 4 350 | 4 066 | 4 112 | 5 078 | 4 373 | 11 797 | 26 412 | 20 936 | 30 853 | 35 409 |
| Current expenditure | 205 564 | 216 177 | 233 400 | 180 276 | 154 010 | 151 903 | 466 269 | 543 182 | 729 125 | 837 342 |
| Labour costs | 98 631 | 109 147 | 114 292 | 94 673 | 92 098 | 100 176 | 243 871 | 303 644 | 420 462 | 468 883 |
| Other current expenditure | 106 933 | 107 030 | 119 108 | 85 603 | 61 912 | 51 727 | 222 398 | 239 538 | 308 663 | 368 459 |
| **Total** | **212 538** | **223 202** | **240 649** | **188 840** | **162 830** | **170 605** | **503 833** | **583 165** | **778 772** | **891 142** |

### Table C.80: Not-for-profit sector R&D expenditure by accounting category (2006/07 to 2015/16)

| TYPE OF EXPENDITURE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 3.3 | 3.1 | 3.0 | 4.5 | 5.4 | 11.0 | 7.5 | 6.9 | 6.4 | 6.0 |
| Land: buildings & other structures | 1.2 | 1.3 | 1.3 | 1.8 | 2.7 | 4.0 | 2.2 | 3.3 | 2.4 | 2.1 |
| Vehicles, plant, machinery, equipment | 2.0 | 1.8 | 1.7 | 2.7 | 2.7 | 6.9 | 5.2 | 3.6 | 4.0 | 4.0 |
| Current expenditure | 96.7 | 96.9 | 97.0 | 95.5 | 94.6 | 89.0 | 92.5 | 93.1 | 93.6 | 94.0 |
| Labour costs | 46.4 | 48.9 | 47.5 | 50.1 | 56.6 | 58.7 | 48.4 | 52.1 | 54.0 | 52.6 |
| Other current expenditure | 50.3 | 48.0 | 49.5 | 45.3 | 38.0 | 30.3 | 44.1 | 41.1 | 39.6 | 41.3 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.81: Not-for-profit sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 429 | 491 | 255 | 4 446 | 5 666 | 8 667 | 29 062 | 62 082 | 128 964 | 159 045 |
| Nanotechnology | 0 | 0 | 0 | 0 | 1 475 | 0 | 10 187 | 4 915 | 70 348 | 81 103 |
| **Total** | **429** | **491** | **255** | **4 446** | **7 141** | **8 667** | **39 249** | **66 997** | **199 312** | **240 148** |
| NPO expenditure on R&D | 212 538 | 223 202 | 240 649 | 188 840 | 162 830 | 170 605 | 503 833 | 583 165 | 778 772 | 891 142 |

### Table C.82: Proportional not-for-profit sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 0.2 | 0.2 | 0.1 | 2.4 | 3.5 | 5.1 | 5.8 | 10.6 | 16.6 | 17.8 |
| Nanotechnology | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 2.0 | 0.8 | 9.0 | 9.1 |
| **Total** | **0.2** | **0.2** | **0.1** | **2.4** | **4.4** | **5.1** | **7.8** | **11.5** | **25.6** | **26.9** |

### Table C.83: Not-for-profit sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF INTEREST | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 15 133 | 18 022 | 27 142 | 50 364 | 52 156 |
| Open source software | 4 973 | 0 | 0 | 0 | 0 | 20 | 419 | 481 | 69 509 | 756 |
| New materials | 1 783 | 0 | 0 | 542 | 830 | 395 | 178 | 191 | 634 | 79 322 |
| Tuberculosis (TB), HIV/AIDS, malaria | 4 215 | 0 | 8 763 | 7 419 | 13 979 | 5 034 | 246 760 | 301 086 | 374 460 | 482 298 |
| **Total** | **10 971** | **0** | **8 763** | **7 962** | **14 809** | **20 581** | **265 379** | **328 901** | **494 966** | **614 532** |
| NPO expenditure on R&D | 212 538 | 223 202 | 240 649 | 188 840 | 162 830 | 170 605 | 503 833 | 583 165 | 778 772 | 891 142 |

### Table C.84: Proportional not-for-profit sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF INTEREST | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 8.9 | 3.6 | 4.7 | 6.5 | 5.9 |
| Open source software | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 8.9 | 0.1 |
| New materials | 0.8 | 0.0 | 0.0 | 0.3 | 0.5 | 0.2 | 0.0 | 0.0 | 0.1 | 8.9 |
| Tuberculosis (TB), HIV/AIDS, malaria | 2.0 | 0.0 | 3.6 | 3.9 | 8.6 | 3.0 | 49.0 | 51.6 | 48.1 | 54.1 |
| **Total** | **5.2** | **0.0** | **3.6** | **4.2** | **9.1** | **12.1** | **52.7** | **56.4** | **63.6** | **69** |

### Table C.85: Not-for-profit sector R&D expenditure by research field (2006/07 to 2015/16)

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **53 937** | **61 494** | **72 018** | **53 112** | **54 776** | **64 042** | **346 961** | **427 237** | **647 068** | **766 355** |
| Mathematical sciences | 0 | 0 | 1 041 | 0 | 0 | 0 | 8 223 | 9 674 | 14 613 | 14 293 |
| Physical sciences | 0 | 0 | 0 | 6 422 | 0 | 0 | 765 | 802 | 989 | 1191.043 |
| Chemical sciences | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 309 | 0 | 0 |
| Earth sciences | 185 | 459 | 1 012 | 452 | 2 585 | 2 407 | 2 598 | 5 907 | 8 371 | 8 356 |
| Information, computer and communication technologies | 925 | 1 446 | 1 555 | 2 207 | 0 | 595 | 2 919 | 39 | 197 | 528.4 |
| Applied sciences and technologies | 1 407 | 0 | 0 | 0 | 0 | 1 487 | 4 317 | 4 666 | 19 123 | 30 565 |
| Engineering sciences | 0 | 0 | 0 | 0 | 0 | 0 | 4 075 | 4 915 | 4 638 | 4 005 |
| Biological sciences | 1 874 | 2 005 | 2 126 | 904 | 1 473 | 7 978 | 15 475 | 23 435 | 23 338 | 11 400 |

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Agricultural sciences | 17 234 | 18 324 | 19 426 | 20 404 | 25 679 | 25 819 | 33 105 | 34 165 | 53 777 | 60 727 |
| Medical and health sciences | 25 237 | 29 603 | 36 032 | 13 999 | 15 920 | 17 423 | 265 031 | 329 293 | 497 588 | 614 889 |
| Environmental sciences | 3 097 | 7 363 | 8 396 | 6 014 | 3 433 | 7 553 | 10 122 | 12 238 | 23 548 | 19 552 |
| Material sciences | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marine sciences | 3 978 | 2 294 | 2 431 | 2 711 | 5 687 | 781 | 331 | 794 | 886 | 847.56 |
| **Division 2: Social Sciences and Humanities** | **158 601** | **161 708** | **168 631** | **135 728** | **108 054** | **106 563** | **156 872** | **155 928** | **131 705** | **124 787** |
| Social sciences | 156 574 | 159 155 | 165 924 | 133 340 | 104 306 | 104 842 | 142 525 | 147 029 | 122 105 | 117 549 |
| Humanities | 2 027 | 2 553 | 2 707 | 2 388 | 3 749 | 1 720 | 14 348 | 8 898 | 9 599 | 7 238 |
| **Total** | **212 538** | **223 202** | **240 649** | **188 840** | **162 830** | **170 605** | **503 833** | **583 165** | **778 772** | **891 142** |

**Table C.86: Proportional not-for-profit sector R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **25.4** | **27.6** | **29.9** | **28.1** | **33.6** | **37.5** | **68.9** | **73.3** | **83.1** | **86** |
| Mathematical sciences | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 1.6 | 1.7 | 1.9 | 1.6 |
| Physical sciences | 0.0 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 0.2 | 0.1 | 0.1 | 0.1 |
| Chemical sciences | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Earth sciences | 0.1 | 0.2 | 0.4 | 0.2 | 1.6 | 1.4 | 0.5 | 1.0 | 1.1 | 0.9 |
| Information, computer and communication technologies | 0.4 | 0.6 | 0.6 | 1.2 | 0.0 | 0.3 | 0.6 | 0.0 | 0.0 | 0.1 |
| Applied sciences and technologies | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.9 | 0.8 | 2.5 | 3.4 |
| Engineering sciences | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 0.6 | 0.4 |
| Biological sciences | 0.9 | 0.9 | 0.9 | 0.5 | 0.9 | 4.7 | 3.1 | 4.0 | 3.0 | 1.3 |
| Agricultural sciences | 8.1 | 8.2 | 8.1 | 10.8 | 15.8 | 15.1 | 6.6 | 5.9 | 6.9 | 6.8 |
| Medical and health sciences | 11.9 | 13.3 | 15.0 | 7.4 | 9.8 | 10.2 | 52.6 | 56.5 | 63.9 | 69.0 |
| Environmental sciences | 1.5 | 3.3 | 3.5 | 3.2 | 2.1 | 4.4 | 2.0 | 2.1 | 3.0 | 2.2 |
| Material sciences | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Marine sciences | 1.9 | 1.0 | 1.0 | 1.4 | 3.5 | 0.5 | 0.1 | 0.1 | 0.1 | 0.1 |
| **Division 2: Social Sciences and Humanities** | **74.6** | **72.4** | **70.1** | **71.9** | **66.4** | **62.5** | **31.1** | **26.7** | **16.9** | **14** |
| Social sciences | 73.7 | 71.3 | 68.9 | 70.6 | 64.1 | 61.5 | 28.3 | 25.2 | 15.7 | 13.2 |
| Humanities | 1.0 | 1.1 | 1.1 | 1.3 | 2.3 | 1.0 | 2.8 | 1.5 | 1.2 | 0.8 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.87: Not-for-profit sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **1 312** | **1 438** | **2 050** | **1 600** | **0** | **0** | **0** | **0** | **690** | **0** |
| Defence | 1 312 | 1 438 | 2 050 | 1 600 | 0 | 0 | 0 | 0 | 690 | 0 |
| **Division 2: Economic Development** | **61 743** | **63 450** | **69 810** | **71 939** | **65 777** | **60 758** | **110 866** | **113 991** | **152 573** | **157 608** |
| Economic Development unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plant production and plant primary products | 13 996 | 16 030 | 17 520 | 18 873 | 25 441 | 24 850 | 36 127 | 35 511 | 28 974 | 32 936 |
| Animal production and animal primary products | 1 850 | 918 | 972 | 1 632 | 1 389 | 828 | 2 538 | 3 083 | 4 000 | 7 628 |
| Mineral resources (excluding Energy) | 0 | 0 | 0 | 0 | 763 | 0 | 8 150 | 9 831 | 9 242 | 7 955 |
| Energy resources | 656 | 1 000 | 1 760 | 2 604 | 1 653 | 969 | 2 538 | 3 083 | 3 993 | 4 008 |
| Energy supply | 1 312 | 1 438 | 2 575 | 3 774 | 3 307 | 3 430 | 4 363 | 8 690 | 7 663 | 6 242 |
| Manufacturing | 0 | 0 | 0 | 0 | 0 | 2 197 | 3 896 | 2 955 | 26 291 | 31 646 |
| Construction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Transport | 0 | 70 | 74 | 208 | 0 | 137 | 465 | 424 | 0 | 0 |
| Information and communication services | 1 388 | 0 | 0 | 0 | 0 | 1 480 | 2 031 | 1 823 | 316 | 2411.45 |
| Commercial services | 622 | 782 | 827 | 970 | 0 | 0 | 0 | 0 | 0 | 1134.7 |
| Economic framework | 37 516 | 36 588 | 39 059 | 39 463 | 27 068 | 22 228 | 45 252 | 42 423 | 54 435 | 53 406 |
| Natural resources | 4 403 | 6 624 | 7 022 | 4 414 | 6 157 | 4 640 | 5 507 | 6 167 | 17 659 | 10 242 |
| **Division 3: Society** | **127 170** | **129 159** | **141 189** | **93 947** | **82 481** | **75 597** | **360 333** | **415 093** | **555 151** | **632 030** |
| Society unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Health | 28 057 | 33 549 | 37 461 | 16 554 | 15 050 | 13 496 | 260 712 | 303 535 | 449 619 | 527 783 |
| Education and training | 38 907 | 32 161 | 32 308 | 19 986 | 22 303 | 23 762 | 58 894 | 63 833 | 61 150 | 59 917 |
| Social development and community services | 60 206 | 63 449 | 71 420 | 57 407 | 45 128 | 38 339 | 40 726 | 47 725 | 44 382 | 44 330 |
| **Division 4: Environment** | 4 493 | 5 885 | 6 937 | 7 052 | 10 051 | 13 356 | 12 841 | 15 044 | 16 135 | 17 503 |
| Environment unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Environmental knowledge | 1 090 | 2 553 | 3 406 | 3 577 | 6 139 | 7 233 | 4 716 | 7 845 | 8 697 | 9 949 |
| Environmental aspects of development | 209 | 559 | 593 | 683 | 504 | 3 746 | 5 771 | 4 545 | 4 569 | 4 494 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Environmental and other aspects | 3 194 | 2 773 | 2 938 | 2 792 | 3 408 | 2 377 | 2 355 | 2 654 | 2 869 | 3 060 |
| **Division 5: Advancement of Knowledge** | **17 819** | **23 271** | **20 663** | **14 303** | **4 521** | **20 895** | **19 793** | **39 036** | **54 223** | **84 002** |
| Advancement of Knowledge unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Natural sciences, technologies and engineering | 925 | 459 | 486 | 452 | 632 | 13 166 | 7 754 | 31 450 | 42 017 | 69 845 |
| Social sciences and humanities | 16 894 | 22 812 | 20 177 | 13 851 | 3 889 | 7 729 | 12 039 | 7 586 | 12 206 | 14 157 |
| **Total** | **212 537** | **223 203** | **240 649** | **188 840** | **162 830** | **170 605** | **503 833** | **583 165** | **778 772** | **891 142** |

**Table C.88: Proportional not-for-profit sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **0.6** | **0.6** | **0.9** | **0.8** | **0.0** | **0.0** | **0.0** | **0.0** | **0.1** | **0.0** |
| Defence | 0.6 | 0.6 | 0.9 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| **Division 2: Economic Development** | **29.1** | **28.4** | **29.0** | **38.1** | **40.4** | **35.6** | **22.0** | **19.5** | **19.6** | **17.7** |
| Economic Development unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plant production and plant primary products | 6.6 | 7.2 | 7.3 | 10 | 15.6 | 14.6 | 7.2 | 6.1 | 3.7 | 3.7 |
| Animal production and animal primary products | 0.9 | 0.4 | 0.4 | 0.9 | 0.9 | 0.5 | 0.5 | 0.5 | 0.5 | 0.9 |
| Mineral resources (excluding Energy) | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 1.6 | 1.7 | 1.2 | 0.9 |
| Energy resources | 0.3 | 0.4 | 0.7 | 1.4 | 1.0 | 0.6 | 0.5 | 0.5 | 0.5 | 0.4 |
| Energy supply | 0.6 | 0.6 | 1.1 | 2.0 | 2.0 | 2.0 | 0.9 | 1.5 | 1.0 | 0.7 |
| Manufacturing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.8 | 0.5 | 3.4 | 3.6 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 |
| Information and communication services | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.4 | 0.3 | 0.0 | 0.3 |
| Commercial services | 0.3 | 0.4 | 0.3 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Economic framework | 17.7 | 16.4 | 16.2 | 20.9 | 16.6 | 13.0 | 9.0 | 7.3 | 7.0 | 6.0 |
| Natural resources | 2.1 | 3.0 | 2.9 | 2.3 | 3.8 | 2.7 | 1.1 | 1.1 | 2.3 | 1.1 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 3: Society** | **59.8** | **57.9** | **58.7** | **49.7** | **50.7** | **44.3** | **71.5** | **71.2** | **71.3** | **70.9** |
| Society unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health | 13.2 | 15.0 | 15.6 | 8.8 | 9.2 | 7.9 | 51.7 | 52.0 | 57.7 | 59.2 |
| Education and training | 18.3 | 14.4 | 13.4 | 10.6 | 13.7 | 13.9 | 11.7 | 10.9 | 7.9 | 6.7 |
| Social development and community services | 28.3 | 28.4 | 29.7 | 30.4 | 27.7 | 22.5 | 8.1 | 8.2 | 5.7 | 5.0 |
| **Division 4: Environment** | **2.1** | **2.6** | **2.9** | **3.7** | **6.2** | **7.8** | **2.5** | **2.6** | **2.1** | **2.0** |
| Environment unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Environmental knowledge | 0.5 | 1.1 | 1.4 | 1.9 | 3.8 | 4.2 | 0.9 | 1.3 | 1.1 | 1.1 |
| Environmental aspects of development | 0.1 | 0.3 | 0.2 | 0.4 | 0.3 | 2.2 | 1.1 | 0.8 | 0.6 | 0.5 |
| Environmental and other aspects | 1.5 | 1.2 | 1.2 | 1.5 | 2.1 | 1.4 | 0.5 | 0.5 | 0.4 | 0.3 |
| **Division 5: Advancement of Knowledge** | **8.4** | **10.4** | **8.6** | **7.6** | **2.8** | **12.2** | **3.9** | **6.7** | **7.0** | **9.4** |
| Advancement of Knowledge unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural sciences, technologies and engineering | 0.4 | 0.2 | 0.2 | 0.2 | 0.4 | 7.7 | 1.5 | 5.4 | 5.4 | 7.8 |
| Social sciences and humanities | 7.9 | 10.2 | 8.4 | 7.3 | 2.4 | 4.5 | 2.4 | 1.3 | 1.6 | 1.6 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.89: Not-for-profit sector R&D expenditure by province (2006/07 to 2015/16)**

| PROVINCE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Eastern Cape | 4 850 | 6 164 | 6 790 | 8 136 | 9 790 | 9 493 | 25 610 | 25 478 | 27 219 | 21 026 |
| Free State | 1 974 | 1 255 | 4 763 | 4 418 | 6 385 | 5 096 | 15 297 | 15 953 | 14 214 | 8 890 |
| Gauteng | 102 141 | 115 499 | 126 136 | 104 420 | 61 496 | 69 321 | 162 866 | 175 651 | 287 783 | 345 937 |
| KwaZulu-Natal | 42 902 | 42 141 | 40 492 | 30 548 | 35 765 | 33 740 | 163 221 | 166 603 | 181 052 | 232 636 |
| Limpopo | 3 979 | 4 602 | 5 138 | 4 524 | 4 541 | 7 449 | 11 779 | 13 719 | 49 971 | 56 143 |
| Mpumalanga | 9 131 | 9 930 | 10 332 | 8 311 | 13 206 | 16 027 | 23 195 | 26 979 | 30 594 | 25 944 |
| North-West | 1 974 | 2 207 | 2 339 | 2 382 | 5 612 | 6 353 | 42 960 | 72 446 | 105 904 | 97 918 |
| Northern Cape | 1 736 | 2 038 | 2 159 | 4 493 | 2 030 | 1 889 | 3 867 | 3 583 | 1 546 | 2 200 |
| Western Cape | 43 852 | 39 367 | 42 500 | 21 609 | 24 003 | 21 236 | 55 038 | 82 753 | 80 489 | 100 448 |
| **Total** | **212 538** | **223 203** | **240 649** | **188 840** | **162 830** | **170 605** | **503 833** | **583 165** | **778 772** | **891 142** |

**Table C.90: Proportional not-for-profit sector R&D expenditure by province (2006/07 to 2015/16)**

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Eastern Cape | 2.3 | 2.8 | 2.8 | 4.3 | 6.0 | 5.6 | 5.1 | 4.4 | 3.5 | 2.4 |
| Free State | 0.9 | 0.6 | 2.0 | 2.3 | 3.9 | 3.0 | 3.0 | 2.7 | 1.8 | 1.0 |
| Gauteng | 48.1 | 51.7 | 52.4 | 55.3 | 37.8 | 40.6 | 32.3 | 30.1 | 37 | 38.8 |
| KwaZulu-Natal | 20.2 | 18.9 | 16.8 | 16.2 | 22 | 19.8 | 32.4 | 28.6 | 23.2 | 26.1 |
| Limpopo | 1.9 | 2.1 | 2.1 | 2.4 | 2.8 | 4.4 | 2.3 | 2.4 | 6.4 | 6.3 |
| Mpumalanga | 4.3 | 4.4 | 4.3 | 4.4 | 8.1 | 9.4 | 4.6 | 4.6 | 3.9 | 2.9 |
| North-West | 0.8 | 1.0 | 0.9 | 2.4 | 3.4 | 1.1 | 8.5 | 12.4 | 13.6 | 11.0 |
| Northern Cape | 0.9 | 0.9 | 1.0 | 1.3 | 1.2 | 3.7 | 0.8 | 0.6 | 0.2 | 0.2 |
| Western Cape | 20.6 | 17.6 | 17.7 | 11.4 | 14.7 | 12.4 | 10.9 | 14.2 | 10.3 | 11.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Table C.91: Not-for-profit sector R&D personnel in headcounts and full-time equivalents by occupation (2006/07 to 2015/16)**

| YEAR | HEADCOUNTS | | | | FULL-TIME EQUIVALENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL |
| 2006/07 | 484 | 252 | 77 | 155 | 362.7 | 203.6 | 55.3 | 103.9 |
| 2007/08 | 502 | 264 | 77 | 161 | 379.1 | 215.6 | 56.5 | 107 |
| 2008/09 | 502 | 262 | 77 | 163 | 366.4 | 207.6 | 56.5 | 102.3 |
| 2009/10 | 380 | 224 | 76 | 80 | 309.7 | 187.5 | 63.7 | 58.6 |
| 2010/11 | 400 | 250 | 49 | 101 | 313.1 | 196.2 | 47.6 | 69.3 |
| 2011/12 | 405 | 254 | 56 | 95 | 312.1 | 190.8 | 47.2 | 74.1 |
| 2012/13 | 906 | 394 | 132 | 380 | 768 | 294.5 | 114.2 | 359.4 |
| 2013/14 | 1017 | 435 | 205 | 377 | 891.4 | 338.4 | 195.1 | 357.9 |
| 2014/15 | 1471 | 506 | 368 | 597 | 1231.2 | 396 | 355.5 | 479.8 |
| 2015/16 | 1493 | 465 | 436 | 592 | 1367.3 | 384.81 | 411.23 | 571.23 |

**Table C.92: Not-for-profit sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2013/14, 2014/15 and 2015/16)**

| YEAR | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | | | |
|---|---|---|---|---|---|---|---|
| 2013/14 | TOTAL | MALE | FEMALE | TOTAL | MALE | FEMALE | FTEs AS % OF HEADCOUNTS |
| Researchers | 435 | 202 | 233 | 338.4 | 155.6 | 182.9 | 77.8 |
| Technicians directly supporting R&D | 205 | 74 | 131 | 195.1 | 68.0 | 127.1 | 95.2 |
| Other personnel directly supporting R&D | 377 | 81 | 296 | 357.9 | 77.9 | 280.0 | 94.9 |
| Total | 1017 | 357 | 660 | 891.4 | 301.4 | 590.0 | 87.6 |
| 2014/15 | TOTAL | MALE | FEMALE | TOTAL | MALE | FEMALE | FTEs AS % OF HEADCOUNTS |
| Researchers | 506 | 234 | 272 | 396.0 | 177.1 | 218.9 | 78.3 |
| Technicians directly supporting R&D | 368 | 116 | 252 | 355.5 | 110.0 | 245.5 | 96.6 |
| Other personnel directly supporting R&D | 597 | 167 | 430 | 479.8 | 123.4 | 356.3 | 80.4 |
| Total | 1471 | 517 | 954 | 1231.2 | 410.5 | 820.7 | 83.7 |
| 2015/16 | TOTAL | MALE | FEMALE | TOTAL | MALE | FEMALE | FTEs AS % OF HEADCOUNTS |
| Researchers | 465 | 206 | 259 | 384.8 | 158.6 | 226.2 | 82.8 |
| Technicians directly supporting R&D | 436 | 136 | 300 | 411.2 | 124.2 | 287.0 | 94.3 |
| Other personnel directly supporting R&D | 592 | 157 | 435 | 571.2 | 153.9 | 417.3 | 96.5 |
| Total | 1493 | 499 | 994 | 1 367.3 | 436.7 | 930.5 | 91.6 |

**Table C.93: Not-for-profit sector R&D personnel in headcounts by occupation, qualification, population group and gender (2015/16)**

| OCCUPATION AND QUALIFICATION | TOTAL | SUBTOTAL | | AFRICAN | | COLOURED | | INDIAN | | WHITE | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE |
| **Researchers** | **465** | **206** | **259** | **89** | **96** | **9** | **25** | **10** | **34** | **98** | **104** |
| Doctoral degree or equivalent | 123 | 73 | 50 | 23 | 12 | 1 | 6 | 3 | 7 | 46 | 25 |
| Masters, honours, bachelor or equivalent | 291 | 117 | 174 | 54 | 64 | 7 | 13 | 6 | 22 | 50 | 75 |
| Diplomas | 51 | 16 | 35 | 12 | 20 | 1 | 6 | 1 | 5 | 2 | 4 |
| **Technicians directly supporting R&D** | **436** | **136** | **300** | **99** | **210** | **3** | **14** | **13** | **44** | **21** | **32** |
| Doctoral degree or equivalent | 7 | 0 | 7 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 4 |
| Masters, honours, bachelor or equivalent | 120 | 39 | 81 | 16 | 33 | 1 | 7 | 10 | 26 | 12 | 15 |
| Diplomas | 309 | 97 | 212 | 83 | 174 | 2 | 7 | 3 | 18 | 9 | 13 |
| **Other personnel directly supporting R&D** | **592** | **157** | **435** | **118** | **304** | **5** | **24** | **16** | **45** | **18** | **62** |
| Doctoral degree or equivalent | 6 | 0 | 6 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 2 |
| Masters, honours, bachelor or equivalent | 146 | 34 | 112 | 17 | 43 | 1 | 7 | 6 | 30 | 10 | 32 |
| Diplomas | 440 | 123 | 317 | 101 | 258 | 4 | 17 | 10 | 14 | 8 | 28 |
| **Total** | **1 493** | **499** | **994** | **306** | **610** | **17** | **63** | **39** | **123** | **137** | **198** |

## C.2.3. Government sector

**Table C.94: Government sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic research | 224 774 | 322 270 | 357 786 | 257 806 | 257 235 | 263 380 | 331 587 | 245 167 | 338 250 | 358 666 |
| Applied research | 521 845 | 599 162 | 601 688 | 621 762 | 600 205 | 812 067 | 873 469 | 1 194 866 | 1 292 421 | 1 390 221 |
| Experimental research | 274 736 | 232 967 | 180 202 | 187 734 | 153 900 | 160 223 | 232 453 | 257 118 | 262 339 | 264 134 |
| **Total** | **1 021 355** | **1 154 399** | **1 139 676** | **1 067 302** | **1 011 340** | **1 235 669** | **1 437 509** | **1 697 151** | **1 893 010** | **2 013 021** |

**Table C.95: Proportional government sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic research | 22.0 | 27.9 | 31.4 | 24.2 | 25.4 | 21.3 | 23.1 | 14.4 | 17.9 | 17.8 |
| Applied research | 51.1 | 51.9 | 52.8 | 58.3 | 59.3 | 65.7 | 60.8 | 70.4 | 68.3 | 69.1 |
| Experimental research | 26.9 | 20.2 | 15.8 | 17.6 | 15.2 | 13.0 | 16.2 | 15.1 | 13.9 | 13.1 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |



**Table C.96: Government sector R&D expenditure by spheres and institutes of government and accounting category (2006/07 to 2015/16)**

| TYPE OF EXPENDITURE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| **Municipalities** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **14 959** | **65 541** | **59 418** | **62 485** | **61 703** |
| Capital expenditure | N/A | N/A | N/A | N/A | N/A | 144 | 18 605 | 23 033 | 12 921 | 13 059 |
| Land: buildings and other structures | N/A | N/A | N/A | N/A | N/A | 0 | 5 400 | 10 000 | 6 537 | 6 598 |
| Vehicles, plant, machinery, equipment | N/A | N/A | N/A | N/A | N/A | 144 | 13 205 | 13 033 | 6 384 | 6 461 |
| Current expenditure | N/A | N/A | N/A | N/A | N/A | 14 815 | 46 936 | 36 385 | 49 564 | 48 644 |
| Labour costs | N/A | N/A | N/A | N/A | N/A | 12 715 | 30 131 | 27 513 | 39 314 | 38 687 |
| Other current expenditure | N/A | N/A | N/A | N/A | N/A | 2 100 | 16 805 | 8 872 | 10 250 | 9 957 |
| **Provincial departments** | **174 860** | **253 418** | **232 062** | **245 031** | **284 539** | **335 607** | **372 231** | **249 705** | **421 126** | **376 232** |
| Capital expenditure | 12 706 | 37 336 | 24 249 | 39 748 | 30 475 | 42 895 | 45 895 | 17 540 | 39 325 | 57 905 |
| Land: buildings and other structures | 4 495 | 8 681 | 2 515 | 11 238 | 13 022 | 10 674 | 7 255 | 2 122 | 5 500 | 18 037 |
| Vehicles, plant, machinery, equipment | 8 211 | 28 655 | 21 734 | 28 510 | 17 453 | 32 221 | 38 640 | 15 418 | 33 825 | 39 868 |
| Current expenditure | 162 154 | 216 082 | 207 813 | 205 283 | 254 064 | 292 712 | 326 336 | 232 165 | 381 801 | 318 327 |
| Labour costs | 100 676 | 135 695 | 129 187 | 138 397 | 182 175 | 206 583 | 236 367 | 198 440 | 248 823 | 189 465 |
| Other current expenditure | 61 478 | 80 387 | 78 626 | 66 886 | 71 889 | 86 129 | 89 969 | 33 725 | 132 978 | 128 862 |
| **National departments** | **489 971** | **499 085** | **287 333** | **240 412** | **211 176** | **280 005** | **321 632** | **390 301** | **248 041** | **381 855** |
| Capital expenditure | 48 920 | 22 507 | 9 340 | 2 022 | 38 629 | 31 879 | 32 669 | 45 930 | 4 406 | 43 918 |
| Land: buildings and other structures | 3 701 | 0 | 1 107 | 500 | 3 657 | 11 820 | 12 783 | 6 348 | 811 | 7900 |
| Vehicles, plant, machinery, equipment | 45 219 | 22 507 | 8 233 | 1 522 | 34 972 | 20 059 | 19 886 | 39 582 | 3 595 | 36 018 |
| Current expenditure | 441 051 | 476 578 | 277 993 | 238 390 | 172 547 | 248 126 | 288 963 | 344 371 | 243 635 | 337 937 |
| Labour costs | 158 890 | 120 257 | 98 791 | 81 619 | 144 779 | 140 146 | 158 808 | 233 321 | 150 921 | 208 005 |
| Other current expenditure | 282 161 | 356 321 | 179 202 | 156 771 | 27 768 | 107 980 | 130 155 | 111 050 | 92 714 | 129 932 |
| **Government research institutes** | **327 065** | **365 468** | **579 395** | **553 651** | **483 999** | **573 698** | **644 360** | **973 807** | **1 134 875** | **1 165 161** |
| Capital expenditure | 57 343 | 38 837 | 49 345 | 168 544 | 113 395 | 35 071 | 157 221 | 98 010 | 233 386 | 202 878 |
| Land: buildings and other structures | 31 602 | 10 225 | 9 955 | 115 101 | 43 360 | 2 487 | 58 280 | 4 542 | 93 477 | 112 710 |
| Vehicles, plant, machinery, equipment | 25 741 | 28 612 | 39 390 | 53 443 | 70 035 | 32 584 | 98 941 | 93 468 | 139 909 | 90 168 |
| Current expenditure | 269 722 | 326 631 | 530 050 | 385 107 | 370 604 | 538 627 | 487 139 | 875 797 | 901 489 | 962 283 |
| Labour costs | 148 117 | 183 167 | 224 691 | 245 767 | 269 965 | 316 835 | 355 503 | 316 256 | 375 939 | 311 876 |
| Other current expenditure | 121 605 | 143 464 | 305 359 | 139 340 | 100 639 | 221 792 | 131 636 | 559 541 | 525 550 | 650 407 |
| **Museums** | **29 459** | **36 428** | **40 886** | **28 208** | **31 626** | **31 400** | **33 745** | **23 920** | **26 484** | **28 070** |
| Capital expenditure | 1 908 | 1 644 | 4 002 | 4 087 | 3 699 | 3 256 | 649 | 946 | 1 996 | 2 005 |
| Land: buildings and other structures | 481 | 460 | 2 331 | 2 491 | 2 141 | 2 337 | 30 | 638 | 687 | 663 |
| Vehicles, plant, machinery, equipment | 1 427 | 1 184 | 1 671 | 1 596 | 1 558 | 919 | 619 | 308 | 1 309 | 1 342 |
| Current expenditure | 27 551 | 34 784 | 36 884 | 24 121 | 27 927 | 28 144 | 33 096 | 22 974 | 24 488 | 26 065 |
| Labour costs | 20 197 | 25 041 | 27 141 | 17 839 | 20 814 | 21 413 | 25 471 | 20 769 | 22 429 | 23 751 |
| Other current expenditure | 7 354 | 9 743 | 9 743 | 6 282 | 7 113 | 6 731 | 7 625 | 2 205 | 2 059 | 2 314 |
| **Government sector** | **1 021 355** | **1 154 399** | **1 139 676** | **1 067 302** | **1 011 340** | **1 235 669** | **1 437 509** | **1 697 151** | **1 893 010** | **2 013 021** |
| Capital expenditure | 120 877 | 100 324 | 86 936 | 214 401 | 186 198 | 113 245 | 255 039 | 185 459 | 292 034 | 319 765 |
| Land: buildings and other structures | 40 279 | 19 366 | 15 908 | 129 330 | 62 180 | 27 318 | 83 748 | 23 650 | 107 012 | 145 908 |
| Vehicles, plant, machinery, equipment | 80 598 | 80 958 | 71 028 | 85 071 | 124 018 | 85 927 | 171 291 | 161 809 | 185 022 | 173 857 |
| Current expenditure | 900 478 | 1 054 075 | 1 052 740 | 852 901 | 825 142 | 1 122 424 | 1 182 470 | 1 511 692 | 1 600 976 | 1 693 256 |
| Labour costs | 427 880 | 464 160 | 479 810 | 483 622 | 617 733 | 697 692 | 806 280 | 796 299 | 837 425 | 771 784 |
| Other current expenditure | 472 598 | 589 915 | 572 930 | 369 279 | 207 409 | 424 732 | 376 190 | 715 393 | 763 551 | 921 472 |

N/A: Municipal data were collected from the 2011/12 R&D survey onwards.

**Table C.97: Proportional government sector R&D expenditure by spheres and institutes of government and accounting category (2006/07 to 2015/16)**

| TYPE OF EXPENDITURE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| **Municipalities** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Capital expenditure | N/A | N/A | N/A | N/A | N/A | 1.0 | 28.4 | 38.8 | 20.7 | 21.2 |
| Land: buildings and other structures | N/A | N/A | N/A | N/A | N/A | 0.0 | 8.2 | 16.8 | 10.5 | 10.7 |
| Vehicles, plant, machinery, equipment | N/A | N/A | N/A | N/A | N/A | 1.0 | 20.1 | 21.9 | 10.2 | 10.5 |
| Current expenditure | N/A | N/A | N/A | N/A | N/A | 99.0 | 71.6 | 61.2 | 79.3 | 78.8 |
| Labour costs | N/A | N/A | N/A | N/A | N/A | 85.0 | 46.0 | 46.3 | 62.9 | 62.7 |
| Other current expenditure | N/A | N/A | N/A | N/A | N/A | 14.0 | 25.6 | 14.9 | 16.4 | 16.1 |
| **Provincial departments** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Capital expenditure | 7.3 | 14.7 | 10.4 | 16.2 | 10.7 | 12.8 | 12.3 | 7.0 | 9.3 | 15.4 |
| Land: buildings and other structures | 2.6 | 3.4 | 1.1 | 4.6 | 4.6 | 3.2 | 1.9 | 0.8 | 1.3 | 4.8 |
| Vehicles, plant, machinery, equipment | 4.7 | 11.3 | 9.4 | 11.6 | 6.1 | 9.6 | 10.4 | 6.2 | 8.0 | 10.6 |
| Current expenditure | 92.7 | 85.3 | 89.6 | 83.8 | 89.3 | 87.2 | 87.7 | 93.0 | 90.7 | 84.6 |
| Labour costs | 57.6 | 53.5 | 55.7 | 56.5 | 64.0 | 61.6 | 63.5 | 79.5 | 59.1 | 50.4 |
| Other current expenditure | 35.2 | 31.7 | 33.9 | 27.3 | 25.3 | 25.7 | 24.2 | 13.5 | 31.6 | 34.3 |
| **National departments** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Capital expenditure | 10.0 | 4.5 | 3.3 | 0.8 | 18.3 | 11.4 | 10.2 | 11.8 | 1.8 | 11.5 |
| Land: buildings and other structures | 0.8 | 0.0 | 0.4 | 0.2 | 1.7 | 4.2 | 4.0 | 1.6 | 0.3 | 2.1 |
| Vehicles, plant, machinery, equipment | 9.2 | 4.5 | 2.9 | 0.6 | 16.6 | 7.2 | 6.2 | 10.1 | 1.4 | 9.4 |
| Current expenditure | 90.0 | 95.5 | 96.7 | 99.2 | 81.7 | 88.6 | 89.8 | 88.2 | 98.2 | 88.5 |
| Labour costs | 32.4 | 24.1 | 34.4 | 33.9 | 68.6 | 50.1 | 49.4 | 59.8 | 60.8 | 54.5 |
| Other current expenditure | 57.6 | 71.4 | 62.4 | 65.2 | 13.1 | 38.6 | 40.5 | 28.5 | 37.4 | 34.0 |
| **Government research institutes** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Capital expenditure | 17.5 | 10.6 | 8.5 | 30.4 | 23.4 | 6.1 | 24.4 | 10.1 | 20.6 | 17.4 |
| Land: buildings and other structures | 9.7 | 2.8 | 1.7 | 20.8 | 9.0 | 0.4 | 9.0 | 0.5 | 8.2 | 9.7 |
| Vehicles, plant, machinery, equipment | 7.9 | 7.8 | 6.8 | 9.7 | 14.5 | 5.7 | 15.4 | 9.6 | 12.3 | 7.7 |
| Current expenditure | 82.5 | 89.4 | 91.5 | 69.6 | 76.6 | 93.9 | 75.6 | 89.9 | 79.4 | 82.6 |
| Labour costs | 45.3 | 50.1 | 38.8 | 44.4 | 55.8 | 55.2 | 55.2 | 32.5 | 33.1 | 26.8 |
| Other current expenditure | 37.2 | 39.3 | 52.7 | 25.2 | 20.8 | 38.7 | 20.4 | 57.5 | 46.3 | 55.8 |
| **Museums** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Capital expenditure | 6.5 | 4.5 | 9.8 | 14.5 | 11.7 | 10.4 | 1.9 | 4.0 | 7.5 | 7.1 |
| Land: buildings and other structures | 1.6 | 1.3 | 5.7 | 8.8 | 6.8 | 7.4 | 0.1 | 2.7 | 2.6 | 2.4 |
| Vehicles, plant, machinery, equipment | 4.8 | 3.3 | 4.1 | 5.7 | 4.9 | 2.9 | 1.8 | 1.3 | 4.9 | 4.8 |
| Current expenditure | 93.5 | 95.5 | 90.2 | 85.5 | 88.3 | 89.6 | 98.1 | 96.0 | 92.5 | 92.9 |
| Labour costs | 68.6 | 68.7 | 66.4 | 63.2 | 65.8 | 68.2 | 75.5 | 86.8 | 84.7 | 84.6 |
| Other current expenditure | 25.0 | 26.7 | 23.8 | 22.3 | 22.5 | 21.4 | 22.6 | 9.2 | 7.8 | 8.2 |
| **Government sector** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Capital expenditure | 11.8 | 8.7 | 7.6 | 20.1 | 18.4 | 9.2 | 17.7 | 10.9 | 15.4 | 15.9 |
| Land: buildings and other structures | 3.9 | 1.7 | 1.4 | 12.1 | 6.1 | 2.2 | 5.8 | 1.4 | 5.7 | 7.2 |
| Vehicles, plant, machinery, equipment | 7.9 | 7.0 | 6.2 | 8.0 | 12.3 | 7.0 | 11.9 | 9.5 | 9.8 | 8.6 |
| Current expenditure | 88.2 | 91.3 | 92.4 | 79.9 | 81.6 | 90.8 | 82.3 | 89.1 | 84.6 | 84.1 |
| Labour costs | 41.9 | 40.2 | 42.1 | 45.3 | 61.1 | 56.5 | 56.1 | 46.9 | 44.2 | 38.3 |
| Other current expenditure | 46.3 | 51.1 | 50.3 | 34.6 | 20.5 | 34.4 | 26.2 | 42.2 | 40.3 | 45.8 |

N/A: Municipal data were collected from the 2011/12 R&D survey onwards.



### Table C.98: Government sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 21 911 | 8 639 | 21 729 | 32 496 | 213 817 | 81 993 | 124 429 | 97 816 | 85 385 | 81 409 |
| Nanotechnology | 0 | 0 | 4 652 | 0 | 4 196 | 4 609 | 15 035 | 16 929 | 13 112 | 11 774 |
| **Total** | **21 911** | **8 639** | **26 381** | **32 496** | **218 013** | **86 602** | **139 464** | **114 745** | **98 497** | **93 183** |
| Government expenditure on R&D | 1 021 355 | 1 154 399 | 1 139 676 | 1 067 302 | 1 011 340 | 1 235 669 | 1 437 509 | 1 697 151 | 1 893 010 | 2 013 021 |

### Table C.99: Proportional government sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 2.1 | 0.7 | 1.9 | 3.0 | 21.1 | 6.6 | 8.7 | 5.8 | 4.5 | 4.0 |
| Nanotechnology | 0.0 | 0.0 | 0.4 | 0.0 | 0.4 | 0.4 | 1.0 | 1.0 | 0.7 | 0.6 |
| **Total** | **2.1** | **0.7** | **2.3** | **3.0** | **21.6** | **7.0** | **9.7** | **6.8** | **5.2** | **4.6** |

### Table C.100: Government sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF R&D | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 109 774 | 170 304 | 194 564 | 232 090 | 192 774 |
| Open source software | 4 | 21 494 | 4 658 | 7 238 | 7 261 | 1 345 | 1 501 | 0 | 0 | 0 |
| New materials | 1 054 | 630 | 726 | 7 156 | 26 166 | 4 107 | 28 708 | 30 945 | 12 062 | 5 291 |
| Tuberculosis (TB), HIV/AIDS, malaria | 64 750 | 263 | 240 | 199 977 | 174 382 | 167 522 | 132 264 | 380 640 | 359 074 | 389 279 |
| **Total** | **65 808** | **22 387** | **5 624** | **214 371** | **207 809** | **282 748** | **332 777** | **411 585** | **371 135** | **587 343** |
| Government expenditure on R&D | 1 021 355 | 1 154 399 | 1 139 676 | 1 067 302 | 1 011 340 | 1 235 669 | 1 437 509 | 1 697 151 | 1 893 010 | 2 013 021 |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.101: Proportional government sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF R&D | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 8.9 | 11.8 | 11.5 | 12.3 | 9.6 |
| Open source software | 0.0 | 1.9 | 0.4 | 0.7 | 0.7 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| New materials | 0.1 | 0.1 | 0.1 | 0.7 | 2.6 | 0.3 | 2.0 | 1.8 | 0.6 | 0.3 |
| Tuberculosis (TB), HIV/AIDS, malaria | 6.3 | 0.0 | 0.0 | 18.7 | 17.2 | 13.6 | 9.2 | 22.4 | 19.0 | 19.3 |
| **Total** | **6.4** | **1.9** | **0.5** | **20.1** | **20.5** | **22.9** | **23.1** | **24.3** | **19.6** | **29.2** |

**Table C.102: Government sector R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **808 404** | **874 425** | **824 394** | **806 995** | **634 237** | **863 949** | **1 045 006** | **1 359 179** | **1 558 094** | **1 520 894** |
| Mathematical sciences | 24 823 | 20 643 | 20 704 | 24 441 | 22 811 | 2 349 | 1 076 | 1 525 | 28 302 | 397 |
| Physical sciences | 24 726 | 45 052 | 45 804 | 12 093 | 0 | 0 | 5 064 | 0 | 30 154 | 26 455 |
| Chemical sciences | 16 622 | 22 672 | 17 009 | 21 698 | 10 653 | 1 223 | 21 823 | 19 394 | 61 881 | 61 688 |
| Earth sciences | 109 959 | 161 815 | 163 156 | 47 624 | 42 081 | 39 303 | 90 571 | 65 501 | 139 388 | 79 942 |
| Information, computer and communication technologies | 56 323 | 82 123 | 22 191 | 28 176 | 31 960 | 15 642 | 7 760 | 8 431 | 12 141 | 4 662 |
| Applied sciences and technologies | 31 603 | 15 286 | 15 852 | 9 315 | 4 154 | 10 183 | 32 467 | 23 216 | 29 723 | 22 531 |
| Engineering sciences | 26 008 | 14 164 | 11 487 | 14 996 | 4 165 | 4 515 | 10 430 | 11 853 | 13 176 | 12 129 |
| Biological sciences | 99 841 | 113 409 | 125 152 | 54 893 | 85 990 | 94 662 | 111 871 | 138 000 | 152 735 | 196 053 |
| Agricultural sciences | 170 347 | 208 662 | 200 598 | 274 781 | 225 441 | 362 241 | 460 921 | 397 687 | 506 445 | 471 798 |
| Medical and health sciences | 187 741 | 173 929 | 180 260 | 288 488 | 168 400 | 270 312 | 211 840 | 594 684 | 553 534 | 608 530 |
| Environmental sciences | 40 851 | 8 589 | 11 675 | 10 722 | 9 147 | 34 231 | 54 394 | 55 245 | 14 353 | 14 478 |
| Material sciences | 158 | 637 | 640 | 0 | 0 | 4 107 | 9 771 | 10 537 | 0 | 0 |
| Marine sciences | 19 402 | 7 445 | 9 866 | 19 768 | 29 434 | 25 182 | 27 019 | 33 106 | 16 262 | 22 232 |
| **Division 2: Social Sciences and Humanities** | **212 951** | **279 974** | **315 282** | **260 308** | **377 103** | **371 720** | **392 503** | **337 972** | **334 916** | **492 127** |
| Social sciences | 189 155 | 235 299 | 268 058 | 249 155 | 363 055 | 358 892 | 383 172 | 326 603 | 328 522 | 479 316 |
| Humanities | 23 796 | 44 676 | 47 225 | 11 152 | 14 048 | 12 828 | 9 331 | 11 369 | 6 394 | 12 811 |
| **Total** | **1 021 355** | **1 154 399** | **1 139 676** | **1 067 302** | **1 011 340** | **1 235 669** | **1 437 509** | **1 697 151** | **1 893 010** | **2 013 021** |

**Table C.103: Proportional government sector R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **79.2** | **75.7** | **72.3** | **75.6** | **62.7** | **69.9** | **72.7** | **80.1** | **82.3** | **75.6** |
| Mathematical sciences | 2.4 | 1.8 | 1.8 | 2.3 | 2.3 | 0.2 | 0.1 | 0.1 | 1.5 | 0.0 |
| Physical sciences | 2.4 | 3.9 | 4.0 | 1.1 | 0.0 | 0.0 | 0.4 | 0.0 | 1.6 | 1.3 |
| Chemical sciences | 1.6 | 2.0 | 1.5 | 2.0 | 1.1 | 0.1 | 1.5 | 1.1 | 3.3 | 3.1 |
| Earth sciences | 10.8 | 14.0 | 14.3 | 4.5 | 4.2 | 3.2 | 6.3 | 3.9 | 7.4 | 4.0 |

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Information, computer and communication technologies | 5.5 | 7.1 | 1.9 | 2.6 | 3.2 | 1.3 | 0.5 | 0.5 | 0.6 | 0.2 |
| Applied sciences and technologies | 3.1 | 1.3 | 1.4 | 0.9 | 0.4 | 0.8 | 2.3 | 1.4 | 1.6 | 1.1 |
| Engineering sciences | 2.5 | 1.2 | 1.0 | 1.4 | 0.4 | 0.4 | 0.7 | 0.7 | 0.7 | 0.6 |
| Biological sciences | 9.8 | 9.8 | 11.0 | 5.1 | 8.5 | 7.7 | 7.8 | 8.1 | 8.1 | 9.7 |
| Agricultural sciences | 16.7 | 18.1 | 17.6 | 25.7 | 22.3 | 29.3 | 32.1 | 23.4 | 26.8 | 23.4 |
| Medical and health sciences | 18.4 | 15.1 | 15.8 | 27.0 | 16.7 | 21.9 | 14.7 | 35.0 | 29.2 | 30.2 |
| Environmental sciences | 4.0 | 0.7 | 1.0 | 1.0 | 0.9 | 2.8 | 3.8 | 3.3 | 0.8 | 0.7 |
| Material sciences | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.3 | 0.7 | 0.6 | 0.0 | 0.0 |
| Marine sciences | 1.9 | 0.6 | 0.9 | 1.9 | 2.9 | 2.0 | 1.9 | 2.0 | 0.9 | 1.1 |
| **Division 2: Social Sciences and Humanities** | **20.8** | **24.3** | **27.7** | **24.4** | **37.3** | **30.1** | **27.3** | **19.9** | **17.7** | **24.4** |
| Social sciences | 18.5 | 20.4 | 23.5 | 23.3 | 35.9 | 29.0 | 26.7 | 19.2 | 17.4 | 23.8 |
| Humanities | 2.3 | 3.9 | 4.1 | 1.0 | 1.4 | 1.0 | 0.6 | 0.7 | 0.3 | 0.6 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.104: Government sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **50 000** | **0** | **0** | **0** | **2 303** | **2 736** | **19 314** | **21 118** | **21 472** | **42 233** |
| Defence | 50 000 | 0 | 0 | 0 | 2 303 | 2 736 | 19 314 | 21 118 | 21 472 | 42 233 |
| **Division 2: Economic Development** | **350 497** | **429 646** | **373 251** | **438 114** | **500 343** | **469 129** | **480 373** | **510 688** | **763 932** | **745 129** |
| Economic Development unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plant production and plant primary products | 45 951 | 79 290 | 66 503 | 63 570 | 64 400 | 70 754 | 100 956 | 89 446 | 107 672 | 92 506 |
| Animal production and animal primary products | 66 655 | 79 997 | 78 619 | 84 842 | 91 877 | 86 710 | 93 504 | 137 279 | 156 437 | 125 737 |
| Mineral resources (excluding Energy) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 311 | 5 403 | 6 548 |
| Energy resources | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 1 023 | 12 062 | 5 291 |
| Energy supply | 8 905 | 14 290 | 12 387 | 2 522 | 6 154 | 10 552 | 7 193 | 8 482 | 34 845 | 29 705 |
| Manufacturing | 79 | 318 | 320 | 5 444 | 15 870 | 1 005 | 1 557 | 1 544 | 79 583 | 1 318 |
| Construction | 3 911 | 3 219 | 2 484 | 0 | 148 | 9 545 | 543 | 741 | 4 312 | 1 394 |
| Transport | 21 710 | 15 386 | 12 073 | 4 369 | 9 377 | 10 964 | 8 774 | 1 672 | 24 105 | 21 537 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Information and communication services | 32 858 | 69 318 | 11 965 | 13 244 | 44 257 | 20 590 | 5 678 | 5 515 | 14 397 | 7 977 |
| Commercial services | 4 908 | 6 897 | 2 405 | 9 957 | 7 471 | 4 708 | 3 587 | 12 162 | 15 532 | 13 531 |
| Economic framework | 76 965 | 98 537 | 105 080 | 161 326 | 187 931 | 157 364 | 161 541 | 116 604 | 167 690 | 262 289 |
| Natural resources | 88 558 | 62 394 | 81 415 | 92 838 | 72 820 | 96 938 | 97 042 | 135 909 | 141 895 | 177 298 |
| **Division 3: Society** | **341 911** | **265 948** | **285 961** | **326 691** | **341 387** | **538 749** | **592 285** | **872 096** | **912 216** | **952 108** |
| Society unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Health | 150 704 | 69 493 | 74 784 | 77 845 | 106 522 | 221 435 | 171 741 | 487 130 | 475 983 | 482 472 |
| Education and training | 112 042 | 111 407 | 127 907 | 158 579 | 42 234 | 69 185 | 116 788 | 165 906 | 174 540 | 209 544 |
| Social development and community services | 79 165 | 85 048 | 83 270 | 90 268 | 192 630 | 248 129 | 303 756 | 219 061 | 261 693 | 260 092 |
| **Division 4: Environment** | **105 792** | **103 372** | **99 985** | **72 614** | **85 347** | **130 742** | **199 677** | **172 006** | **127 394** | **191 334** |
| Environment unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Environmental knowledge | 74 710 | 71 734 | 83 429 | 45 360 | 40 610 | 83 089 | 137 679 | 124 445 | 91 677 | 107 265 |
| Environmental aspects of development | 8 112 | 20 797 | 12 424 | 18 153 | 27 635 | 38 467 | 51 795 | 38 877 | 27 206 | 53 541 |
| Environmental and other aspects | 22 970 | 10 841 | 4 132 | 9 101 | 17 102 | 9 186 | 10 204 | 8 684 | 8 511 | 30 528 |
| **Division 5: Advancement of Knowledge** | **173 155** | **355 434** | **380 480** | **229 883** | **81 960** | **94 314** | **145 860** | **121 243** | **67 996** | **82 217** |
| Advancement of Knowledge unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Natural sciences, technologies and engineering | 149 847 | 324 409 | 333 561 | 205 995 | 50 968 | 61 357 | 120 173 | 96 381 | 43 170 | 58 401 |
| Social sciences and humanities | 23 309 | 31 025 | 46 919 | 23 888 | 30 992 | 32 956 | 25 687 | 24 862 | 24 825 | 23 816 |
| **Total** | **1 021 355** | **1 154 400** | **1 139 676** | **1 067 302** | **1 011 340** | **1 235 669** | **1 437 509** | **1 697 151** | **1 893 010** | **2 013 021** |

**Table C.105: Proportional government sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **4.9** | **0.0** | **0.0** | **0.0** | **0.2** | **0.2** | **1.3** | **1.2** | **1.1** | **2.1** |
| Defence | 4.9 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 1.3 | 1.2 | 1.1 | 2.1 |
| **Division 2: Economic Development** | **34.3** | **37.2** | **32.8** | **41.0** | **49.5** | **38.0** | **33.4** | **30.1** | **40.4** | **37.0** |
| Economic Development unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plant production and plant primary products | 4.5 | 6.9 | 5.8 | 6.0 | 6.4 | 5.7 | 7.0 | 5.3 | 5.7 | 4.6 |
| Animal production and animal primary products | 6.5 | 6.9 | 6.9 | 7.9 | 9.1 | 7.0 | 6.5 | 8.1 | 8.3 | 6.2 |
| Mineral resources (excluding Energy) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.3 |
| Energy resources | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.6 | 0.3 |
| Energy supply | 0.9 | 1.2 | 1.1 | 0.2 | 0.6 | 0.9 | 0.5 | 0.5 | 1.8 | 1.5 |
| Manufacturing | 0.0 | 0.0 | 0.0 | 0.5 | 1.6 | 0.1 | 0.1 | 0.1 | 4.2 | 0.1 |
| Construction | 0.4 | 0.3 | 0.2 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.2 | 0.1 |
| Transport | 2.1 | 1.3 | 1.1 | 0.4 | 0.9 | 0.9 | 0.6 | 0.1 | 1.3 | 1.1 |
| Information and communication services | 3.2 | 6.0 | 1.0 | 1.2 | 4.4 | 1.7 | 0.4 | 0.3 | 0.8 | 0.4 |
| Commercial services | 0.5 | 0.6 | 0.2 | 0.9 | 0.7 | 0.4 | 0.2 | 0.7 | 0.8 | 0.7 |
| Economic framework | 7.5 | 8.5 | 9.2 | 15.1 | 18.6 | 12.7 | 11.2 | 6.9 | 8.9 | 13.0 |
| Natural resources | 8.7 | 5.4 | 7.1 | 8.7 | 7.2 | 7.8 | 6.8 | 8.0 | 7.5 | 8.8 |
| **Division 3: Society** | **33.5** | **23.0** | **25.1** | **30.6** | **33.8** | **43.6** | **41.2** | **51.4** | **48.2** | **47.3** |
| Society unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health | 14.8 | 6.0 | 6.6 | 7.3 | 10.5 | 17.9 | 11.9 | 28.7 | 25.1 | 24.0 |
| Education and training | 11.0 | 9.7 | 11.2 | 14.9 | 4.2 | 5.6 | 8.1 | 9.8 | 9.2 | 10.4 |
| Social development and community services | 7.8 | 7.4 | 7.3 | 8.5 | 19.0 | 20.1 | 21.1 | 12.9 | 13.8 | 12.9 |
| **Division 4: Environment** | **10.4** | **9.0** | **8.8** | **6.8** | **8.4** | **10.6** | **13.9** | **10.1** | **6.7** | **9.5** |
| Environment unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Environmental knowledge | 7.3 | 6.2 | 7.3 | 4.2 | 4.0 | 6.7 | 9.6 | 7.3 | 4.8 | 5.3 |
| Environmental aspects of development | 0.8 | 1.8 | 1.1 | 1.7 | 2.7 | 3.1 | 3.6 | 2.3 | 1.4 | 2.7 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Environmental and other aspects | 2.2 | 0.9 | 0.4 | 0.9 | 1.7 | 0.7 | 0.7 | 0.5 | 0.4 | 1.5 |
| **Division 5: Advancement of Knowledge** | **17.0** | **30.8** | **33.4** | **21.5** | **8.1** | **7.6** | **10.1** | **7.1** | **3.6** | **4.1** |
| Advancement of Knowledge unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural sciences, technologies and engineering | 14.7 | 28.1 | 29.3 | 19.3 | 5.0 | 5.0 | 8.4 | 5.7 | 2.3 | 2.9 |
| Social sciences and humanities | 2.3 | 2.7 | 4.1 | 2.2 | 3.1 | 2.7 | 1.8 | 1.5 | 1.3 | 1.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.106: Government sector R&D expenditure by province (2006/07 to 2015/16)**

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| Eastern Cape | 109 779 | 122 191 | 107 929 | 100 100 | 114 127 | 127 415 | 194 258 | 133 657 | 227 427 | 225 603 |
| Free State | 69 314 | 62 116 | 58 697 | 46 155 | 39 998 | 44 200 | 38 659 | 55 095 | 60 860 | 61 802 |
| Gauteng | 321 176 | 292 757 | 264 273 | 396 124 | 343 096 | 447 635 | 427 173 | 689 915 | 760 199 | 832 397 |
| KwaZulu-Natal | 84 192 | 76 458 | 115 302 | 54 914 | 48 056 | 126 857 | 168 029 | 161 962 | 177 517 | 187 088 |
| Limpopo | 31 118 | 40 217 | 55 252 | 60 421 | 57 797 | 65 017 | 74 621 | 95 668 | 83 683 | 84 232 |
| Mpumalanga | 50 568 | 74 690 | 39 103 | 68 796 | 69 980 | 78 335 | 80 201 | 77 479 | 93 566 | 112 173 |
| North-West | 32 889 | 42 500 | 70 741 | 29 176 | 43 048 | 44 618 | 45 573 | 73 576 | 56 719 | 61 815 |
| Northern Cape | 64 733 | 66 921 | 52 907 | 77 978 | 58 918 | 63 556 | 75 440 | 61 932 | 52 579 | 69 174 |
| Western Cape | 257 586 | 376 550 | 375 473 | 233 639 | 236 320 | 238 035 | 333 555 | 347 869 | 380 461 | 378 737 |
| **Total** | **1 021 355** | **1 154 399** | **1 139 676** | **1 067 302** | **1 011 340** | **1 235 669** | **1 437 509** | **1 697 151** | **1 893 010** | **2 013 021** |

**Table C.107: Proportional government sector R&D expenditure by province (2006/07 to 2015/16)**

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Eastern Cape | 10.7 | 10.6 | 9.5 | 9.4 | 11.3 | 10.3 | 13.5 | 7.9 | 12.0 | 11.2 |
| Free State | 6.8 | 5.4 | 5.2 | 4.3 | 4.0 | 3.6 | 2.7 | 3.2 | 3.2 | 3.1 |
| Gauteng | 31.4 | 25.4 | 23.2 | 37.1 | 33.9 | 36.2 | 29.7 | 40.7 | 40.2 | 41.4 |
| KwaZulu-Natal | 8.2 | 6.6 | 10.1 | 5.1 | 4.8 | 10.3 | 11.7 | 9.5 | 9.4 | 9.3 |
| Limpopo | 3.0 | 3.5 | 4.8 | 5.7 | 5.7 | 5.3 | 5.2 | 5.6 | 4.4 | 4.2 |
| Mpumalanga | 5.0 | 6.5 | 3.4 | 6.4 | 6.9 | 6.3 | 5.6 | 4.6 | 4.9 | 5.6 |
| North-West | 3.2 | 3.7 | 6.2 | 2.7 | 4.3 | 3.6 | 3.2 | 4.3 | 3.0 | 3.1 |
| Northern Cape | 6.3 | 5.8 | 4.6 | 7.3 | 5.8 | 5.1 | 5.2 | 3.6 | 2.8 | 3.4 |
| Western Cape | 25.2 | 32.6 | 32.9 | 21.9 | 23.4 | 19.3 | 23.2 | 20.5 | 20.1 | 18.8 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |



**Table C.108: Government sector R&D personnel in headcounts and full-time equivalents by occupation (2006/07 to 2015/16)**

| YEAR | HEADCOUNTS | | | | FULL-TIME EQUIVALENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL |
| 2006/07 | 2924 | 1111 | 831 | 982 | 2068.3 | 784.6 | 555.7 | 728.0 |
| 2007/08 | 2794 | 1138 | 739 | 917 | 1950.0 | 757.6 | 495.6 | 696.9 |
| 2008/09 | 2963 | 1169 | 744 | 1050 | 2073.9 | 805.0 | 495.2 | 773.7 |
| 2009/10 | 2580 | 986 | 509 | 1085 | 1903.9 | 680.4 | 356.8 | 866.7 |
| 2010/11 | 2704 | 1184 | 421 | 1099 | 2178.6 | 874.2 | 352.9 | 951.6 |
| 2011/12 | 3143 | 1411 | 432 | 1300 | 2404.5 | 1009.8 | 330.4 | 1 064.3 |
| 2012/13 | 3252 | 1409 | 517 | 1326 | 2597.0 | 1091.4 | 385.8 | 1 119.9 |
| 2013/14 | 2874 | 1229 | 518 | 1127 | 2245.5 | 923.7 | 366.3 | 955.4 |
| 2014/15 | 2893 | 1343 | 550 | 1000 | 2181.5 | 970.0 | 337.9 | 873.5 |
| 2015/16 | 2997 | 1573 | 537 | 887 | 2056.2 | 953.9 | 365.7 | 736.7 |

**Table C.109: Government sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2013/14, 2014/15 and 2015/16)**

| YEAR | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | | | |
|---|---|---|---|---|---|---|---|
| 2013/14 | TOTAL | MALE | FEMALE | TOTAL | MALE | FEMALE | FTEs AS % OF HEADCOUNTS |
| Researchers | 1 229 | 586 | 643 | 923.7 | 456.8 | 466.9 | 75.2 |
| Technicians directly supporting R&D | 518 | 280 | 238 | 366.3 | 206.0 | 160.3 | 70.7 |
| Other personnel directly supporting R&D | 1 127 | 746 | 381 | 955.4 | 650.8 | 304.7 | 84.8 |
| **Total** | **2 874** | **1 612** | **1 262** | **2 245.5** | **1 313.6** | **931.9** | **78.1** |
| **2014/15** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 1 343 | 615 | 728 | 970.0 | 460.1 | 509.9 | 72.2 |
| Technicians directly supporting R&D | 550 | 298 | 252 | 337.9 | 200.1 | 137.8 | 61.4 |
| Other personnel directly supporting R&D | 1 000 | 680 | 320 | 873.5 | 617.6 | 255.9 | 87.3 |
| **Total** | **2 893** | **1 593** | **1 300** | **2 181.5** | **1 277.8** | **903.6** | **75.4** |
| **2015/16** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 1 573 | 727 | 846 | 953.9 | 462.6 | 491.3 | 60.6 |
| Technicians directly supporting R&D | 537 | 290 | 247 | 365.7 | 204.3 | 161.5 | 68.1 |
| Other personnel directly supporting R&D | 887 | 576 | 311 | 736.7 | 502.7 | 234.0 | 83.0 |
| **Total** | **2 997** | **1 593** | **1 404** | **2 056.2** | **1 169.5** | **886.7** | **68.6** |

**Table C.110: Government sector R&D personnel in headcounts by occupation, qualification, population group and gender (2015/16)**

| OCCUPATION AND QUALIFICATION | TOTAL | SUBTOTAL | | AFRICAN | | COLOURED | | INDIAN | | WHITE | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE |
| **Researchers** | **1 573** | **727** | **846** | **392** | **434** | **47** | **62** | **35** | **75** | **253** | **275** |
| Doctoral degree or equivalent | 291 | 155 | 136 | 44 | 24 | 9 | 4 | 11 | 15 | 91 | 93 |
| Masters, honours, bachelor or equivalent | 1 179 | 527 | 652 | 322 | 367 | 34 | 54 | 21 | 55 | 150 | 176 |
| Diplomas | 103 | 45 | 58 | 26 | 43 | 4 | 4 | 3 | 5 | 12 | 6 |
| **Technicians directly supporting R&D** | **537** | **290** | **247** | **178** | **146** | **38** | **29** | **7** | **12** | **67** | **60** |
| Doctoral degree or equivalent | 4 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| Masters, honours, bachelor or equivalent | 301 | 160 | 141 | 114 | 86 | 9 | 14 | 6 | 8 | 31 | 33 |
| Diplomas | 232 | 128 | 104 | 63 | 60 | 29 | 15 | 1 | 4 | 35 | 25 |
| **Other personnel directly supporting R&D** | **887** | **576** | **311** | **409** | **195** | **135** | **51** | **1** | **8** | **31** | **57** |
| Doctoral degree or equivalent | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Masters, honours, bachelor or equivalent | 44 | 16 | 28 | 8 | 11 | 2 | 5 | 0 | 2 | 6 | 10 |
| Diplomas | 842 | 560 | 282 | 401 | 184 | 133 | 46 | 1 | 6 | 25 | 46 |
| **Total** | **2 997** | **1 593** | **1 404** | **979** | **775** | **220** | **142** | **43** | **95** | **351** | **392** |

## C.2.4. Science councils sector

**Table C.111: Science councils sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| Basic research | 647 191 | 804 731 | 776 406 | 776 505 | 871 635 | 900 830 | 937 826 | 970 785 | 1 166 491 | 1 348 533 |
| Applied research | 1 328 996 | 1 314 770 | 1 384 860 | 1 552 560 | 1 531 563 | 1 756 157 | 1 885 484 | 2 114 943 | 2 421 309 | 2 781 198 |
| Experimental research | 768 531 | 766 593 | 976 077 | 1 129 009 | 1 192 825 | 1 072 693 | 1 202 689 | 1 218 827 | 1 416 869 | 1 611 166 |
| **Total** | **2 744 718** | **2 886 094** | **3 137 343** | **3 458 074** | **3 596 023** | **3 729 680** | **4 025 998** | **4 304 556** | **5 004 669** | **5 740 897** |

**Table C.112: Proportional science councils sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Basic research | 23.6 | 27.9 | 24.7 | 22.5 | 24.2 | 24.2 | 23.3 | 22.6 | 23.3 | 23.5 |
| Applied research | 48.4 | 45.6 | 44.1 | 44.9 | 42.6 | 47.1 | 46.8 | 49.1 | 48.4 | 48.4 |
| Experimental research | 28.0 | 26.6 | 31.1 | 32.6 | 33.2 | 28.8 | 29.9 | 28.3 | 28.3 | 28.1 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.113: Science councils sector R&D expenditure by accounting category (2006/07 to 2015/16)

| TYPE OF EXPENDITURE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 212 625 | 205 857 | 383 927 | 452 801 | 291 830 | 323 070 | 275 750 | 323 190 | 598 429 | 916 480 |
| Land: buildings & other structures | 53 713 | 30 704 | 61 063 | 107 455 | 56 141 | 65 442 | 68 565 | 71 602 | 362 246 | 162 904 |
| Vehicles, plant, machinery, equipment | 158 912 | 175 153 | 322 864 | 345 346 | 235 689 | 257 628 | 207 185 | 251 588 | 236 183 | 753 576 |
| Current expenditure | 2 532 093 | 2 680 237 | 2 753 416 | 3 005 273 | 3 304 193 | 3 406 610 | 3 750 248 | 3 981 366 | 4 406 240 | 4 824 418 |
| Labour costs | 1 162 633 | 1 250 480 | 1 283 210 | 1 413 128 | 1 293 033 | 1 531 460 | 2 053 204 | 2 187 401 | 1 986 918 | 2 142 875 |
| Other current expenditure | 1 369 460 | 1 429 757 | 1 470 206 | 1 592 145 | 2 011 160 | 1 875 150 | 1 697 044 | 1 793 965 | 2 419 322 | 2 681 543 |
| **Total** | **2 744 718** | **2 886 094** | **3 137 343** | **3 458 074** | **3 596 023** | **3 729 680** | **4 025 998** | **4 304 556** | **5 004 669** | **5 740 897** |

### Table C.114: Proportional science councils sector R&D expenditure by accounting category (2006/07 to 2015/16)

| TYPE OF EXPENDITURE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 7.7 | 7.1 | 12.2 | 13.1 | 8.1 | 8.7 | 6.8 | 7.5 | 12.0 | 16.0 |
| Land: buildings & other structures | 2.0 | 1.1 | 1.9 | 3.1 | 1.6 | 1.8 | 1.7 | 1.7 | 7.2 | 2.8 |
| Vehicles, plant, machinery, equipment | 5.8 | 6.1 | 10.3 | 10.0 | 6.6 | 6.9 | 5.1 | 5.8 | 4.7 | 13.1 |
| Current expenditure | 92.3 | 92.9 | 87.8 | 86.9 | 91.9 | 91.3 | 93.2 | 92.5 | 88.0 | 84.0 |
| Labour costs | 42.4 | 43.3 | 40.9 | 40.9 | 36.0 | 41.1 | 51.0 | 50.8 | 39.7 | 37.3 |
| Other current expenditure | 49.9 | 49.5 | 46.9 | 46.0 | 55.9 | 50.3 | 42.2 | 41.7 | 48.3 | 46.7 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.115: Science councils sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 222 190 | 216 292 | 207 250 | 183 844 | 199 934 | 208 466 | 145 671 | 143 868 | 312 793 | 320 048 |
| Nanotechnology | 14 031 | 47 802 | 173 834 | 117 215 | 101 386 | 102 007 | 118 555 | 114 990 | 125 107 | 139 107 |
| **Total** | **236 221** | **264 094** | **381 084** | **301 058** | **301 320** | **310 473** | **264 226** | **258 857** | **437 900** | **459 154** |
| Science councils expenditure on R&D | 2 744 718 | 2 886 094 | 3 137 343 | 3 458 074 | 3 596 023 | 3 729 680 | 4 025 998 | 4 304 556 | 5 004 669 | 5 740 897 |

### Table C.116: Science councils sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 8.1 | 7.5 | 6.6 | 5.3 | 5.6 | 5.6 | 3.6 | 3.3 | 6.3 | 5.6 |
| Nanotechnology | 0.5 | 1.7 | 5.5 | 3.4 | 2.8 | 2.7 | 2.9 | 2.7 | 2.5 | 2.4 |
| **Total** | **8.6** | **9.2** | **12.1** | **8.7** | **8.4** | **8.3** | **6.6** | **6.0** | **8.7** | **8.0** |

### Table C.117: Science councils sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF INTEREST | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 770 339 | 378 782 | 297 097 | 1 037 320 | 1 054 651 |
| Open source software | 27 510 | 77 885 | 67 833 | 15 013 | 7 228 | 15 982 | 36 636 | 0 | 389 871 | 692 096 |
| New materials | 82 990 | 64 131 | 157 134 | 94 304 | 201 071 | 197 430 | 751 305 | 229 854 | 358 361 | 374 463 |
| Tuberculosis (TB), HIV/AIDS, malaria | 180 104 | 233 917 | 490 982 | 333 841 | 386 948 | 399 070 | 455 311 | 398 880 | 346 751 | 470 488 |
| **Total** | **290 604** | **375 933** | **715 949** | **443 158** | **595 247** | **1 382 821** | **1 622 034** | **925 831** | **2 132 304** | **2 591 697** |
| Science councils expenditure on R&D | 2 744 718 | 2 886 094 | 3 137 343 | 3 458 074 | 3 596 023 | 3 729 680 | 4 025 998 | 4 304 556 | 5 004 669 | 5 740 897 |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.118: Proportional science councils sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF INTEREST | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 20.7 | 9.4 | 6.9 | 20.7 | 18.4 |
| Open source software | 1.0 | 2.7 | 2.2 | 0.4 | 0.2 | 0.4 | 0.9 | 0.0 | 7.8 | 12.1 |
| New materials | 3.0 | 2.2 | 5.0 | 2.7 | 5.6 | 5.3 | 18.7 | 5.3 | 7.2 | 6.5 |
| Tuberculosis (TB), HIV/AIDS, malaria | 6.6 | 8.1 | 15.6 | 9.7 | 10.8 | 10.7 | 11.3 | 9.3 | 6.9 | 8.2 |
| **Total** | **10.6** | **13.0** | **22.8** | **12.8** | **16.6** | **37.1** | **40.3** | **21.5** | **42.6** | **45.1** |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.119: Science councils sector R&D expenditure by research field (2006/07 to 2015/16)

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **2 530 246** | **2 623 455** | **2 916 350** | **3 258 392** | **3 414 985** | **3 517 520** | **3 819 642** | **4 109 105** | **4 800 742** | **5 486 847** |
| Mathematical sciences | 27 129 | 35 551 | 40 632 | 37 678 | 113 396 | 117 637 | 134 046 | 128 291 | 48 258 | 54 212 |
| Physical sciences | 126 542 | 93 583 | 115 737 | 87 221 | 97 922 | 120 267 | 123 267 | 129 568 | 263 302 | 418 648 |
| Chemical sciences | 33 774 | 37 430 | 44 271 | 49 462 | 8 074 | 20 972 | 14 078 | 18 166 | 63 775 | 71 024 |
| Earth sciences | 130 879 | 147 427 | 167 463 | 179 999 | 94 642 | 100 921 | 112 406 | 110 092 | 162 880 | 181 876 |

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Information, computer and communication technologies | 133 328 | 212 796 | 201 731 | 265 191 | 161 282 | 168 115 | 181 521 | 182 402 | 780 044 | 977 891 |
| Applied sciences and technologies | 126 107 | 138 849 | 139 267 | 153 830 | 924 104 | 954 616 | 1 092 098 | 1 046 934 | 277 649 | 296 162 |
| Engineering sciences | 642 923 | 643 349 | 863 084 | 947 315 | 365 980 | 278 125 | 292 940 | 349 666 | 1 001 486 | 1 107 289 |
| Biological sciences | 306 056 | 175 592 | 171 810 | 200 625 | 437 938 | 425 036 | 485 673 | 482 728 | 148 268 | 144 341 |
| Agricultural sciences | 521 454 | 566 561 | 442 060 | 647 750 | 479 449 | 582 438 | 594 638 | 859 600 | 1 075 165 | 1 043 494 |
| Medical and health sciences | 340 764 | 358 726 | 447 479 | 440 895 | 428 642 | 443 156 | 426 520 | 430 472 | 596 600 | 775 858 |
| Environmental sciences | 72 191 | 85 414 | 101 920 | 112 327 | 273 283 | 284 116 | 330 667 | 326 122 | 228 909 | 240 075 |
| Material sciences | 51 020 | 108 068 | 155 529 | 106 411 | 23 199 | 15 462 | 22 905 | 35 093 | 113 457 | 133 231 |
| Marine sciences | 18 078 | 20 108 | 25 368 | 29 689 | 7 073 | 6 656 | 8 885 | 9 970 | 40 949 | 42 747 |
| **Division 2: Social Sciences and Humanities** | **214 472** | **262 639** | **220 993** | **199 682** | **181 038** | **212 160** | **206 356** | **195 452** | **203 927** | **254 050** |
| Social sciences | 194 040 | 238 019 | 194 646 | 182 431 | 164 954 | 190 845 | 186 132 | 173 407 | 179 456 | 223 966 |
| Humanities | 20 432 | 24 620 | 26 347 | 17 250 | 16 084 | 21 315 | 20 224 | 22 044 | 24 471 | 30 084 |
| **Total** | **2 744 718** | **2 886 094** | **3 137 343** | **3 458 074** | **3 596 023** | **3 729 680** | **4 025 998** | **4 304 556** | **5 004 669** | **5 740 897** |

**Table C.120: Proportional science councils sector R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **92.2** | **90.9** | **93.0** | **94.2** | **95.0** | **94.3** | **94.9** | **95.5** | **95.9** | **95.6** |
| Mathematical sciences | 1.0 | 1.2 | 1.3 | 1.1 | 3.2 | 3.2 | 3.3 | 3.0 | 1.0 | 0.9 |
| Physical sciences | 4.6 | 3.2 | 3.7 | 2.5 | 2.7 | 3.2 | 3.1 | 3.0 | 5.3 | 7.3 |
| Chemical sciences | 1.2 | 1.3 | 1.4 | 1.4 | 0.2 | 0.6 | 0.3 | 0.4 | 1.3 | 1.2 |
| Earth sciences | 4.8 | 5.1 | 5.3 | 5.2 | 2.6 | 2.7 | 2.8 | 2.6 | 3.3 | 3.2 |
| Information, computer and communication technologies | 4.9 | 7.4 | 6.4 | 7.7 | 4.5 | 4.5 | 4.5 | 4.2 | 15.6 | 17.0 |
| Applied sciences and technologies | 4.6 | 4.8 | 4.4 | 4.4 | 25.7 | 25.6 | 27.1 | 24.3 | 5.5 | 5.2 |
| Engineering sciences | 23.4 | 22.3 | 27.5 | 27.4 | 10.2 | 7.5 | 7.3 | 8.1 | 20.0 | 19.3 |
| Biological sciences | 11.2 | 6.1 | 5.5 | 5.8 | 12.2 | 11.4 | 12.1 | 11.2 | 3.0 | 2.5 |
| Agricultural sciences | 19.0 | 19.6 | 14.1 | 18.7 | 13.3 | 15.6 | 14.8 | 20.0 | 21.5 | 18.2 |
| Medical and health sciences | 12.4 | 12.4 | 14.3 | 12.7 | 11.9 | 11.9 | 10.6 | 10.0 | 11.9 | 13.5 |

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Environmental sciences | 2.6 | 3.0 | 3.2 | 3.2 | 7.6 | 7.6 | 8.2 | 7.6 | 4.6 | 4.2 |
| Material sciences | 1.9 | 3.7 | 5.0 | 3.1 | 0.6 | 0.4 | 0.6 | 0.8 | 2.3 | 2.3 |
| Marine sciences | 0.7 | 0.7 | 0.8 | 0.9 | 0.2 | 0.2 | 0.2 | 0.2 | 0.8 | 0.7 |
| **Division 2: Social Sciences and Humanities** | **7.8** | **9.1** | **7.0** | **5.8** | **5.0** | **5.7** | **5.1** | **4.5** | **4.1** | **4.4** |
| Social sciences | 7.1 | 8.2 | 6.2 | 5.3 | 4.6 | 5.1 | 4.6 | 4.0 | 3.6 | 3.9 |
| Humanities | 0.7 | 0.9 | 0.8 | 0.5 | 0.4 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.121: Science councils sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **260 354** | **228 603** | **280 219** | **311 288** | **228 376** | **243 083** | **279 989** | **262 203** | **762 464** | **826 261** |
| Defence | 260 354 | 228 603 | 280 219 | 311 288 | 228 376 | 243 083 | 279 989 | 262 203 | 762 464 | 826 261 |
| **Division 2: Economic Development** | **1 172 607** | **1 560 688** | **1 592 110** | **1 834 253** | **2 111 033** | **2 191 098** | **2 400 747** | **2 686 504** | **2 306 795** | **2 529 244** |
| Economic Development unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plant production and plant primary products | 332 655 | 433 850 | 349 907 | 485 470 | 478 437 | 448 531 | 473 133 | 624 675 | 413 737 | 396 612 |
| Animal production and animal primary products | 115 649 | 25 124 | 18 760 | 27 043 | 25 193 | 280 542 | 287 431 | 419 259 | 269 519 | 247 883 |
| Mineral resources (excluding Energy) | 62 585 | 63 469 | 67 418 | 387 531 | 294 203 | 202 919 | 213 007 | 234 273 | 232 114 | 265 006 |
| Energy resources | 51 257 | 38 979 | 379 859 | 32 136 | 90 342 | 94 385 | 108 360 | 106 823 | 5 590 | 5 063 |
| Energy supply | 8 033 | 874 | 0 | 0 | 0 | 14 715 | 13 237 | 2 937 | 0 | 0 |
| Manufacturing | 130 396 | 385 822 | 225 227 | 262 443 | 366 380 | 351 021 | 400 864 | 393 152 | 88 746 | 146 395 |
| Construction | 149 809 | 101 232 | 116 781 | 129 922 | 222 124 | 220 595 | 256 024 | 245 333 | 31 034 | 60 828 |
| Transport | 30 943 | 33 817 | 41 260 | 45 848 | 0 | 0 | 0 | 0 | 0 | 0 |
| Information and communication services | 25 177 | 17 429 | 24 146 | 68 506 | 115 342 | 127 021 | 141 495 | 135 629 | 396 310 | 419 252 |
| Commercial services | 3 546 | 8 975 | 19 536 | 5 465 | 14 152 | 15 522 | 25 053 | 19 724 | 5 236 | 5 671 |
| Economic framework | 85 194 | 206 878 | 106 105 | 84 205 | 97 367 | 72 109 | 70 509 | 75 411 | 537 499 | 664 440 |
| Natural resources | 177 363 | 244 239 | 243 111 | 305 685 | 407 492 | 363 738 | 411 634 | 429 288 | 327 009 | 318 094 |
| **Division 3: Society** | **359 982** | **368 010** | **418 385** | **453 428** | **388 244** | **430 876** | **413 060** | **425 943** | **801 370** | **977 159** |
| Society unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Health | 240 248 | 272 905 | 326 340 | 348 407 | 310 760 | 326 500 | 314 412 | 316 987 | 424 639 | 552 314 |
| Education and training | 56 054 | 37 449 | 50 525 | 65 761 | 50 676 | 68 852 | 64 941 | 72 216 | 335 946 | 374 704 |
| Social development and community services | 63 680 | 57 656 | 41 520 | 39 260 | 26 807 | 35 525 | 33 707 | 36 741 | 40 785 | 50 141 |
| **Division 4: Environment** | **225 563** | **263 325** | **338 290** | **355 484** | **52 334** | **31 241** | **39 169** | **46 559** | **422 650** | **455 404** |
| Environment unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Environmental knowledge | 120 806 | 130 041 | 173 945 | 190 926 | 24 043 | 19 956 | 22 939 | 28 295 | 402 820 | 426 582 |
| Environmental aspects of development | 50 877 | 46 190 | 59 943 | 48 262 | 19 333 | 8 623 | 13 665 | 14 071 | 15 824 | 14 179 |
| Environmental and other aspects | 53 880 | 87 094 | 104 402 | 116 296 | 8 958 | 2 662 | 2 565 | 4 194 | 4 006 | 14 644 |
| **Division 5: Advancement of Knowledge** | **726 212** | **465 468** | **508 339** | **503 621** | **816 035** | **833 382** | **893 033** | **883 346** | **711 390** | **952 830** |
| Advancement of Knowledge unclassified | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Natural sciences, technologies and engineering | 616 487 | 361 714 | 407 189 | 381 098 | 674 421 | 694 254 | 760 107 | 746 397 | 422 429 | 620 283 |
| Social sciences and humanities | 109 725 | 103 754 | 101 150 | 122 523 | 141 614 | 139 127 | 132 926 | 136 949 | 288 961 | 332 547 |
| **Total** | **2 744 718** | **2 886 094** | **3 137 343** | **3 458 074** | **3 596 023** | **3 729 680** | **4 025 998** | **4 304 556** | **5 004 669** | **5 740 897** |

**Table C.122: Proportional science councils sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **9.5** | **7.9** | **8.9** | **9.0** | **6.4** | **6.5** | **7.0** | **6.1** | **15.2** | **14.4** |
| Defence | 9.5 | 7.9 | 8.9 | 9.0 | 6.4 | 6.5 | 7.0 | 6.1 | 15.2 | 14.4 |
| **Division 2: Economic Development** | **42.7** | **54.1** | **50.7** | **53.0** | **58.7** | **58.7** | **59.6** | **62.4** | **46.1** | **44.1** |
| Economic Development unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plant production and plant primary products | 12.1 | 15.0 | 11.2 | 14.0 | 13.3 | 12.0 | 11.8 | 14.5 | 8.3 | 6.9 |
| Animal production and animal primary products | 4.2 | 0.9 | 0.6 | 0.8 | 0.7 | 7.5 | 7.1 | 9.7 | 5.4 | 4.3 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Mineral resources (excluding Energy) | 2.3 | 2.2 | 2.1 | 11.2 | 8.2 | 5.4 | 5.3 | 5.4 | 4.6 | 4.6 |
| Energy resources | 1.9 | 1.4 | 12.1 | 0.9 | 2.5 | 2.5 | 2.7 | 2.5 | 0.1 | 0.1 |
| Energy supply | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.3 | 0.1 | 0.0 | 0.0 |
| Manufacturing | 4.8 | 13.4 | 7.2 | 7.6 | 10.2 | 9.4 | 10.0 | 9.1 | 1.8 | 2.6 |
| Construction | 5.5 | 3.5 | 3.7 | 3.8 | 6.2 | 5.9 | 6.4 | 5.7 | 0.6 | 1.1 |
| Transport | 1.1 | 1.2 | 1.3 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Information and communication services | 0.9 | 0.6 | 0.8 | 2.0 | 3.2 | 3.4 | 3.5 | 3.2 | 7.9 | 7.3 |
| Commercial services | 0.1 | 0.3 | 0.6 | 0.2 | 0.4 | 0.4 | 0.6 | 0.5 | 0.1 | 0.1 |
| Economic framework | 3.1 | 7.2 | 3.4 | 2.4 | 2.7 | 1.9 | 1.8 | 1.8 | 10.7 | 11.6 |
| Natural resources | 6.5 | 8.5 | 7.7 | 8.8 | 11.3 | 9.8 | 10.2 | 10.0 | 6.5 | 5.5 |
| **Division 3: Society** | **13.1** | **12.8** | **13.3** | **13.1** | **10.8** | **11.6** | **10.3** | **9.9** | **16.0** | **17.0** |
| Society unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health | 8.8 | 9.5 | 10.4 | 10.1 | 8.6 | 8.8 | 7.8 | 7.4 | 8.5 | 9.6 |
| Education and training | 2.0 | 1.3 | 1.6 | 1.9 | 1.4 | 1.8 | 1.6 | 1.7 | 6.7 | 6.5 |
| Social development and community services | 2.3 | 2.0 | 1.3 | 1.1 | 0.7 | 1.0 | 0.8 | 0.9 | 0.8 | 0.9 |
| **Division 4: Environment** | **8.2** | **9.1** | **10.8** | **10.3** | **1.5** | **0.8** | **1.0** | **1.1** | **8.4** | **7.9** |
| Environment unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Environmental knowledge | 4.4 | 4.5 | 5.5 | 5.5 | 0.7 | 0.5 | 0.6 | 0.7 | 8.0 | 7.4 |
| Environmental aspects of development | 1.9 | 1.6 | 1.9 | 1.4 | 0.5 | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 |
| Environmental and other aspects | 2.0 | 3.0 | 3.3 | 3.4 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.3 |
| **Division 5: Advancement of Knowledge** | **26.5** | **16.1** | **16.2** | **14.6** | **22.7** | **22.3** | **22.2** | **20.5** | **14.2** | **16.6** |
| Advancement of Knowledge unclassified | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural sciences, technologies and engineering | 22.5 | 12.5 | 13.0 | 11.0 | 18.8 | 18.6 | 18.9 | 17.3 | 8.4 | 10.8 |
| Social sciences and humanities | 4.0 | 3.6 | 3.2 | 3.5 | 3.9 | 3.7 | 3.3 | 3.2 | 5.8 | 5.8 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |



### Table C.123: Science councils sector R&D expenditure by province (2006/07 to 2015/16)

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| Eastern Cape | 131 126 | 138 342 | 171 669 | 155 501 | 150 665 | 178 594 | 182 664 | 115 925 | 259 128 | 269 658 |
| Free State | 52 773 | 67 901 | 58 561 | 74 355 | 60 443 | 37 138 | 39 054 | 47 271 | 58 608 | 59 953 |
| Gauteng | 1 546 032 | 1 809 272 | 1 991 853 | 2 219 609 | 2 327 712 | 2 287 762 | 2 537 028 | 3 062 983 | 2 745 142 | 2 998 643 |
| KwaZulu-Natal | 267 620 | 201 009 | 231 033 | 235 432 | 249 137 | 292 246 | 307 302 | 239 387 | 484 142 | 575 016 |
| Limpopo | 69 808 | 67 562 | 63 455 | 78 662 | 66 250 | 99 104 | 105 150 | 7 286 | 117 270 | 111 649 |
| Mpumalanga | 69 859 | 66 333 | 55 547 | 66 881 | 55 690 | 100 476 | 103 468 | 62 349 | 124 613 | 122 432 |
| North-West | 72 968 | 49 390 | 41 541 | 51 295 | 42 854 | 104 139 | 110 361 | 39 615 | 153 911 | 153 676 |
| Northern Cape | 55 676 | 45 250 | 43 624 | 35 253 | 64 774 | 81 998 | 78 714 | 122 454 | 148 387 | 218 317 |
| Western Cape | 478 856 | 441 036 | 480 059 | 541 086 | 578 497 | 548 223 | 562 256 | 607 285 | 913 468 | 1 231 555 |
| **Total** | **2 744 718** | **2 886 094** | **3 137 343** | **3 458 074** | **3 596 023** | **3 729 680** | **4 025 998** | **4 304 556** | **5 004 669** | **5 740 897** |

### Table C.124: Proportional science councils sector R&D expenditure by province (2006/07 to 2015/16)

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Eastern Cape | 4.8 | 4.8 | 5.5 | 4.5 | 4.2 | 4.8 | 4.5 | 2.7 | 5.2 | 4.7 |
| Free State | 1.9 | 2.4 | 1.9 | 2.2 | 1.7 | 1.0 | 1.0 | 1.1 | 1.2 | 1.0 |
| Gauteng | 56.3 | 62.7 | 63.5 | 64.2 | 64.7 | 61.3 | 63.0 | 71.2 | 54.9 | 52.2 |
| KwaZulu-Natal | 9.8 | 7.0 | 7.4 | 6.8 | 6.9 | 7.8 | 7.6 | 5.6 | 9.7 | 10.0 |
| Limpopo | 2.5 | 2.3 | 2.0 | 2.3 | 1.8 | 2.7 | 2.6 | 0.2 | 2.3 | 1.9 |
| Mpumalanga | 2.5 | 2.3 | 1.8 | 1.9 | 1.5 | 2.7 | 2.6 | 1.4 | 2.5 | 2.1 |
| North-West | 2.7 | 1.7 | 1.3 | 1.5 | 1.2 | 2.8 | 2.7 | 0.9 | 3.1 | 2.7 |
| Northern Cape | 2.0 | 1.6 | 1.4 | 1.0 | 1.8 | 2.2 | 2.0 | 2.8 | 3.0 | 3.8 |
| Western Cape | 17.4 | 15.3 | 15.3 | 15.6 | 16.1 | 14.7 | 14.0 | 14.1 | 18.3 | 21.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.125: Science councils sector R&D personnel in headcounts and full-time equivalents by occupation (2006/07 to 2015/16)

| YEAR | HEADCOUNTS | | | | FULL-TIME EQUIVALENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL | TOTAL | RESEARCHERS | TECHNICIANS | OTHER R&D PERSONNEL |
| 2006/07 | 5 798 | 2 255 | 1 570 | 1 973 | 4 956.1 | 1 982.7 | 1 342.1 | 1 631.3 |
| 2007/08 | 5 988 | 2 594 | 1 351 | 2 043 | 5 058.8 | 2 300.2 | 1 099.2 | 1 659.4 |
| 2008/09 | 5 609 | 2 648 | 1 302 | 1 659 | 4 699.9 | 2 246.7 | 1 119.1 | 1 334.0 |
| 2009/10 | 5 926 | 2 669 | 1 381 | 1 876 | 4 782.7 | 2 251.5 | 1 179.4 | 1 351.8 |
| 2010/11 | 4 923 | 1 941 | 1 336 | 1 646 | 4 312.4 | 1 777.3 | 1 155.5 | 1 379.6 |
| 2011/12 | 4 494 | 1 803 | 1 333 | 1 358 | 3 803.5 | 1 634.9 | 1 172.4 | 996.1 |
| 2012/13 | 5 399 | 1 879 | 1 403 | 2 117 | 4 748.5 | 1 697.1 | 1 279.6 | 1 771.8 |
| 2013/14 | 5 884 | 1 956 | 1 396 | 2 532 | 5 164.5 | 1 781.3 | 1 247.3 | 2 136 |
| 2014/15 | 4 836 | 1 988 | 1 857 | 991 | 4 180.4 | 1 765.4 | 1 686.2 | 728.9 |
| 2015/16 | 5 162 | 2 072 | 1 839 | 1251 | 4361.2 | 1827.1 | 1683.7 | 850.3 |

**Table C.126: Science councils sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2013/14, 2014/15 and 2015/16)**

| YEAR | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | | | |
|---|---|---|---|---|---|---|---|
| **2013/14** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 1 956 | 1 101 | 855 | 1781.3 | 993.8 | 787.5 | 91.1 |
| Technicians directly supporting R&D | 1 396 | 814 | 582 | 1247.3 | 724.9 | 522.4 | 89.3 |
| Other personnel directly supporting R&D | 2 532 | 1 308 | 1 224 | 2136.0 | 1034.2 | 1101.8 | 84.4 |
| **Total** | **5 884** | **3 223** | **2 661** | **5164.5** | **2752.8** | **2411.7** | **87.8** |
| **2014/15** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 1 988 | 1 154 | 834 | 1765.4 | 1016.5 | 748.9 | 88.8 |
| Technicians directly supporting R&D | 1 857 | 1 077 | 780 | 1686.2 | 959.9 | 726.3 | 90.8 |
| Other personnel directly supporting R&D | 991 | 564 | 427 | 728.9 | 364.7 | 364.2 | 73.6 |
| **Total** | **4 836** | **2 795** | **2 041** | **4180.4** | **2341.1** | **1839.4** | **86.4** |
| **2015/16** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers | 2 072 | 1 174 | 898 | 1827.2 | 1036.4 | 790.8 | 88.2 |
| Technicians directly supporting R&D | 1 839 | 1 088 | 751 | 1683.7 | 973.3 | 710.4 | 91.6 |
| Other personnel directly supporting R&D | 1 251 | 671 | 580 | 850.4 | 409.4 | 441.0 | 68.0 |
| **Total** | **5 162** | **2 933** | **2 229** | **4361.2** | **2419.1** | **1942.2** | **84.5** |

**Table C.127: Science councils sector R&D personnel in headcounts by occupation, qualification, population group and gender (2015/16)**

| OCCUPATION AND QUALIFICATION | TOTAL | SUBTOTAL | | AFRICAN | | COLOURED | | INDIAN | | WHITE | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE |
| **Researchers** | **2 072** | **1 174** | **898** | **540** | **391** | **60** | **69** | **83** | **95** | **491** | **343** |
| Doctoral degree or equivalent | 858 | 532 | 326 | 222 | 96 | 29 | 28 | 31 | 34 | 250 | 168 |
| Masters, honours, bachelor or equivalent | 1 168 | 610 | 558 | 310 | 286 | 27 | 41 | 51 | 58 | 222 | 173 |
| Diplomas | 46 | 32 | 14 | 8 | 9 | 4 | 0 | 1 | 3 | 19 | 2 |
| **Technicians directly supporting R&D** | **1 839** | **1 088** | **751** | **589** | **437** | **88** | **36** | **55** | **72** | **356** | **206** |
| Doctoral degree or equivalent | 51 | 44 | 7 | 8 | 2 | 0 | 0 | 3 | 3 | 33 | 2 |
| Masters, honours, bachelor or equivalent | 982 | 524 | 458 | 269 | 250 | 25 | 21 | 42 | 55 | 188 | 132 |
| Diplomas | 806 | 520 | 286 | 312 | 185 | 63 | 15 | 10 | 14 | 135 | 72 |
| **Other personnel directly supporting R&D** | **1 251** | **671** | **580** | **490** | **378** | **50** | **74** | **37** | **40** | **94** | **88** |
| Doctoral degree or equivalent | 32 | 24 | 8 | 11 | 5 | 3 | 0 | 1 | 1 | 9 | 2 |
| Masters, honours, bachelor or equivalent | 557 | 265 | 292 | 158 | 182 | 16 | 17 | 28 | 31 | 63 | 62 |
| Diplomas | 662 | 382 | 280 | 321 | 191 | 31 | 57 | 8 | 8 | 22 | 24 |
| **Total** | **5 162** | **2 933** | **2 229** | **1 619** | **1 206** | **198** | **179** | **175** | **207** | **941** | **637** |

**Table C.128: Science councils sector overview (2014/15 and 2015/16)**

| SCIENCE COUNCILS | 2014/15 | | | | 2015/16 | | | |
|---|---|---|---|---|---|---|---|---|
| | R&D EXPENDITURE | RESEARCHERS | BASIC RESEARCH | CAPITAL EXPENDITURE | R&D EXPENDITURE | RESEARCHERS | BASIC RESEARCH | CAPITAL EXPENDITURE |
| | R'000 | FTEs | R'000 | R'000 | R'000 | FTEs | R'000 | R'000 |
| Agricultural Research Council | 1 034 342 | 472.0 | 206 868 | 111 103 | 991 531 | 542.0 | 198 306 | 54 231 |
| Council for Scientific and Industrial Research | 2 198 138 | 622.0 | 219 814 | 209 682 | 2 342 179 | 631.0 | 234 218 | 308 043 |
| Council for Geoscience | 130 903 | 81.0 | 26 181 | 31 113 | 141 787 | 94.9 | 28 357 | 40 002 |
| Human Science Research Council | 271 903 | 98.4 | 54 381 | 4 416 | 334 271 | 143.2 | 66 854 | 15 342 |
| Medical Research Council | 544 480 | 208.0 | 326 688 | 7 783 | 719 738 | 1710 | 431 843 | 42 751 |
| Mintek | 288 189 | 136.2 | 89 338 | 23 556 | 338 956 | 105.6 | 67 791 | 38 730 |
| National Research Foundation | 536 714 | 147.8 | 243 221 | 210 776 | 872 436 | 139.4 | 321 163 | 417 381 |
| **Total** | **5 004 669** | **1 765.40** | **1 166 491** | **598 429** | **5 740 897** | **1827.2** | **1 348 533** | **916 480** |

## C.2.5. Higher education sector

The HE sector in 2015/16 obtained improved responses amounting to an additional R772 558 000 to previous estimates of HERD in 2014/15, contributing 7.8% of HERD in 2015/16. This needs to be borne in mind when making inferences on trends in the HE sector.

**Table C.129: Higher education sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| Basic research | 1 348 299 | 1 709 334 | 1 965 121 | 2 459 733 | 2 634 722 | 3 290 328 | 3 843 906 | 3 785 149 | 4 601 453 | 5 395 693 |
| Applied research | 1 282 627 | 1 262 425 | 1 468 624 | 1 729 496 | 1 890 185 | 2 279 175 | 2 390 090 | 2 412 316 | 2 649 558 | 3 176 685 |
| Experimental research | 667 882 | 650 102 | 757 621 | 911 994 | 899 695 | 1 039 712 | 1 099 157 | 1 095 388 | 1 126 565 | 1 304 245 |
| **Total** | **3 298 808** | **3 621 861** | **4 191 366** | **5 101 224** | **5 424 602** | **6 609 216** | **7 333 153** | **7 292 853** | **8 377 575** | **9 876 623** |

**Table C.130: Proportional higher education sector R&D expenditure by type of research (2006/07 to 2015/16)**

| TYPE OF RESEARCH | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Basic research | 40.9 | 47.2 | 46.9 | 48.2 | 48.6 | 49.8 | 52.4 | 51.9 | 54.9 | 54.6 |
| Applied research | 38.9 | 34.9 | 35.0 | 33.9 | 34.8 | 34.5 | 32.6 | 33.1 | 31.6 | 32.2 |
| Experimental research | 20.2 | 17.9 | 18.1 | 17.9 | 16.6 | 15.7 | 15.0 | 15.0 | 13.4 | 13.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.131: Higher education sector R&D expenditure by accounting category (2006/07 to 2015/16)

| TYPE OF EXPENDITURE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 216 037 | 295 813 | 281 193 | 376 057 | 393 758 | 564 179 | 602 116 | 706 336 | 779 789 | 1 141 349 |
| Land: buildings & other structures | 69 123 | 51 734 | 38 564 | 97 533 | 146 602 | 137 530 | 192 324 | 256 114 | 200 253 | 198 032 |
| Vehicles, plant, machinery, equipment | 146 914 | 244 079 | 242 629 | 278 524 | 247 156 | 426 649 | 409 792 | 450 222 | 579 536 | 943 317 |
| Current expenditure | 3 082 771 | 3 326 049 | 3 910 173 | 4 725 167 | 5 030 844 | 6 045 037 | 6 731 037 | 6 586 517 | 7 597 786 | 8 735 274 |
| Labour costs | 1 376 395 | 1 466 379 | 1 504 542 | 1 710 183 | 1 883 176 | 2 481 322 | 2 996 929.0 | 3 248 542.0 | 3 539 733.2 | 3 576 140 |
| Total cost of R&D postgraduate students | 438 486 | 495 128 | 532 883 | 581 140 | 756 930 | 1 074 207 | 1 186 653.0 | 1 224 611 | 1 579 088 | 1 926 301 |
| Other current expenditure | 1 267 890 | 1 364 542 | 1 872 748 | 2 433 844 | 2 390 738 | 2 489 508 | 2 547 455 | 2 113 364 | 2 478 965 | 3 232 833 |
| **Total** | **3 298 808** | **3 621 862** | **4 191 366** | **5 101 224** | **5 424 602** | **6 609 216** | **7 333 153** | **7 292 853** | **8 377 575** | **9 876 623** |

### Table C.132: Proportional higher education sector R&D expenditure by accounting category (2006/07 to 2015/16)

| TYPE OF EXPENDITURE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital expenditure | 6.5 | 8.2 | 6.7 | 7.4 | 7.3 | 8.5 | 8.2 | 9.7 | 9.3 | 11.6 |
| Land: buildings & other structures | 2.1 | 1.4 | 0.9 | 1.9 | 2.7 | 2.1 | 2.6 | 3.5 | 2.4 | 2.0 |
| Vehicles, plant, machinery, equipment | 4.5 | 6.7 | 5.8 | 5.5 | 4.6 | 6.5 | 5.6 | 6.2 | 6.9 | 9.6 |
| Current expenditure | 93.5 | 91.8 | 93.3 | 92.6 | 92.7 | 91.5 | 91.8 | 90.3 | 90.7 | 88.4 |
| Labour costs | 41.7 | 40.5 | 35.9 | 33.5 | 34.7 | 37.5 | 40.9 | 44.5 | 42.3 | 36.2 |
| Total cost of R&D postgraduate students | 13.3 | 13.7 | 12.7 | 11.4 | 14.0 | 16.3 | 16.2 | 16.8 | 18.8 | 19.5 |
| Other current expenditure | 38.4 | 37.7 | 44.7 | 47.7 | 44.1 | 37.7 | 34.7 | 29.0 | 29.6 | 32.7 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.133: Higher education sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 215 606 | 253 872 | 303 483 | 366 900 | 381 225 | 344 039 | 380 727 | 406 285 | 470 837 | 553 562 |
| Nanotechnology | 140 998 | 170 405 | 153 013 | 156 176 | 204 802 | 317 649 | 293 300 | 356 826 | 393 137 | 505 380 |
| **Total** | **356 604** | **424 277** | **456 496** | **523 076** | **586 027** | **661 688** | **674 028** | **763 111** | **863 974** | **1 058 942** |
| Higher Education expenditure on R&D | 3 298 808 | 3 621 862 | 4 191 366 | 5 101 224 | 5 424 602 | 6 609 216 | 7 333 153 | 7 292 853 | 8 377 575 | 9 876 623 |

### Table C.134: Proportional higher education sector expenditure on multidisciplinary areas of R&D (2006/07 to 2015/16)

| MULTI-DISCIPLINARY AREA OF R&D | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Biotechnology | 6.5 | 7.0 | 7.2 | 7.2 | 7.0 | 5.2 | 5.2 | 5.6 | 5.6 | 5.6 |
| Nanotechnology | 4.3 | 4.7 | 3.7 | 3.1 | 3.8 | 4.8 | 4.0 | 4.9 | 4.7 | 5.1 |
| **Total** | **10.8** | **11.7** | **10.9** | **10.3** | **10.8** | **10.0** | **9.2** | **10.5** | **10.3** | **10.7** |

### Table C.135: Higher education sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF R&D | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 770 339 | 300 006 | 340 386 | 499 958 | 583 723 |
| Open source software | 41 441 | 41 234 | 49 532 | 58 643 | 75 195 | 15 982 | 85 508 | 105 008 | 117 646 | 125 883 |
| New materials | 135 803 | 160 993 | 202 242 | 283 711 | 266 419 | 197 430 | 321 744 | 381 136 | 436 975 | 462 962 |
| Tuberculosis (TB), HIV/AIDS, malaria | 391 002 | 583 726 | 650 502 | 815 431 | 845 216 | 399 070 | 714 966 | 794 810 | 845 245 | 944 490 |
| **Total** | **568 246** | **785 953** | **902 276** | **1 157 785** | **1 186 830** | **1 382 821** | **1 422 224** | **1 621 339** | **1 899 823** | **2 117 058** |
| Higher Education expenditure on R&D | 3 298 808 | 3 621 862 | 4 191 366 | 5 101 224 | 5 424 602 | 6 609 216 | 7 333 153 | 7 292 853 | 8 377 575 | 9 876 623 |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.136: Proportional higher education sector R&D expenditure on selected areas of interest (2006/07 to 2015/16)

| AREA OF R&D | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment related | N/A | N/A | N/A | N/A | N/A | 11.7 | 4.1 | 4.7 | 6.0 | 5.9 |
| Open source software | 1.3 | 1.1 | 1.2 | 1.1 | 1.4 | 0.2 | 1.2 | 1.4 | 1.4 | 1.3 |
| New materials | 4.1 | 4.4 | 4.8 | 5.6 | 4.9 | 3.0 | 4.4 | 5.2 | 5.2 | 4.7 |
| Tuberculosis (TB), HIV/AIDS, malaria | 11.9 | 16.1 | 15.5 | 16.0 | 15.6 | 6.0 | 9.7 | 10.9 | 10.1 | 9.6 |
| **Total** | **17.2** | **21.7** | **21.5** | **22.7** | **21.9** | **20.9** | **19.4** | **22.2** | **22.7** | **21.4** |

N/A: Environment-related data were collected from the 2011/12 R&D survey onwards.

### Table C.137: Higher education sector R&D expenditure by research field (2006/07 to 2015/16)

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **2 294 479** | **2 389 525** | **2 703 975** | **3 374 024** | **3 558 265** | **4 486 057** | **5 045 892** | **4 925 713** | **5 704 150** | **6 340 906** |
| Mathematical sciences | 104 323 | 109 354 | 151 880 | 168 689 | 283 942 | 311 572 | 342 093 | 278 183 | 333 587 | 458 068 |
| Physical sciences | 121 559 | 146 726 | 135 002 | 352 628 | 175 110 | 189 341 | 193 849 | 198 735 | 230 826 | 287 830 |
| Chemical sciences | 106 214 | 143 897 | 136 528 | 161 856 | 158 775 | 317 389 | 444 258 | 286 511 | 326 992 | 386 300 |
| Earth sciences | 119 682 | 121 419 | 136 955 | 84 777 | 157 781 | 174 141 | 190 744 | 207 261 | 260 862 | 271 814 |

| MAIN RESEARCH FIELD | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Information, computer and communication technologies | 143 037 | 119 600 | 125 413 | 121 750 | 112 985 | 186 870 | 232 090 | 192 911 | 245 257 | 322 406 |
| Applied sciences and technologies | 101 400 | 96 972 | 78 904 | 306 195 | 90 761 | 245 611 | 251 278 | 280 310 | 274 283 | 272 429 |
| Engineering sciences | 349 889 | 294 630 | 352 114 | 305 953 | 461 980 | 741 462 | 768 810 | 855 529 | 918 494 | 891 532 |
| Biological sciences | 230 480 | 271 216 | 282 280 | 349 343 | 593 219 | 610 408 | 731 389 | 721 229 | 825 432 | 846 897 |
| Agricultural sciences | 151 950 | 159 793 | 192 265 | 179 309 | 205 311 | 268 834 | 276 857 | 311 355 | 354 949 | 326 296 |
| Medical and health sciences | 710 386 | 785 630 | 966 365 | 1 195 597 | 1 226 127 | 1 245 284 | 1 391 838 | 1 339 755 | 1 641 683 | 2 089 591 |
| Environmental sciences | 58 256 | 58 793 | 68 869 | 52 431 | 60 458 | 111 612 | 147 367 | 166 493 | 180 324 | 79 430 |
| Material sciences | 86 764 | 72 484 | 68 467 | 76 732 | 26 629 | 81 749 | 68 849 | 82 479 | 100 358 | 93 871 |
| Marine sciences | 10 539 | 9 013 | 8 933 | 18 764 | 5 186 | 1 783 | 6 469 | 4 961 | 11 105 | 14 442 |
| **Division 2: Social Sciences and Humanities** | **1 004 329** | **1 232 337** | **1 487 391** | **1 727 200** | **1 866 337** | **2 123 159** | **2 287 261** | **2 367 140** | **2 673 425** | **3 535 718** |
| Social sciences | 658 419 | 796 281 | 967 204 | 1 273 479 | 1 433 610 | 1 664 653 | 1 844 744 | 1 825 026 | 2 056 555 | 2 855 673 |
| Humanities | 345 910 | 436 056 | 520 187 | 453 721 | 432 727 | 458 505 | 442 517 | 542 114 | 616 870 | 680 046 |
| **Total** | **3 298 808** | **3 621 862** | **4 191 366** | **5 101 224** | **5 424 602** | **6 609 216** | **7 333 153** | **7 292 853** | **8 377 575** | **9 876 615** |

**Table C.138: Proportional higher education sector R&D expenditure by research field (2006/07 to 2015/16)**

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Natural Sciences, Technology and Engineering** | **69.6** | **66.0** | **64.5** | **66.1** | **65.6** | **67.9** | **68.8** | **67.5** | **68.1** | **64.2** |
| Mathematical sciences | 3.2 | 3.0 | 3.6 | 3.3 | 5.2 | 4.7 | 4.7 | 3.8 | 4.0 | 4.6 |
| Physical sciences | 3.7 | 4.1 | 3.2 | 6.9 | 3.2 | 2.9 | 2.6 | 2.7 | 2.8 | 2.9 |
| Chemical sciences | 3.2 | 4.0 | 3.3 | 3.2 | 2.9 | 4.8 | 6.1 | 3.9 | 3.9 | 3.9 |
| Earth sciences | 3.6 | 3.4 | 3.3 | 1.7 | 2.9 | 2.6 | 2.6 | 2.8 | 3.1 | 2.8 |
| Information, computer and communication technologies | 4.3 | 3.3 | 3.0 | 2.4 | 2.1 | 2.8 | 3.2 | 2.6 | 2.9 | 3.3 |
| Applied sciences and technologies | 3.1 | 2.7 | 1.9 | 6.0 | 1.7 | 3.7 | 3.4 | 3.8 | 3.3 | 2.8 |
| Engineering sciences | 10.6 | 8.1 | 8.4 | 6.0 | 8.5 | 11.2 | 10.5 | 11.7 | 11.0 | 9.0 |
| Biological sciences | 7.0 | 7.5 | 6.7 | 6.8 | 10.9 | 9.2 | 10.0 | 9.9 | 9.9 | 8.6 |
| Agricultural sciences | 4.6 | 4.4 | 4.6 | 3.5 | 3.8 | 4.1 | 3.8 | 4.3 | 4.2 | 3.3 |
| Medical and health sciences | 21.5 | 21.7 | 23.1 | 23.4 | 22.6 | 18.8 | 19.0 | 18.4 | 19.6 | 21.2 |

| MAIN RESEARCH FIELD | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Environmental sciences | 1.8 | 1.6 | 1.6 | 1.0 | 1.1 | 1.7 | 2.0 | 2.3 | 2.2 | 0.8 |
| Material sciences | 2.6 | 2.0 | 1.6 | 1.5 | 0.5 | 1.2 | 0.9 | 1.1 | 1.2 | 1.0 |
| Marine sciences | 0.3 | 0.2 | 0.2 | 0.4 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| **Division 2: Social Sciences and Humanities** | **30.4** | **34.0** | **35.5** | **33.9** | **34.4** | **32.1** | **31.2** | **32.5** | **31.9** | **35.8** |
| Social sciences | 20.0 | 22.0 | 23.1 | 25.0 | 26.4 | 25.2 | 25.2 | 25.0 | 24.5 | 28.9 |
| Humanities | 10.5 | 12.0 | 12.4 | 8.9 | 8.0 | 6.9 | 6.0 | 7.4 | 7.4 | 6.9 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table C.139: Higher education sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | 2 711 | 4 328 | 5 150 | 3 620 | 7 271 | 10 211 | 12 009 | 6 121 | 7 266 | 8 330 |
| Defence | 2 711 | 4 328 | 5 150 | 3 620 | 7 271 | 10 211 | 12 009 | 6 121 | 7 266 | 8 330 |
| **Division 2: Economic Development** | **1 199 956** | **1 271 620** | **1 539 534** | **1 738 239** | **1 542 453** | **2 072 624** | **1 996 497** | **2 547 254** | **2 472 831** | **2 850 018** |
| Economic Development unclassified | 150 668 | 171 520 | 209 400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plant production and plant primary products | 119 949 | 123 126 | 153 054 | 178 033 | 188 513 | 277 764 | 234 309 | 534 417 | 220 024 | 282 188 |
| Animal production and animal primary products | 85 256 | 95 219 | 117 255 | 130 828 | 128 705 | 151 334 | 176 645 | 173 865 | 190 421 | 199 545 |
| Mineral resources (excluding Energy) | 89 559 | 74 725 | 88 576 | 83 294 | 99 966 | 129 185 | 69 062 | 129 459 | 127 236 | 131 141 |
| Energy resources | 51 923 | 84 459 | 71 648 | 81 689 | 88 657 | 87 659 | 92 947 | 82 011 | 75 367 | 84 862 |
| Energy supply | 90 365 | 96 209 | 106 457 | 107 759 | 144 462 | 157 304 | 162 879 | 221 160 | 233 075 | 237 993 |
| Manufacturing | 210 910 | 172 947 | 210 009 | 297 303 | 245 037 | 272 287 | 348 845 | 340 630 | 329 083 | 380 258 |
| Construction | 27 521 | 28 313 | 46 175 | 23 858 | 73 340 | 116 141 | 74 322 | 79 775 | 96 642 | 111 437 |
| Transport | 16 447 | 22 770 | 29 517 | 30 456 | 24 045 | 53 043 | 31 830 | 32 503 | 38 549 | 47 577 |
| Information and communication services | 80 322 | 67 026 | 87 013 | 110 589 | 93 281 | 144 313 | 101 980 | 139 305 | 152 987 | 232 257 |
| Commercial services | 41 037 | 93 285 | 54 604 | 282 078 | 54 659 | 106 287 | 111 587 | 156 001 | 124 971 | 125 771 |
| Economic framework | 133 600 | 164 759 | 193 599 | 206 625 | 217 501 | 302 693 | 335 217 | 363 483 | 493 154 | 544 118 |
| Natural resources | 102 399 | 77 260 | 172 228 | 205 728 | 184 287 | 274 612 | 256 874 | 294 645 | 391 322 | 472 871 |
| **Division 3: Society** | **1 062 182** | **1 149 091** | **1 359 797** | **1 177 651** | **1 393 700** | **1 583 800** | **1 865 914** | **1 569 371** | **2 180 662** | **2 820 755** |
| Society unclassified | 150 668 | 171 520 | 209 400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 R'000 | 2007/08 R'000 | 2008/09 R'000 | 2009/10 R'000 | 2010/11 R'000 | 2011/12 R'000 | 2012/13 R'000 | 2013/14 R'000 | 2014/15 R'000 | 2015/16 R'000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Health | 507 767 | 556 914 | 644 763 | 701 007 | 776 688 | 686 152 | 1 150 349 | 654 525 | 1 074 951 | 1 375 861 |
| Education and training | 199 056 | 195 917 | 227 502 | 187 291 | 294 482 | 359 897 | 402 285 | 547 108 | 739 611 | 925 245 |
| Social development and community services | 204 691 | 224 740 | 278 132 | 289 353 | 322 530 | 537 752 | 313 280 | 367 738 | 366 099 | 519 649 |
| **Division 4: Environment** | **261 464** | **317 863** | **339 148** | **346 483** | **377 151** | **509 533** | **554 758** | **456 619** | **629 133** | **614 011** |
| Environment unclassified | 50 223 | 57 173 | 69 800 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Environmental knowledge | 112 319 | 108 189 | 135 472 | 170 901 | 188 250 | 230 135 | 232 440 | 184 169 | 269 688 | 246 804 |
| Environmental aspects of development | 42 619 | 93 853 | 72 050 | 92 353 | 86 295 | 123 344 | 168 956 | 154 462 | 202 787 | 212 879 |
| Environmental and other aspects | 56 303 | 58 648 | 61 826 | 83 229 | 102 606 | 156 054 | 153 362 | 117 989 | 156 658 | 154 328 |
| **Division 5: Advancement of Knowledge** | **772 495** | **878 959** | **947 737** | **1 835 231** | **2 104 026** | **2 433 048** | **2 903 975** | **2 713 487** | **3 087 684** | **3 583 508** |
| Advancement of Knowledge unclassified | 150 668 | 171 520 | 209 400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Natural sciences, technologies and engineering | 329 497 | 416 081 | 423 469 | 969 079 | 1 263 802 | 1 443 913 | 1 731 540 | 1 633 257 | 2 006 195 | 2 262 831 |
| Social sciences and humanities | 292 330 | 291 359 | 314 868 | 866 152 | 840 223 | 989 135 | 1 172 435 | 1 080 231 | 1 081 488 | 1 320 677 |
| **Total** | **3 298 808** | **3 621 862** | **4 191 366** | **5 101 224** | **5 424 602** | **6 609 216** | **7 333 153** | **7 292 853** | **8 377 575** | **9 876 623** |

**Table C.140: Proportional higher education sector R&D expenditure by socio-economic objective (2006/07 to 2015/16)**

| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division 1: Defence** | **0.1** | **0.1** | **0.1** | **0.1** | **0.1** | **0.2** | **0.2** | **0.1** | **0.1** | **0.1** |
| Defence | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| **Division 2: Economic Development** | **36.4** | **35.1** | **36.7** | **34.1** | **28.4** | **31.4** | **27.2** | **34.9** | **29.5** | **28.9** |
| Economic Development unclassified | 4.6 | 4.7 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plant production and plant primary products | 3.6 | 3.4 | 3.7 | 3.5 | 3.5 | 4.2 | 3.2 | 7.3 | 2.6 | 2.9 |
| Animal production and animal primary products | 2.6 | 2.6 | 2.8 | 2.6 | 2.4 | 2.3 | 2.4 | 2.4 | 2.3 | 2.0 |



| SOCIO-ECONOMIC OBJECTIVE | 2006/07 % | 2007/08 % | 2008/09 % | 2009/10 % | 2010/11 % | 2011/12 % | 2012/13 % | 2013/14 % | 2014/15 % | 2015/16 % |
|---|---|---|---|---|---|---|---|---|---|---|
| Mineral resources (excluding Energy) | 2.7 | 2.1 | 2.1 | 1.6 | 1.8 | 2.0 | 0.9 | 1.8 | 1.5 | 1.3 |
| Energy resources | 1.6 | 2.3 | 1.7 | 1.6 | 1.6 | 1.3 | 1.3 | 1.1 | 0.9 | 0.9 |
| Energy supply | 2.7 | 2.7 | 2.5 | 2.1 | 2.7 | 2.4 | 2.2 | 3.0 | 2.8 | 2.4 |
| Manufacturing | 6.4 | 4.8 | 5.0 | 5.8 | 4.5 | 4.1 | 4.8 | 4.7 | 3.9 | 3.9 |
| Construction | 0.8 | 0.8 | 1.1 | 0.5 | 1.4 | 1.8 | 1.0 | 1.1 | 1.2 | 1.1 |
| Transport | 0.5 | 0.6 | 0.7 | 0.6 | 0.4 | 0.8 | 0.4 | 0.4 | 0.5 | 0.5 |
| Information and communication services | 2.4 | 1.9 | 2.1 | 2.2 | 1.7 | 2.2 | 1.4 | 1.9 | 1.8 | 2.4 |
| Commercial services | 1.2 | 2.6 | 1.3 | 5.5 | 1.0 | 1.6 | 1.5 | 2.1 | 1.5 | 1.3 |
| Economic framework | 4.0 | 4.5 | 4.6 | 4.1 | 4.0 | 4.6 | 4.6 | 5.0 | 5.9 | 5.5 |
| Natural resources | 3.1 | 2.1 | 4.1 | 4.0 | 3.4 | 4.2 | 3.5 | 4.0 | 4.7 | 4.8 |
| **Division 3: Society** | **32.2** | **31.7** | **32.4** | **23.1** | **25.7** | **24.0** | **25.4** | **21.5** | **26.0** | **28.6** |
| Society unclassified | 4.6 | 4.7 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health | 15.4 | 15.4 | 15.4 | 13.7 | 14.3 | 10.4 | 15.7 | 9.0 | 12.8 | 13.9 |
| Education and training | 6.0 | 5.4 | 5.4 | 3.7 | 5.4 | 5.4 | 5.5 | 7.5 | 8.8 | 9.4 |
| Social development and community services | 6.2 | 6.2 | 6.6 | 5.7 | 5.9 | 8.1 | 4.3 | 5.0 | 4.4 | 5.3 |
| **Division 4: Environment** | 7.9 | 8.8 | 8.1 | 6.8 | 7.0 | 7.7 | 7.6 | 6.3 | 7.5 | 6.2 |
| Environment unclassified | 1.5 | 1.6 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Environmental knowledge | 3.4 | 3.0 | 3.2 | 3.4 | 3.5 | 3.5 | 3.2 | 2.5 | 3.2 | 2.5 |
| Environmental aspects of development | 1.3 | 2.6 | 1.7 | 1.8 | 1.6 | 1.9 | 2.3 | 2.1 | 2.4 | 2.2 |
| Environmental and other aspects | 1.7 | 1.6 | 1.5 | 1.6 | 1.9 | 2.4 | 2.1 | 1.6 | 1.9 | 1.6 |
| **Division 5: Advancement of Knowledge** | **23.4** | **24.3** | **22.6** | **36.0** | **38.8** | **36.8** | **39.6** | **37.2** | **36.9** | **36.3** |
| Advancement of Knowledge unclassified | 4.6 | 4.7 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Natural sciences, technologies and engineering | 10.0 | 11.5 | 10.1 | 19.0 | 23.3 | 21.8 | 23.6 | 22.4 | 23.9 | 22.9 |
| Social sciences and humanities | 8.9 | 8.0 | 7.5 | 17.0 | 15.5 | 15.0 | 16.0 | 14.8 | 12.9 | 13.4 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.141: Higher education sector R&D expenditure by province (2006/07 to 2015/16)

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 | R'000 |
| Eastern Cape | 259 254 | 276 740 | 286 605 | 536 792 | 556 496 | 608 815 | 592 861 | 557 292 | 612 239 | 975 099 |
| Free State | 155 326 | 180 713 | 226 892 | 246 298 | 281 889 | 323 335 | 356 177 | 449 852 | 491 203 | 523 782 |
| Gauteng | 1 214 575 | 1 260 991 | 1 467 914 | 1 537 166 | 1 600 783 | 2 028 145 | 2 118 817 | 2 233 696 | 2 733 330 | 3 305 576 |
| KwaZulu-Natal | 451 992 | 459 299 | 567 999 | 662 518 | 677 740 | 902 386 | 1 137 258 | 750 507 | 843 111 | 903 664 |
| Limpopo | 63 233 | 79 716 | 86 635 | 147 397 | 224 603 | 349 559 | 300 435 | 187 317 | 216 352 | 229 364 |
| Mpumalanga | 67 029 | 105 629 | 72 590 | 88 680 | 119 231 | 170 966 | 182 192 | 147 134 | 174 657 | 190 716 |
| North-West | 97 246 | 166 137 | 150 125 | 190 570 | 184 514 | 275 088 | 311 325 | 405 963 | 404 575 | 444 135 |
| Northern Cape | 42 944 | 48 277 | 68 443 | 92 062 | 107 581 | 148 425 | 164 483 | 161 603 | 146 769 | 164 487 |
| Western Cape | 947 209 | 1 044 360 | 1 264 162 | 1 599 741 | 1 671 766 | 1 802 496 | 2 169 606 | 2 399 489 | 2 755 339 | 3 139 800 |
| **Total** | **3 298 808** | **3 621 862** | **4 191 366** | **5 101 224** | **5 424 602** | **6 609 216** | **7 333 153** | **7 292 853** | **8 377 575** | **9 876 623** |

### Table C.142: Proportional higher education sector R&D expenditure by province (2006/07 to 2015/16)

| PROVINCE | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % |
| Eastern Cape | 7.9 | 7.6 | 6.8 | 10.5 | 10.3 | 9.2 | 8.1 | 7.6 | 7.3 | 9.9 |
| Free State | 4.7 | 5.0 | 5.4 | 4.8 | 5.2 | 4.9 | 4.9 | 6.2 | 5.9 | 5.3 |
| Gauteng | 36.8 | 34.8 | 35.0 | 30.1 | 29.5 | 30.7 | 28.9 | 30.6 | 32.6 | 33.5 |
| KwaZulu-Natal | 13.7 | 12.7 | 13.6 | 13.0 | 12.5 | 13.7 | 15.5 | 10.3 | 10.1 | 9.1 |
| Limpopo | 1.9 | 2.2 | 2.1 | 2.9 | 4.1 | 5.3 | 4.1 | 2.6 | 2.6 | 2.3 |
| Mpumalanga | 2.0 | 2.9 | 1.7 | 1.7 | 2.2 | 2.6 | 2.5 | 2.0 | 2.1 | 1.9 |
| North-West | 2.9 | 4.6 | 3.6 | 3.7 | 3.4 | 4.2 | 4.2 | 5.6 | 4.8 | 4.5 |
| Northern Cape | 1.3 | 1.3 | 1.6 | 1.8 | 2.0 | 2.2 | 2.2 | 2.2 | 1.8 | 1.7 |
| Western Cape | 28.7 | 28.8 | 30.2 | 31.4 | 30.8 | 27.3 | 29.6 | 32.9 | 32.9 | 31.8 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

### Table C.143: Higher education sector R&D personnel in headcounts and full-time equivalents by occupation (2006/07 to 2015/16)

| YEAR | HEADCOUNTS | | | | FULL-TIME EQUIVALENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | RESEARCHERS* | TECHNICIANS | OTHER R&D PERSONNEL | TOTAL | RESEARCHERS* | TECHNICIANS | OTHER R&D PERSONNEL |
| 2006/07 | 21 746 | 17 459 | 2 170 | 2 117 | 5168.9 | 3657.8 | 643.8 | 867.3 |
| 2007/08 | 21 365 | 17 008 | 2 006 | 2 351 | 5178.1 | 3672.3 | 612.8 | 893.0 |
| 2008/09 | 20 223 | 16 313 | 2 054 | 1 856 | 4859.3 | 3643.5 | 541.7 | 674.2 |
| 2009/10 | 20 850 | 17 010 | 2 115 | 1 725 | 5018.0 | 3761.8 | 579.8 | 676.4 |
| 2010/11 | 19 970 | 15 553 | 2 123 | 2 294 | 5023.0 | 3613.7 | 534.9 | 874.5 |
| 2011/12 | 21 458 | 16 294 | 2 344 | 2 820 | 6091.2 | 4355.3 | 673.4 | 1062.5 |
| 2012/13 | 22 691 | 17 441 | 2 344 | 2 906 | 6571.5 | 4700.6 | 737.3 | 1133.5 |
| 2013/14 | 23 543 | 18 212 | 2 284 | 3 047 | 7005.7 | 5000.5 | 843.7 | 1161.5 |
| 2014/15 | 24 701 | 18 625 | 2 496 | 3 580 | 7237.8 | 5097.7 | 857.3 | 1282.8 |
| 2015/16 | 25 612 | 19 217 | 2 616 | 3 779 | 7147.1 | 4701.9 | 1000.3 | 1445.0 |

*Excluding post-graduates.

**Table C.144: Higher education sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2013/14, 2014/15 and 2015/16)**

| YEAR | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | | | |
|---|---|---|---|---|---|---|---|
| **2013/14** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 36 133 | 19 920 | 16 213 | 15 772.5 | 8 825.3 | 6 947.2 | 43.7 |
| Technicians directly supporting R&D | 2 284 | 1 314 | 970 | 843.7 | 465.1 | 378.6 | 36.9 |
| Other personnel directly supporting R&D | 3 047 | 989 | 2 058 | 1 161.5 | 367.8 | 793.7 | 38.1 |
| **Total** | **41 464** | **22 223** | **19 241** | **17 777.7** | **9 658.2** | **8 119.5** | **42.9** |
| **2014/15** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 38 381 | 21 060 | 17 321 | 15 804.3 | 8 731.8 | 7 072.5 | 41.2 |
| Technicians directly supporting R&D | 2 496 | 1 381 | 1 115 | 857.3 | 509.5 | 347.8 | 34.3 |
| Other personnel directly supporting R&D | 3 580 | 1 176 | 2 404 | 1 282.8 | 374.8 | 908.0 | 35.8 |
| **Total** | **44 457** | **23 617** | **20 840** | **17 944.4** | **9 616.2** | **8 328.3** | **40.4** |
| **2015/16** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **MALE** | **FEMALE** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 41 639 | 22 491 | 19 148 | 18 366.8 | 10 130.6 | 8 236.2 | 44.1 |
| Technicians directly supporting R&D | 2 616 | 1 491 | 1 125 | 1 000.3 | 614.8 | 385.4 | 38.2 |
| Other personnel directly supporting R&D | 3 779 | 1 222 | 2 557 | 1 445.0 | 403.6 | 1 041.4 | 38.2 |
| **Total** | **48 034** | **25 204** | **22 830** | **20 812.0** | **11 149.0** | **9 663.0** | **43.3** |

*Includes doctoral students and post-doctoral fellows.

**Table C.145: Higher education sector R&D personnel in headcounts by occupation and gender, and full-time equivalents by occupation (2013/14, 2014/15 and 2015/16)**

| OCCUPATION | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | |
|---|---|---|---|---|---|
| **2013/14** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 18 212 | 9 736 | 8 476 | 5 000.5 | 27.5 |
| Technicians directly supporting R&D | 2 284 | 1 314 | 970 | 843.7 | 36.9 |
| Other personnel directly supporting R&D | 3 047 | 989 | 2 058 | 1 161.5 | 38.1 |
| **Total** | **23 543** | **12 039** | **11 504** | **7 005.7** | **29.8** |
| **2014/15** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 18 625 | 9 876 | 8 749 | 5 097.7 | 27.4 |
| Technicians directly supporting R&D | 2 496 | 1 381 | 1 115 | 857.3 | 34.3 |
| Other personnel directly supporting R&D | 3 580 | 1 176 | 2 404 | 1 282.8 | 35.8 |
| **Total** | **24 701** | **12 433** | **12 268** | **7 237.8** | **29.3** |
| **2015/16** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **FTEs AS % OF HEADCOUNTS** |
| Researchers* | 19 217 | 10 098 | 9 119 | 4 701.9 | 24.5 |
| Technicians directly supporting R&D | 2 616 | 1 491 | 1 125 | 1 000.3 | 38.2 |
| Other personnel directly supporting R&D | 3 779 | 1 222 | 2 557 | 1 445.0 | 38.2 |
| **Total** | **25 612** | **12 811** | **12 801** | **7 147.1** | **27.9** |

*Excludes doctoral students and post-doctoral fellows.

**Table C.146: Higher education sector R&D postgraduates in headcounts by qualification and gender, and full-time equivalents by qualification (2013/14, 2014/15 and 2015/16)**

| OCCUPATION | HEADCOUNTS | | | FULL-TIME EQUIVALENTS (FTEs) | |
|---|---|---|---|---|---|
| 2013/14 | TOTAL | MALE | FEMALE | TOTAL | FTEs AS % OF HEADCOUNTS |
| Post-doctoral fellows | 1 801 | 1 101 | 700 | 1 706.9 | 94.8 |
| Doctoral students | 16 120 | 9 083 | 7 037 | 9 065.2 | 56.2 |
| Masters students | 36 274 | 17 932 | 18 342 | 18 933.6 | 52.2 |
| **Total** | **54 195** | **28 116** | **26 079** | **29 705.6** | **54.8** |
| **2014/15** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **FTEs AS % OF HEADCOUNTS** |
| Post-doctoral fellows | 1 983 | 1 183 | 800 | 1 876.8 | 94.6 |
| Doctoral students | 17 773 | 10 001 | 7 772 | 8 829.8 | 49.7 |
| Masters students | 35 746 | 17 241 | 18 505 | 16 796.7 | 47.0 |
| **Total** | **55 502** | **28 425** | **27 077** | **27 503.3** | **49.6** |
| **2015/16** | **TOTAL** | **MALE** | **FEMALE** | **TOTAL** | **FTEs AS % OF HEADCOUNTS** |
| Post-doctoral fellows | 2 268 | 1 338 | 930 | 2 167.2 | 95.6 |
| Doctoral students | 20 154 | 11 055 | 9 099 | 11 497.7 | 57.0 |
| Masters students | 38 501 | 18 258 | 20 243 | 17 780.9 | 46.2 |
| **Total** | **60 923** | **30 651** | **30 272** | **31 445.8** | **51.6** |

**Table C.147: Higher education sector R&D personnel in headcounts by occupation, qualification, population group and gender (2015/16)**

| OCCUPATION AND QUALIFICATION | TOTAL | SUBTOTAL | | AFRICAN | | COLOURED | | INDIAN | | WHITE | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE |
| **Researchers*** | **19 217** | **10 098** | **9 119** | **3 691** | **2 672** | **624** | **674** | **819** | **850** | **4 964** | **4 923** |
| Doctoral degree or equivalent | 8 370 | 4 879 | 3 491 | 1 325 | 736 | 300 | 222 | 375 | 281 | 2 879 | 2 252 |
| Masters, honours, bachelor or equivalent | 9 683 | 4 633 | 5 050 | 2 055 | 1 710 | 305 | 415 | 404 | 527 | 1 869 | 2 398 |
| Diplomas | 1 164 | 586 | 578 | 311 | 226 | 19 | 37 | 40 | 42 | 216 | 273 |
| **Technicians directly supporting R&D** | **2 616** | **1 491** | **1 125** | **573** | **498** | **248** | **122** | **94** | **81** | **576** | **424** |
| Doctoral degree or equivalent | 248 | 143 | 105 | 20 | 6 | 5 | 3 | 2 | 4 | 116 | 92 |
| Masters, honours, bachelor or equivalent | 725 | 361 | 364 | 153 | 118 | 36 | 54 | 20 | 24 | 152 | 168 |
| Diplomas | 1 643 | 987 | 656 | 400 | 374 | 207 | 65 | 72 | 53 | 308 | 164 |
| **Other personnel directly supporting R&D** | **3 779** | **1 222** | **2 557** | **557** | **869** | **150** | **463** | **55** | **83** | **460** | **1 142** |
| Doctoral degree or equivalent | 263 | 131 | 132 | 33 | 39 | 7 | 10 | 14 | 10 | 77 | 73 |
| Masters, honours, bachelor or equivalent | 1 420 | 473 | 947 | 209 | 278 | 45 | 126 | 22 | 35 | 197 | 508 |
| Diplomas | 2 096 | 618 | 1 478 | 315 | 552 | 98 | 327 | 19 | 38 | 186 | 561 |
| **Total** | **25 612** | **12 811** | **12 801** | **4 821** | **4 039** | **1 022** | **1 259** | **968** | **1 014** | **6 000** | **6 489** |

*Excludes doctoral students and post-doctoral fellows.

**Table C.148 Higher education sector overview (2015/16)**

| | R&D EXPENDITURE | RESEARCHER HEADCOUNT | RESEARCHER FTE | POSTGRAD HEADCOUNT* | POSTGRAD FTE* |
|---|---|---|---|---|---|
| | R' 000 | | | | |
| Private Universities | 108 441 | 415 | 205.1 | 288 | 151.7 |
| Universities | 8 913 707 | 15 739 | 4 020.8 | 20 644 | 12 481.7 |
| Nelson Mandela Metropolitan University | 285 928 | 537 | 104.2 | 629 | 313.4 |
| North West University | 603 524 | 1 616 | 414.3 | 1 619 | 852.0 |
| Rhodes University | 239 032 | 495 | 155.6 | 631 | 631.0 |
| Sefako Makgatho Health Sciences University (SMU)† | 167 449 | 504 | 106.8 | 68 | 47.6 |
| University of Cape Town | 1 473 043 | 1 310 | 527.3 | 2 066 | 1 319.6 |
| University of Fort Hare | 307 607 | 466 | 93.2 | 652 | 652.0 |
| University of Johannesburg | 443 016 | 916 | 234.5 | 1 062 | 587.3 |
| University of KwaZulu Natal | 652 217 | 1 417 | 389.5 | 3 118 | 1 485.0 |
| University of Limpopo | 96 886 | 360 | 66.2 | 220 | 192.1 |
| University of Pretoria | 933 182 | 1 652 | 380.8 | 2 479 | 1 160.7 |
| University of South Africa | 491 305 | 1703 | 394.9 | 2 203 | 1 363.0 |
| University of Stellenbosch | 1 125 733 | 1 163 | 398.1 | 1 783 | 988.8 |
| University of the Free State | 362 643 | 566 | 164.4 | 827 | 397.6 |
| University of the Western Cape | 419 521 | 946 | 281.6 | 1 016 | 880.5 |
| University of the Witwatersrand | 1 233 285 | 1 793 | 269.0 | 2 013 | 1 449.9 |
| University of Zululand | 79 338 | 295 | 40.5 | 258 | 161.2 |
| Universities of (Science) and Technology | 854 476 | 3 063 | 476.0 | 1 490 | 1 031.5 |
| Cape Peninsula University of Technology | 180 175 | 524 | 95.4 | 235 | 235.0 |
| Walter Sisulu University of Technology and Science | 237 522 | 703 | 105.5 | 63 | 46.8 |
| Central University of Technology | 68 316 | 282 | 68.5 | 114 | 49.1 |
| Durban Institute of Technology | 85 990 | 350 | 44.7 | 271 | 157.8 |
| Mangosuthu Technikon | 17 668 | 160 | 20.3 | 8 | 8.0 |
| Tshwane University of Technology | 160 364 | 289 | 47.7 | 498 | 344.3 |
| University of Venda for Science and Technology | 43 522 | 388 | 38.8 | 241 | 145.2 |
| Vaal University of Technology | 60 920 | 367 | 55.1 | 60 | 45.3 |
| **Total** | **9 876 623** | **19 217** | **4701.9** | **22 422** | **13 664.9** |

*Postdoctoral and doctoral students.

† SMU (previously Medunsa) split from University of Limpopo.

Collected personnel data may differ from Higher Education Management Information System (HEMIS) data in some cases due to definitional differences in personnel categories.

# D. METHODOLOGY

## D.1. Survey design and planning

The South African National Survey of Research and Experimental Development (R&D survey) forms part of the tools for monitoring and evaluating the performance of the National System of Innovation (NSI).

The R&D survey may be thought of as three survey instruments covering the four main institutional sectors described in the Frascati Manual: business enterprise, government, private not-for-profit and higher education sectors. In South Africa, the science councils are extracted from the government sector and are reported separately, thus comprising a fifth South African sector.

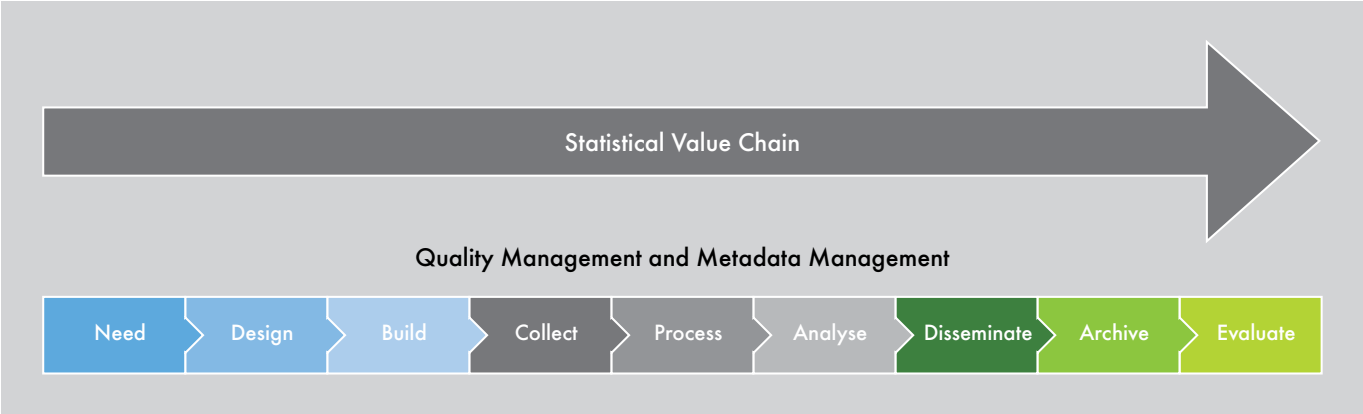
The scope of the survey includes all units performing R&D, either continuously or occasionally. Output tables are agreed in advance of the survey between CeSTII and the DST as a standard.

The survey collects data in accordance with the guidelines recommended by the OECD in the Frascati Manual (OECD, 2002). This helps to maintain coherence and international comparability. The System of National Accounts (EC, IMF, OECD, UN and World Bank, 2009) and the National System of Innovation differ on the identification of target units and definitions.

In the interests of coherence of its data with other South African economic survey data, the South African R&D survey takes care to use standards and methods applied or recommended by Stats SA. Concepts and definitions are aligned as far as possible with those in use by the National Statistical Organisation (NSO) (Stats SA, 2010a). Indicators that use external data are sourced from Stats SA surveys: gross domestic product values are the values for the 2015 annual reference period taken from the quarterly Stats SA GDP statistical release P0441 (Stats SA, 2017a), and employment level is the value for the first quarter of 2015 obtained from the Stats SA Quarterly Labour Force Survey statistical release P02111 (Stats SA, 2016). The survey also uses the Standard Industrial Classification (Stats SA, 2004) codes for business sector industrial classifications employed by Stats SA.

Overall, CeSTII performs quality management in line with practices recommended by Stats SA in the South African Statistical Quality Assessment Framework (SASQAF) (Stats SA, 2010b). The survey was conducted according to a project plan aligned with the phases of the Statistical Value Chain (SVC) illustrated in Figure D.1, which is modelled on practice at Stats SA.

**Figure D.1 Statistical Value Chain used in quality and metadata management**



## D.2. Frame, sample selection and fieldwork

Three questionnaires were used in the survey for the business sector, the higher education sector, and government departments, research institutes, museums, science councils and not-for-profit organisations.

R&D performers in sectors were taken to be any units that had R&D expenditure, or were likely to have had R&D expenditure, in 2015/16. Table D.1 describes each of the sectors, the fieldwork periods by sector, and also their respective reference periods.

**Table D.1: Description of sectors, respective reference periods, sampling methods and fieldwork periods**

| SECTOR | DESCRIPTION | REFERENCE PERIOD | METHOD OF SURVEYING | FIELDWORK AND FOLLOW-UP PERIOD |
|---|---|---|---|---|
| Business | Business enterprises, including state-owned enterprises. | Financial year 2015-2016 (or the closest complete financial year). | A purposive design was used for the survey of the business sector, and the frame was constructed from the business register of likely R&D performers developed and maintained by CeSTII since 2001. All known and likely R&D performers were targeted. | October 2016 - June 2017 |
| Not-for-profit | Non-governmental and not-for-profit entities (i.e. those registered as Section 21 Companies). | Financial year 1 April 2015 to 31 March 2016 (or nearest complete financial year). | All known and likely R&D performers were surveyed following an investigative process using a list of registered non-governmental and not-for-profit organisations including those that were on the current frame. | 26 September 2016 - 7 April 2017 |
| Government | National and provincial departments, local government, museums, research institutes and other research units with an R&D components. | Financial year 1 April 2015 to 31 March 2016 (or nearest complete financial year). | Government departments were surveyed using a census approach. All national government departments, associated research institutions and museums performing R&D at national, provincial and local levels were included in the government sector. | 25 October 2016 - 31 May 2017 |
| Science councils | The nine science councils established through Acts of Parliament. | Financial year 1 April 2015 to 31 March 2016 (or nearest complete financial year). | Seven statutory science councils were surveyed, using a census approach. | 25 October 2016 - 31 May 2017 |
| Higher education | All public higher education institutions as well as private higher education institutions that performed R&D. Teaching hospitals were also included in this sector. | Calendar year (ending 31 December 2015). | Higher education institutions, namely universities, universities of science and technology, institutes of education and private higher education institutions were included in the higher education sector frame. All public higher education institutions were surveyed, using a census approach. | 25 October 2016 - 31 May 2017 |

## D.3. Fieldwork

The R&D data were collected by means of questionnaires that were sent to the units in each sector by surface and/or electronic mail.

A unit was considered as a response if it completed and returned a questionnaire with non-zero in-house R&D expenditure; if the unit's in-house R&D expenditure, headcounts, and sources of fund data were reported by the respondent without a completed questionnaire; or if data were confirmed by the respondent after being imputed based on secondary data sources. The data sources used for imputation included previous R&D survey responses as well as other private and public data sources such as the Higher Education Management Information System (HEMIS) and Support Programme for Industrial Innovation (SPII).

For each sector, a list of R&D-performing units was identified from existing lists and intelligence-gathering operations. These units were verified as R&D performers to determine the units to be surveyed before collection began.

## Business sector

CeSTII has developed a register of potential R&D performers in the business sector from several information sources, including the following lists: JSE Limited Top 100 Companies, Technology Top 100, Support Programme for Industrial Innovation and Technology and Human Resources for Industry Programme). The business sector register benefited further from inclusions from the DST R&D Tax Incentive programme surveyed in 2014/15. The business register contained 874 units in the 2015/16 survey period.

In 2015/16, the business sector used 251 units obtained from the 2013 Business Innovation Survey sample to improve coverage. The identified 251 units were classified as potential new R&D performers, as they were yet to undergo a register cleaning and contact verification procedure. Following contact searches, of the 251 units identified as potential new R&D performers, 247 units had available contact details with which to ensure effective contact verification. Out of the 156 units with identified reporting units, 136 returned questionnaires and 26 recorded R&D activity. The additional coverage from the remaining 26 that the process yielded was estimated in Table D.2.

**Table D.2: Assessment of improved coverage in the business sector**

| | AMOUNT | PROPORTIONAL CONTRIBUTION TO BERD | NUMBER OF UNITS |
|---|---|---|---|
| | RAND MILLION | % | |
| BERD | 13,814.995 | | |
| Improved coverage in business sector | 109.854 | 0.8 | 26 |
| **Total additional coverage contribution to BERD** | **109.854** | **0.8** | |

As a proportion of GERD, the additional coverage due to all three of these effects in 2015/16 was 0.3%. Viewed as a proportion of overall BERD, the additional coverage was relatively small at 0.8%.

It was estimated that the contribution of the improved coverage to the R&D intensity was 0.003 percentage points of the value of 0.80%.

## Science councils sector

Seven R&D-active science councils responded to the survey questionnaire. One of these science councils was surveyed at the level of its constituent units, resulting in a total of 13 reporting units surveyed in the science councils sector.

## Not-for-profit sector

There is an ongoing process of improvement in coverage of the not-for-profit sector by investigating a comprehensive list of 2 203 NPOs. No new sources were added to the register. A total of 141 units on the source list were investigated for the 2015/16 survey, of which 12 were confirmed with reporting units. The NPO frame for the 2015/16 survey comprised a total of 82 units that were identified as likely R&D performers, consisting of 12 new units and 70 that were previously surveyed.

## Government sector

The government sector investigated a list of 164 units consisting of national and provincial departments, municipalities, research centres and museums, of which 100 units were selected for surveying.

## Higher education sector

In the 2015/16 R&D survey, the survey frame for the higher education sector was 33, which consisted of 9 private universities and 24 public universities. The 2015/16 R&D survey included responses from three institutions that were previously imputed on more than one occasion, and also included the Sefako Makgatho Health Sciences University (SMU) for the first time. The effect of these improved responses and improved coverage in the private higher education sector is assessed in Table D.3. SMU, previously part of the Medunsa Campus at the University of Limpopo was established in May 2016 through the Higher Education Act 1997 (Act 101 of 1997). The two other newly formed universities, the Sol Plaatje University and University of Mpumalanga, will be included in the higher education sector frame as they become fully operational and established in their research activities.

The use of annual reports in producing estimates for missing other current expenditure was put to greater use in 2015/16. The additional R&D expenditure covered from such increased usage is estimated in Table D.3.

The funding of research chairs, while not explicitly delineated between respondents and collectors, were included in these estimates, as it has been in previous years.

**Table D.3: Assessment of effects of improved fieldwork responses in the higher education sector**

| | AMOUNT | PROPORTIONAL CONTRIBUTION TO BERD | NUMBER OF UNITS |
|---|---|---|---|
| | RAND MILLION | % | |
| HERD | 9,876.623 | | |
| Additional R&D expenditure from annual reports | 57.023 | 0.6 | 7 |
| Additional R&D expenditure from improved responses in public universities | 658.825 | 6.6 | 4 |
| Additional R&D expenditure from improved fieldwork responses in private universities | 56.711 | 0.6 | 3 |
| **Total additional contribution to HERD** | **772.558** | **7.8** | |

As a proportion of GERD, the additional coverage due to all three of these effects in 2015/16 was 2.4%. Viewed as a proportion of overall HERD, it is relatively large. The additional coverage was estimated at 7.8% of HERD expenditure, and this needs to be taken into consideration when making inferences on trends in the HE sector.

It was estimated that the contribution of these effects to the R&D intensity was 0.02 percentage points of the value of 0.80%.

## D.4. Quality indicators of survey coverage, fieldwork and analysis

A summary set of quality indicators for the collection and imputation phases of the survey processes in Table D.4 records an overall questionnaire response rate of 73.1% for the 2015/16 R&D survey, which is an improvement of 5.2 percentage points on the response rate of 67.9% that was achieved in 2014/15. At the same time, the survey systematically increased coverage that was realised in the business sector by 26 units (that contributed an additional R 110 million worth of R&D expenditure) from the addition of a new source to existing sources. Also, in the higher education sector coverage was increased by three units (contributing an additional R57 million), and in the NPO sector by 1 unit (adding half a million Rand to R&D expenditure in the sector), using existing sources of coverage.

The R&D expenditure weighted response rate of 87.2% gives an estimate of the size of national R&D expenditure captured from responses alone; that is, excluding the proportion contributed by imputed units. This indicator decreased by 6.8 percentage points from 94.0% in 2014/15 due mainly to an increase in the number and size of unit imputations in the business sector.

Part of the relatively high number of out-of-scopes in the business, not-for-profit and government sectors may be attributed to the nature of the scope of R&D surveys conducted according to Frascati standards, where the units selected for surveying include *likely* R&D performers in addition to known R&D performers. The nature of R&D performance is such that there may be a very small number of projects active in the R&D-performing business unit of a firm. These projects typically last for around three years, according to reports from the field. Upon termination of the project, the R&D expenditure of a firm would thus be nought for a particular reference period, which with the existing CeSTII operational procedures would classify it as an out-of-scope unit, even though it might very well perform R&D again in the future. For this reason the R&D survey uses collection rates as well as questionnaire response rates as key quality indicators of the collect phase of the SVC.

*Non-response*[7] was defined as failure to obtain a measurement on one or more variables for one or more units selected for the survey. These include out-of-scope units. *Out-of-scope units* are defined as units that should not be included in the survey frame because they did not belong to the target population in the reference period. Entities that returned a questionnaire stating nil in-house R&D expenditure for the survey reference period were counted as out-of-scope for the 2015/16 R&D survey.

[7] Adapted from Sarndal, Swensson, & Wretman, 1992.

*Questionnaire responses* were defined as those units that were not classified as non-responses within the set of all questionnaires sent out. The questionnaire response rate was calculated using the following formula:

$$\text{Questionnaire response rate} = \frac{\textit{Responses}}{\textit{(Responses+Non-response)–(Out-of-scope)}}$$

*Collection rate* was defined as the proportion of completed questionnaires received for the survey compared to the total number of actively reporting sample units on the sample registry.

$$\text{Collection rate} = \frac{\textit{Responses+Out of scope+Refusals}}{\textit{active reporting units}}$$

The *weighted response rate* is a measure of the fraction of R&D expenditure collected from responses. It was calculated as:

$$\text{Weighted response rate} = \frac{\textit{R\&D expenditure obtained from responses}}{\textit{(R\&D expenditure from responses + unit imputations)}}$$

The *survey unit imputation rate* was defined as the number of eligible non-responding units that had all data imputed as a fraction of eligible units. It was calculated using the following formula:

$$\text{Survey unit imputation rate} = \frac{\textit{Unit imputations}}{\textit{(Response+Non-response)–(Out-of-scope)}}$$

**Table D.4: Quality indicators of survey coverage by sector**

| SECTOR | NUMBER OF UNITS INVESTI-GATED | NUMBER OF UNITS SELECTED TO COMPILE STATISTICS | NON-RESPONSE | OUT-OF-SCOPE | RESPONSES | QUESTION-NAIRE RESPONSE RATE | COLLECTION RATE | UNIT IMPUTATION RATE | R&D EXPENDITURE WEIGHTED RESPONSE RATE |
|---|---|---|---|---|---|---|---|---|---|
| Business | 874 | 624 | 210 | 76 | 414 | 75.5% | 81.1% | 9.3% | 72.4% |
| Not-for-profit | 141 | 82 | 36 | 14 | 46 | 67.6% | 75.6% | 2.9% | 99.1% |
| Government | 164 | 100 | 48 | 5 | 52 | 54.7% | 79.0% | 5.3% | 98.1% |
| Science councils | 13 | 13 | 0 | 0 | 13 | 100.0% | 100.0% | 0.0% | 100.0% |
| Higher education | 33 | 33 | 5 | 0 | 28 | 84.8% | 84.8% | 10.0% | 97.2% |
| **Total** | **1,225** | **852** | **299** | **95** | **553** | **73.1%** | **80.8%** | **8.1%** | **87.2%** |

## D.5. Imputation

Imputation is a procedure for entering a value for a specific data item where the response is missing or unusable. The R&D survey strives to keep the rate of imputation as low as possible, while striving to include all likely sources of R&D activity in the final estimates. Since 2012/13, the rates of imputation employed have been reported, along with the age of the data used to impute (Table D.5). Prior to 2007, the size of imputations were relatively high, and inferences obtained from this period need to take this into account.

A unit is selected for imputation only if sector leaders are convinced that those units do indeed perform R&D. Where it was not possible to obtain company confirmation, individual fieldworkers provide evidence of on-going R&D activity to qualify units for imputation. The survey employed varying degrees of imputation, ranging from using a total R&D expenditure figure reported by the respondent (by email or telephone), followed by imputing the remaining data items from available sector R&D profiles, to generating an R&D profile for a unit based on its known historical R&D profile adjusted by a GDP inflationary factor, or using publicly available data on a unit's R&D. The imputation models were unchanged from those used in the 2013/14 survey. Financial data on R&D were adjusted by a GDP inflation factor of 1.265 in 2015/16.

**Table D.5: Number of units and age of data used in the imputation models by sector**

| AGE OF DATA | BUSINESS | NPO | GOVERNMENT | SCIENCE COUNCILS | HIGHER EDUCATION |
|---|---|---|---|---|---|
| Imputed (data from current reference period) | 0 | 0 | 0 | 0 | 0 |
| Imputed (data from previous year) | 0 | 0 | 0 | 0 | 0 |
| Imputed (data more than one year old) | 0 | 0 | 0 | 0 | 0 |
| Commuted (data from previous year) | 47 | 2 | 5 | 0 | 2 |
| Commuted (data more than one year old) | 4 | 0 | 0 | 0 | 1 |
| Total | 51 | 2 | 5 | 0 | 3 |

Personnel data for non-responding higher education institutions were imputed from personnel data obtained from the Higher Education Management Information System. R&D expenditure for these units was imputed from a mathematical model or left unchanged from previous estimates.

Details of the imputation methods are available from CeSTII on request.

## D.6. Data processing and analysis

Once the individual responses to the questionnaires, including summation and percentage calculations, had been checked by the relevant fieldworker, the data were manually entered on the R&D Survey Management System. Summary data was drawn from the system, and anomalies were identified by cross-checking results and returned to sector leaders for verification and correction, when necessary.

Data tables were drawn from the data in the form of outputs agreed upon by CeSTII and the DST at the start of the survey project process. These included time series data that were added from previous surveys for the purpose of multi-year comparison. Final data quality checks were performed using the time series data, by looking for consistency with expectations, checking other sources of data, and also taking into account the economic environment.

Tables on the SOEs were produced by selecting known SOEs from the enterprises in the business sector. The list of SOEs was developed by CeSTII over several years as part of the register-building process in the business sector and was checked against the treasury list (National Treasury, 2015), and augmented with additional units in the fieldwork collection period for the 2015/16 survey, where these were confirmed by fieldwork.

## D.7. Dissemination

The 2015/16 R&D survey reports will be disseminated to all respondents as well as to other users of the R&D statistics.

This report is available on request from CeSTII and the DST. The report can be downloaded from the HSRC-CeSTII website (http://www.hsrc.ac.za/en/departments/CeSTii/reports-cestii) or the DST website (http://www.dst.gov.za/index.php/resource-center/rad-reports). Care is taken to ensure the confidentiality of respondent information, and the data presented in the report are therefore anonymised as far as possible.

## D.8. Storage and archiving

The data from the R&D survey series have been archived according to established CeSTII procedures. Hard copies of the data from the two most recent surveys are kept in safe storage at CeSTII, while the data from older surveys are kept in safe storage off site. All data are stored electronically on secure servers, and daily backups of databases are generated.

# E. REFERENCES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# F. R&D SURVEY QUESTIONNAIRE (HIGHER EDUCATION SECTOR)

**STRICTLY CONFIDENTIAL**

**NATIONAL SURVEY OF RESEARCH & EXPERIMENTAL DEVELOPMENT INPUTS TO HIGHER EDUCATION [PUBLIC]**
**2015 ACADEMIC YEAR**

| UNIT | Please modify address label if necessary |
|---|---|
| | |

**AUTHORITY**

The Centre for Science, Technology and Innovation Indicators (CeSTII), within the Human Sciences Research Council (HSRC), conducts the Survey of Inputs into Research and Experimental Development (R&D) for the Department of Science and Technology (DST). **The Survey is conducted in terms of the Statistics Act No. 6 of 1999.** Organisations are therefore legally required to respond to this request for data and is required to provide accurate information about R&D performance. All data gathered for this survey is confidential. The HSRC and DST will not disseminate any information identifiable with an organisation without their consent.

**PURPOSE AND SCOPE OF SURVEY**

The R&D survey collects data on the inputs into R&D activities performed **IN-HOUSE** in South Africa by all organisations (including Business, Government, Science Councils, Not-for Profit and Higher Education). The data is used for planning and monitoring purposes and to support decisions about strengthening South Africa's competitiveness. Previous survey results may be viewed at http://www.hsrc.ac.za/en/departments/cestii/sa-national-survey-of-research-and-experimental-development. This survey covers the **Academic Year 1 January to 31 December 2015.**

**DUE DATE**

Kindly complete and return this form as soon as possible, but no later than **1 DECEMBER 2016.**

Return address: R&D Survey, Private Bag X2, Vlaeberg, 8018 **OR:** E-mail to addresses listed below.

**PLEASE KEEP A COPY OF THIS QUESTIONNAIRE FOR YOUR RECORDS**

**ASSISTANCE**

To assist you with queries kindly contact one of the survey managers:

| Name | Contact Number | E-mail |
|---|---|---|
| **Ms Natalie Vlotman** | 021 466 7826 | nvlotman@hsrc.ac.za |

**Dr. Neo Molotja**
Senior Research Specialist
nmolotja@hsrc.ac.za
Tel: 021 466 7818

**Details of person completing this questionnaire (Please print)**

| | | | | |
|---|---|---|---|---|
| **Name (With title)** | | **Tel** | | |
| **Designation** | | **Fax** | | |
| **Date** | | **Cell** | | |
| **Signature** | | **E-mail** | | |

**Details of person who has verified the data provided in this survey form, and is authorised to sign off on behalf of the institution (e.g. Dean/Director/DVC of Research)**

| | | | | |
|---|---|---|---|---|
| **Name (With title)** | | **Tel** | | |
| **Designation** | | **Fax** | | |
| **Date** | | **Cell** | | |
| **Signature** | | **E-mail** | | |

**THE FOLLOWING DEFINITIONS ARE IMPORTANT IN THE COMPLETION OF THE SURVEY QUESTIONNAIRE: WHAT IS R&D?**

**Definition**
This survey follows the approach of the Organisation for Economic Co-operation and Development (OECD), which defines Research and Experimental Development (R&D) as:

- **Research** is creative work and original investigation undertaken on a systematic basis to gain new knowledge, including knowledge of humanity, culture and society.
- **Development** is the application of research findings or other scientific knowledge for the creation of new or significantly improved products, applications or processes.

The basic criterion for distinguishing R&D from related activities is the presence in R&D of an appreciable element of novelty and the resolution of scientific and/or technological uncertainty, i.e. when the solution to a problem is not readily apparent to someone familiar with the basic stock of commonly used knowledge and techniques in the area concerned.

**Scope of survey**
The survey requests data performed IN-HOUSE by your organisation on the national territory of South Africa. Part five asks some questions on "out-sourced R&D".

**R&D in Higher Education Institutions**
Any activity classified as R&D is characterised by originality; it should have investigation as a primary objective and should have the potential to produce results that are sufficiently general for humanity's stock of knowledge (theoretical and/or practical) to be recognisably increased.

Most research work in higher education institutions would qualify as R&D.

**R&D Includes – but is not limited to:**
Activities of personnel who are obviously engaged in R&D. In addition, research activity includes:

- The provision of professional, technical, administrative or clerical support and/or assistance to personnel directly engaged in R&D
- The management of personnel who are either directly engaged in R&D or are providing professional, technical or clerical support or assistance to those R&D activities of students undertaking postgraduate research courses

**R&D Excludes:**
The following specific activities are excluded, except where they are used primarily for the support of, or as part of, R&D activities performed in this reporting unit:

- Preparation for teaching
- Academic development activities
- Scientific and technical information services
- Engineering and technical services
- General purpose or routine data collection
- Standardisation and routine testing
- Feasibility studies (except into R&D projects)
- Specialised routine medical care, for example routine pathology services
- The commercial, legal and administrative aspects of patenting, copyrighting or licensing activities
- Routine computer programming, systems work or software maintenance where there are no technological uncertainties to be resolved.

**The Classification of Borderline Institutions**
Research institutes (such as specialised healthcare clinics or "attached" research institutions) that are not directly concerned with third level teaching, but whose activities, R&D or otherwise, are all the same closely associated with the Higher Education sector should be carefully considered:

- Entities initiated by a Higher Education Institution (HEI) but subsequently becoming a not-for-profit or business entity should be classified as such and surveyed by Not-for Profit or Business sectors, even if there are close links with a Higher Education Institution.
- Staff and R&D expenditure should be reported where it was incurred
- Staff members on the payroll of the HEI Institution (e.g. department heads) should be reported by the HEI concerned.
- Staff that appears on the payroll of the "borderline" institution' should be reported by the institution concerned and not the HEI.
- The same applies to equipment and running costs.

It would be appreciated if we were informed of all such institutions to ensure that they are surveyed by the appropriate sectors and to minimise double counting.

**Provincial/Academic Hospitals**
Higher Education Institutions are requested to report on all academic and technical staff performing R&D, with joint appointments between provincial/academic hospitals and the HEI. This includes headcount, FTE's, labour costs, equipment and running costs.

| | |
|---|---|
| • Supervision and monitoring of postgraduate research courses, including students<br>• Software development where the aim of the project is the systematic resolution of a scientific uncertainty<br>• Research work in the biological, medical, engineering, physical and social sciences and the humanities<br>• Social science research, including economic, cultural, educational, psychological and sociological research<br>• R&D carried out as a participant in any unincorporated joint venture<br>• R&D projects performed on contract for other legal entities, such as businesses<br>• "Feedback R&D" directed at solving problems occurring beyond the original R&D phase, for example technical problems arising during initial production runs | It is understood that some of these costs may not be reflected in the HEI's HEMIS data or financial statements, but we request that a best estimate be included where necessary. |

**PART 1: GENERAL INFORMATION**

1. **Name of Higher Education Institution**

2. **Name of reporting unit e.g. Faculty**

3. **Did the reporting unit perform any IN-HOUSE R&D during the 2015 academic year?**

- In-House R&D refers to R&D performed by the reporting unit on its own behalf or on behalf of others.
- It excludes R&D projects funded by this organisation but carried out by others using their own facilities.
- In-house R&D must be distinguished from outsourced R&D which should be reported under Part 5.
- Only R&D performed in South Africa should be recorded.

(Please tick)

Y ☐ **Continue to Part 2: Question 4**

N ☐ **Proceed to Part 5: Q 16 & 17 on Outsourced R&D if applicable**

**If your reporting unit does *not* do any In-House and/or Outsourced R&D, please check the box below and return the questionnaire as a NIL response.**

**PART 2: R&D PERSONNEL AND STUDENTS**

**R&D PERSONNEL**
**Report against the categories listed below for all personnel employed directly in R&D or providing direct R&D services/support for at least 5% of their time. Do not count any staff NOT supporting research. Please include permanent, temporary, full-time, part-time and contract staff, as well as joint appointments for provincial hospital staff.**

**1. Researchers**

**INCLUDE:**

- Academic staff engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the direct management of the projects concerned.
- Managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher's work. Their rank is usually equal or superior to that of persons directly employed as researchers and they are often former or part-time researchers.
- Academic staff involved in research and also studying towards a Masters or Doctoral degree should be included as research staff (not students).

**EXCLUDE:**

- Managers and directors concerned primarily with budgets and human resources, rather than project management or content (include in Other personnel directly supporting R&D).
- Masters and doctoral students and post-doctoral fellows .

**2. Technicians directly supporting R&D**
Persons doing technical tasks in support of R&D, normally under the direction and supervision of a researcher.

**3. Other personnel directly supporting R&D**

**3.1 Executive and managerial level**
Executives and directors concerned primarily with budgets and human resources in support of research, rather than project management.

**3.2 Administrative and support staff**
Skilled and unskilled crafts workers supporting research.
Secretarial, administrative and clerical personnel supporting/working on, or directly associated with, R&D activity.

**EXCLUDE:**
Persons providing *indirect* services such as security and maintenance personnel, staff of central libraries, IT departments or head offices, should be excluded here but the relevant proportion of their labour costs should be included under "Other Current Costs" in Question 8D.

**R&D STUDENTS**

- All Post-doctoral fellows in whichever capacity they are appointed by the institution
- Doctoral students
- Students undertaking a Masters degree with at least a 40% research component in 2015

## 4. HEADCOUNTS OF R&D PERSONNEL

**Provide the Headcounts of all R&D personnel in this reporting unit according to the categories below**
**(Consult NOTE A on page 6 on how to extract the researcher headcount from HEMIS)**
**(Consult NOTE B on page 6 on how to calculate the Headcount and FTE data for Technicians and Other Support Staff)**

| Personnel Categories and Highest Qualification | African | | Coloured | | Indian | | White | | Sub-total | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | |
| **Researchers** | | | | | | | | | | | |
| Doctorates | | | | | | | | | - | - | - |
| Masters/Hons/Bachelors or equivalent | | | | | | | | | - | - | - |
| Diplomas and other qualifications | | | | | | | | | - | - | - |
| **Researcher total** | | | | | | | | | | | |
| **Technicians/Technologists** | | | | | | | | | | | |
| Doctorates | | | | | | | | | - | - | - |
| Masters/Hons/Bachelors or equivalent | | | | | | | | | - | - | - |
| Diplomas and other qualifications | | | | | | | | | - | - | - |
| **Technician total** | | | | | | | | | | | |
| **Other personnel directly supporting R&D** | | | | | | | | | | | |
| Doctorates | | | | | | | | | - | - | - |
| Masters/Hons/Bachelors or equivalent | | | | | | | | | - | - | - |
| Diplomas and other | | | | | | | | | - | - | - |
| **Other direct support total** | | | | | | | | | | | |

**Carry sub-totals over to Q5**

**5. RESEARCH FULL-TIME EQUIVALENTS (FTE's) AND COST-TO-COMPANY**

**Using the Male and Female Headcounts of all R&D personnel reported for in Question 4, provide the Research Full-Time Equivalents (time devoted to Research and Development). Then calculate the total labour costs of R&D using the average annual full cost-to-company for full-time staff (including annual wages and salaries and all associated costs or fringe benefits such as bonus payments, contributions to pension and medical aid funds, payroll tax, UIF and all other statutory payments) per category below.**

**(Consult the appendix provided on how to calculate Research FTE's for researchers using HEMIS data)**
**(Consult NOTE B on page 6 on how to calculate Research FTE's for technicians and support staff)**

| Personnel Categories | Headcounts (From Q 4) | | | Research Full Time Equivalents (FTE's) | | | Average annual labour cost per full-time person R'000 Excluding VAT (B) | Calculated labour cost of R&D R'000 (A x B) |
|---|---|---|---|---|---|---|---|---|
| | M | F | Total | M | F | Total (A) | | |
| Researchers * | - | - | - | | | - | | R - |
| Technicians directly supporting R&D | - | - | - | | | - | | R - |
| Other personnel directly supporting R&D | - | - | - | | | - | | R - |
| TOTAL LABOUR COST OF R&D | | | | | | | | - |

** Use the median annual labour cost (cost-to-company as explained above) of FULL-TIME senior lecturers*

**Carry over total calculated labour cost of R&D personnel to Question 8C**

**NOTE A: CALCULATION OF RESEARCHER HEADCOUNTS AND FTE'S USING HEMIS DATA**

HEMIS data for the 2015 academic year should be used to calculate researcher headcounts and FTE's. To extract this data from HEMIS use the SFTE final table structure and the Staff Programme Classification (element number/name: 044/staff programme) Classification Code 020 (Research) as the primary filter. We suggest that the data be opened in Microsoft Access or Excel. Create a table with the following variables present:

- *Gender* — *Element 012*
- *Race* — *Element 013*
- *Personnel Category* — *Element 039*
- *FTE Value* — *Element 043*
- *Qualification Type* — *Element 046*

- Only report on data pertaining to instruction/research professionals (Classification Code: 01).
- Please capture all staff, namely: permanent/temporary status, part-time/full –time and joint appointments. The number of records present should provide the headcount, while the total of the FTE values will provide the FTE value for Research that is required.
- Should you wish to extract this information at Faculty level, extract the data using CESM categories as a filter, and then divide these CESM's according to Faculty.

**NOTE B: CALCULATION OF TECHNICIAN AND OTHER SUPPORT STAFF HEADCOUNT AND FTE'S**

Unfortunately HEMIS data only reports on technicians and other staff DOING research and not SUPPORTING research. Technicians and other staff DOING research should be included under the Researcher category. HEMIS data as such could therefore not be used to calculate the headcount and Research FTE's of technicians and other staff supporting research. This information should rather be obtained from Management Information, Faculty Officers and/or Faculty Deans.

**Please note:** Total FTE's should only include such staff members that support research for at least 5% of their time, NOT ALL Technicians, Executive/Managerial or Administrative staff.

**CALCULATING RESEARCH FULL-TIME EQUIVALENTS:**

For the purpose of this survey, a person can work a maximum of 1 FTE in a year. This is why the Research FTE is not defined by specifying the maximum number of working hours in a month or year. The following equation can be used to calculate person years of effort on R&D:

(Full time equivalent) x (Portion of the year the person spent on R&D) x (Portion of their job spent on R&D) = Person years of effort on R&D

**For example:**

-a full time employee who devotes 100% of their time to R&D

1 x 1 x 1 = 1 person years on R&D

-a full time employee spending 40% of his/her time on R&D during half of the survey year:

1 x 0.4 persons x 0.5 years = 0.2 person years of R&D effort

-a part-time employee working 40% of a full time year doing only R&D

0.4 x 1x 1= 0.4 FTE to the R&D effort.

-20 full-time male researchers spending 40% of their time on R&D during the survey year:

20 x 0.4 x 1= 8

NOTE: please calculate FTEs for all R&D personnel

**Indirect Services:**

The labour costs of persons providing indirect services such as security and maintenance personnel, staff of central libraries, IT departments or head offices, should be **excluded** here but the relevant contribution included under "Other Current Costs in Question 8D.

## 6. HEADCOUNT OF POSTGRADUATE STUDENTS

**Provide the Headcount of all R&D post-doctoral fellows and postgraduate students (full-time and part-time students) in this reporting unit according to the categories below.**

| Postgraduate student categories | South African | | | | | | | | Non-South African | | Sub-total | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | African | | Coloured | | Indian | | White | | All Races | | M | F | |
| | M | F | M | F | M | F | M | F | M | F | | | |
| Post-doctoral fellows | | | | | | | | | | | - | - | - |
| Doctoral Students | | | | | | | | | | | - | - | - |
| Masters Students (only those with at least a 40% research component in their Master's degree) | | | | | | | | | | | - | - | - |
| TOTAL | | | | | | | | | | | - | - | 0 |

**Carry sub-totals over to Q7**

**7. PERCENTAGE TIME ON RESEARCH AND TOTAL COSTS**

**Using the headcounts of all R&D post-doctoral fellows and postgraduate students reported in Q6, provide the Research Full Time Equivalents (time spent on Research and Development) according to the categories below. Then provide the total value of salaries, stipends and all bursaries (both internal and external) from all available records.**

| Postgraduate Student Categories | Headcount (From Q6) | | Full-Time Equivalents (FTE's) | | Total value of salaries, stipends & bursaries R'000 Excluding VAT |
|---|---|---|---|---|---|
| | M | F | M | F | |
| Post-doctoral fellows | - | - | | | |
| Doctoral students | - | - | | | |
| Masters Students (only those with at least a 40% research component in their Master's degree) | - | - | | | |
| TOTAL COST OF STUDENTS | | | | | R - |

**Carry over total value of salaries, stipends and bursaries to Question 8C**

**PART 3: IN-HOUSE R&D EXPENDITURE**

**8. IN-HOUSE R&D EXPENDITURE**

**Compile expenditure on IN-HOUSE R&D during the academic year 2015. Include expenditure funded from all sources: internal and external (contracts and grants) and undertaken by the reporting unit on its own behalf or for other parties.**

***PLEASE NOTE:* Outsourced R&D should be reported under Part 5.**

**CAPITAL EXPENDITURE ON R&D**

**(See NOTE C on page 8 regarding the definition of capital expenditure and how to calculate capital expenditure on R&D)**

**Purchase of equipment can, in theory, be classified as either capital or current expenditure. A distinction can therefore be made between "major" and "minor" equipment (to be included in "capital" and "current" expenditures respectively) by establishing some kind of monetary limitation. Please provide us with this limitation as used by your institution:**

**R**

| | | **R'000 Excluding VAT** |
|---|---|---|
| Vehicles, plant, machinery and equipment | **A** | |
| Land, buildings and other structures | **B** | |

| **LABOUR COSTS OF R&D** | | **R'000 Excluding VAT** |
|---|---|---|
| Total cost of R&D personnel (carried over from Question 5) | | - |
| Total cost of R&D postgraduate students (carried over from Question 7) | | - |
| **TOTAL** | **C** | - |

**OTHER CURRENT EXPENDITURE ON R&D**

**(See NOTE D on page 8 regarding the definition of current expenditure and how to calculate current expenditure devoted to R&D)**

| | | **R'000 Excluding VAT** |
|---|---|---|
| Other Current Expenditure | **D** | |

| | | **R'000 Excluding VAT** |
|---|---|---|
| **TOTAL R&D EXPENDITURE (A + B + C + D = E)** | **E** | - |

**Carry over Total R&D Expenditure (E) to Question 9**

## THE DEFINITION AND CALCULATION OF IN-HOUSE R&D EXPENDITURE

### NOTE C: CAPITAL EXPENDITURE

- The full cost of capital expenses must be reported in the year of purchase (Do not depreciate)

***Including – but not limited to:***

- Expenditure on fixed assets used in the R&D projects of this reporting unit
- Acquisition of software, including license fees, expected to be used for more than one year
- Purchase of databases expected to be used for more than one year
- Major repairs, improvements and modifications on land and buildings

***Excluding:***

- Other repairs and maintenance expenses
- Depreciation provisions
- Proceeds from the sale of R&D assets

- Where a capital item is used solely for R&D, allocate the full cost of the item
- If the capital item is used for more than one activity, include only an estimate of the portion used for R&D
- Only where such an estimate of the portion used for R&D is not available, apply the percentage time that Researchers in the reporting unit spent on R&D, to the cost of the item.

### NOTE D: CURRENT EXPENDITURE

***Including - but not limited to:***

- Direct project costs, project consumables and running costs linked to research such as materials, fuels and other inputs, including telephone and printing
- Subsistence and travel expenses
- Repair and maintenance expenses
- Payments to outside organisations for use of specialised testing facilities, analytical work, engineering or other specialised services in support of R&D projects carried out by this reporting unit
- Commission/consultant expenses for research projects carried out by this reporting unit
- The relevant % of indirect and institutional costs and utility costs such as rent, space charge, leasing and hiring expenses, furniture, water, electricity any other overhead costs
- The relevant % of labour costs of persons providing indirect services such as the Head Office, HR, Finances, security and maintenance personnel, staff of central libraries, IT departments

***Excluding:***

- Contract R&D expenses where the research project is carried out elsewhere by others on behalf of this reporting unit
- Payments for purchases of technical know-how (goodwill)
- Licence fees
- Depreciation provisions

- Where current expenses such as direct project costs and consumables are used solely for R&D, allocate the full cost of the items
- If these current expenses are used for more than one activity, include only an estimate of the portion used for R&D
- Only where such an estimate of the portion used for R&D is not available, such as indirect and utility costs, and labour costs of staff providing indirect services, it is advised that respondents apply the percentage time that researchers in the reporting unit spent on R&D to the total of these current expenditures.
- So if a Faculty income and expenditure statement shows that the current expenditure for indirect and utility costs and labour costs of staff providing indirect services for the year was say R1,700,000 and that researchers on average spent 22% of their time to R&D, then this component of R&D current expenditure may be estimated as 0.22 x R1,700,000 = R374,000.

**9. SOURCES OF IN-HOUSE R&D EXPENDITURE (as reported in Question 8)**

**Provide a breakdown of the total R&D expenditure according to the sources of funds listed below**
**(NOTE: Only the proportion of the money actually SPENT is required, not the total income per source.)**

| **EXTERNAL SOURCES SPENT ON R&D** | | **R'000 Excluding VAT** |
|---|---|---|
| **National, Provincial and Local Government** excluding the HE Vote | | |
| **Government Research Institutes** e.g. Water Research Commission, KwaZulu Natal Wildlife, Natal Sharks Board, National Health Laboratories Service, Nuclear Energy Corporation of South Africa (NECSA), SA National Botanical Institute etc. | | |
| **Agency Funding** e.g. all funding administered by NRF and its National Facilities (HartRAO, SAIAB, iThemba Labs, SAAO, HMO, Zoological Gardens); THRIP funds from DTI; Innovation Fund; MRC Agency funding<br>Note: Report only the component of funding spent by **your** institution | | |
| **Science Council Funding** i.e. CSIR, HSRC, MRC (Non-agency), ARC, Geosciences, SABS, Mintek, Africa Institute of SA | | |
| **Domestic Business** including industry funds for THRIP projects | | |
| **Other South African Sources** | | |
| • Other Higher Education Institutions | | |
| • Not for Profit Organisations | | |
| • Donations and bequests from Individuals | | |
| **Foreign Sources** | | |
| **SUB-TOTAL EXTERNAL SOURCES** | **F** | - |

**NOTE F: THE CALCULATION OF GENERAL UNIVERSITY FUNDS**

- To calculate General University Funds please subtract the subtotal of all external sources listed above (F) from the total in-house R&D expenditure reported in Q8. General University Funds will therefore comprise components of the Higher Education Vote and the HEI's own funds (e.g. income from endowments, shareholdings, property, student fees, and subscriptions to journals).
- In order to enable us to classify the source of these funds more accurately, please provide your best estimate of the split of these General University Funds that can be attributed to the Higher Education Vote and the University's Own Funds. You may use a percentage distribution to calculate the split.

| | | |
|---|---|---|
| **Total R&D EXPENDITURE (carried over from Q8)** | **E** | - |
| **SUB-TOTAL (EXTERNAL SOURCES)**<br>**(carried over from F above)** | **F** | - |
| **GENERAL UNIVERSITY FUNDS (See NOTE F above)**<br>**(Including the Higher Education Vote and the HEI's Own Funds)** | **E - F** | - |
| **Higher Education Vote** | % | |
| **Own Funds** | % | |

**10. FOREIGN SOURCES OF FUNDS (in R000's) FOR IN-HOUSE R&D**

**Provide a breakdown of the foreign funding expenditure (as reported in Q9) according to the categories listed below.**

**10a. If your organisation received no R&D funding from foreign sources kindly tick N/A here and move to question 11:**

**NA**

| | | SUB TOTAL (R000's) made up of : | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Category (Sub-Total)** | **Africa (outside SA)** | **Middle East** | **Europe** | **USA / Canada** | **Central & South America** | **China** | **Rest of Asia** | **Other** |
| **Business** | **0** | | | | | | | | |
| **Not-for-Profit Organisations** / Individuals** | **0** | | | | | | | | |
| **Foundations** | **0** | | | | | | | | |
| **Government** | **0** | | | | | | | | |
| **Higher Education** | **0** | | | | | | | | |
| **TOTAL** | **0** | | | | | | | | |

* ***Including affiliated company, trade associations*** *(Affiliated denotes parent or subsidiary organisation)*
** *NPO's serving households only. Funding from non-profit organisations primarily serving by Business, Higher Education or Government should be allocated to these sectors.*

**11. PROVINCIAL EXPENDITURE ON R&D**

**State the locations where the reporting unit carries out R&D activities and the percentage of the total R&D expenditure.**

- Specify where R&D is actually performed, rather than where it is managed from.

| | | | |
|---|---|---|---|
| Eastern Cape | | Mpumalanga | |
| Free State | | Northern Cape | |
| Gauteng | | North-West | |
| KwaZulu-Natal | | Western Cape | |
| Limpopo | | **TOTAL** | **0%** |

**PART 4: CATEGORIES OF R&D EXPENDITURE**

**12. IN-HOUSE R&D CURRENT EXPENDITURE BY TYPE OF R&D**

**Specify the percentage of IN-HOUSE R&D LABOUR COST AND OTHER CURRENT EXPENDITURE by type of R&D.**

**Basic Research**

Work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without a specific application in view.

The analyses of properties, structures and relationships with a view to formulating and testing hypotheses, theories or laws.

Research providing the broad base of knowledge necessary for the solution of recognised practical problems.

The results of basic research are usually published in scientific journals.

%

**Applied Research**

Original investigation to acquire new knowledge with a specific application in view

To determine the possible uses for the findings of basic research.

To determine new methods or ways of achieving specific and pre-determined objectives

The results of applied research are intended primarily to be valid for a single or limited number of products, operations, methods, or systems.

Applied research develops ideas into operational form.

The knowledge or information derived from it is often patented but may also be kept secret.

%

**Experimental Development**

Systematic work using existing knowledge gained from research and/or practical experience for the purpose of creating new or improved materials, products, processes or services, or improving substantially those already produced or installed.

%

**TOTAL** **0%**

**13a. RESEARCH FIELDS (RF)**

**Classify R&D according to Research Fields (see Codes book) and provide the associated % of the Total R&D Expenditure per research field**

- The RF Codes are based on recognised academic disciplines and emerging areas of study.
- RF Codes per institution may exceed the number of rows provided for in the questionnaire - please feel free to provide an expanded list of RF Codes on a seperate sheet if applicable.

| | RF Codes | Percentage | | RF Codes | Percentage |
|---|---|---|---|---|---|
| RF | | | RF | | |
| RF | | | RF | | |
| TOTAL | | | | | 0% |

**13b. Multi-Disciplinary R&D**

- Multi-disciplinary R&D combines several research fields or disciplines. If your organisation performs such R&D, as described below, please provide the applicable % of total R&D Expenditure.
- Note that the percentages will most likely not total 100%.

**DEFINITIONS**

- **Biotechnology** is 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.
- **Nanotechnology** is the understanding and control of matter at dimensions of roughly 1 to 100 nanometers, where unique phenomena enable novel applications. Encompassing nanoscale science, engineering and technology, nanotechnology involves imaging, measuring, modelling, and manipulating matter at this length scale.

Please estimate the percentage of R&D expenditure allocated to the following areas:

| Multidisciplinary Area of R&D | % of R&D expenditure |
|---|---|
| Biotechnology | |
| Nanotechnology | |

**No Multi-Disciplinary R&D** ☐ ← TICK if no such R&D is done

**13c. Specific Areas of R&D**

- National R&D Strategies emphasize the importance of certain areas of R&D.
- Some of these areas are listed below. If your organisation performs R&D in these areas, please provide the applicable % of total R&D Expenditure.
- Note that the percentages will most likely not total 100%.

Please estimate the percentage of R&D expenditure allocated to the following areas:

| Specific Areas of Interest | % of R&D expenditure |
|---|---|
| Open source software | |
| New materials | |
| Tuberculosis (TB), HIV/AIDS, Malaria | |
| Environment/ Environmental issues | |
| **No R&D in these areas** | |

TICK if no such R&D is done

**14. SOCIO-ECONOMIC OBJECTIVES (SEO)**

**Classify R&D according to Socio-Economic Objectives (see Code book) and provide the associated % Expenditure**

- The SEO classification provides an indication of the sector of the national economy which will be the main beneficiary of the R&D you are practicing.
- SEO Codes per institution may exceed the number of rows provided for in the questionnaire - please feel free to provide an expanded list of SEO Codes on a separate sheet if applicable.

| | SEO Codes | Percentage | | SEO Codes | Percentage |
|---|---|---|---|---|---|
| S | | | S | | |
| S | | | S | | |
| S | | | S | | |
| S | | | S | | |
| S | | | S | | |
| **TOTAL** | | | | | **0%** |

**15. COLLABORATIVE R&D**

**15a Does your institution collaborate on R&D with persons / organisation outside your own institution?**

**YES** ☐ **Continue with Question 15.b** **NO** ☐ **Go to Question 16**

**15b. With whom is R&D conducted in partnerships, alliances or collaboration?**

NOTE: In the table below a single collaborative R&D project with several partners may be ticked in several places. Collaborative R&D may be in-house or out-sourced. R&D collaboration can occur without expenditure – please note zero expenditure in such cases.

| | | | Foreign consisting of . . . (tick as appropriate) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | South Africa | Foreign | Africa (outside SA) | Middle East | Europe | USA / Canada | Central & South America | China | Rest of Asia | Other |
| **Higher Education Institutions** | | | | | | | | | | |
| **Science Councils (e.g. CSIR, Mintek, MRC, ARC etc)** | | | | | | | | | | |
| **Government Research Institutes** | | | | | | | | | | |
| **Members of own organisation / Affiliated* organisations** | | | | | | | | | | |
| **Business enterprises (specialist consultants and trade associations)** | | | | | | | | | | |
| **Not-for-profit organisations**** | | | | | | | | | | |
| **NO COLLABORATION** | | | | | | | | | | |
| | **R 000s Excl VAT** | **R 000s Excl VAT** | | | | | | | | |
| **TOTAL (in-house & outsourced) R&D collaboration expenditure** | | | | | | | | | | |

** Affiliated denotes parent or subsidiary organisation*
*** NPO's serving households only. Funding from non-profit organisations primarily serving by Business, Higher Education or Government should be allocated to these sectors*

**PART 5: R&D OUTSOURCED / CONTRACTED OUT**

**Outsourced R&D refers to:**

- Outsourced or extramural expenditures being the amounts a reporting unit paid or committed to pay to another organisation for the performance of R&D during a specific period.
- This includes acquisition of R&D performed by and/or grants given to other organisations for performing R&D.

**If your organisation does not outsource any R&D kindly tick N/A.**

**N/A**

**16. State the value of R&D outsourced <u>INSIDE</u> South Africa**

**R'000 Excluding VAT**

**17. State the value of R&D outsourced <u>OUTSIDE</u> South Africa**

**R'000 Excluding VAT**

**THANK YOU FOR YOUR TIME AND EFFORT!**

# F. USER SATISFACTION SURVEY

## SOUTH AFRICAN NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT: STATISTICAL REPORT 2015/16

In order to improve the quality and relevance of the R&D statistics, it would be useful to receive the views of users of this publication. It would therefore be appreciated if you could complete the following questionnaire and return by fax to +27 (0)21 461 1255 or by email to RnDSurvey@hsrc.ac.za.

### 1. Name and address of respondent:

Name and title _____

Designation/occupation _____

Name and address of organisation or enterprise _____

_____

_____

### 2. Which of the following describes your area of work? Mark with 'X'.

- ☐ Government
- ☐ Private enterprise
- ☐ Public enterprise
- ☐ Academic or research institution
- ☐ International organisation
- ☐ Media
- ☐ Not-for-profit organisation
- ☐ Other, specify _____

_____

_____

### 3. In which country do you work?

_____

### 4. What is your assessment of the contents of this publication?

☐ Excellent ☐ Good ☐ Average ☐ Satisfactory ☐ Poor

5. How useful is this publication for your work?

☐ Extremely useful ☐ Very useful ☐ Useful ☐ Partly useful ☐ Not at all useful

6. How accurate is the picture of R&D in your sector or research field/s as presented in this publication?

☐ Very accurate ☐ Fairly accurate ☐ Unsure ☐ Not very accurate ☐ Not at all accurate

7. How easy was it to find specific information that you required in the publication?

☐ Extremely easy ☐ Very easy ☐ Easy ☐ Not very easy ☐ Not at all easy

8. What information (i.e. tables, text or figures) were of most interest to you? Please be as specific as possible e.g. provide table, page or figure numbers.

9. What did you like best about the publication?

10. Provide any comments or recommendations for the improvement of the publication.

**Thank you for completing the survey.**

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