# SOUTH AFRICAN NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT

# MAIN ANALYSIS REPORT: 2011/12

science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

HSRC
Human Sciences
Research Council

REPUBLIC OF SOUTH AFRICA
STATISTICIAN-GENERAL
NSS
National Statistics System

# NOTIFICATIONS

Produced by the Centre for Science, Technology and Innovation Indicators (CeSTII) on behalf of the Department of Science and Technology (DST).

First published: March 2014

## DISSEMINATION

This report may be downloaded free of charge from:

- http://www.dst.gov.za/index.php/resource-center/rad-reports
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## USER SATISFACTION SURVEY

A User Satisfaction Survey (USS) questionnaire is included as Annexure III to 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 e-mail to mclayford@hsrc.ac.za. The feedback is analysed following each survey cycle to ensure the continued improvement of the R&D Survey.

## DATA EXTRACTIONS

Data extractions in response to users' special data requests are generally provided free of charge, unless fairly substantial analytical work is required to meet any such request. Such data extractions are done in accordance with the approved data access protocol, and requests should be sent to msithole@hsrc.ac.za.

## 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.

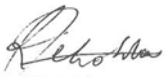
# FOREWORD

Research and Development (R&D) plays an important role in supporting economic growth and development, by both accelerating technological advances and change, and by ensuring a wider dispersion of new and existing technologies. By producing statistics in the area, the R&D survey contributes to a body of official statistics that helps to report the country's progress in R&D as a critical element for development.

The Statistics Act (No. 6 of 1999) requires the Statistician General (SG) to coordinate statistical production beyond the confines of Statistics South Africa (Stats SA). The Department of Science and Technology (DST) has fully supported this intent, playing an exemplary role as a partner within the National Statistics System (NSS). Over and above maintaining the consistency in annually producing the survey, the DST has also subjected the survey to an ongoing process of statistical quality assessment to ensure that the survey remains credible and true to its purpose.

The overall progress made in implementing the statistical quality plan over the past years has resulted in real improvements on survey processes and its output. The expanding uses of R&D statistics, as demonstrated by the ongoing review of international guidelines in this regard and user feedback will require that new dimensions be incorporated in the survey over the coming years.

Given my assessment of the recommendation of the Clearance Committee for this survey, I endorse the 2011/12 R&D Survey results and encourage its use by stakeholders.



**PALI J LEHOHLA**
**STATISTICIAN-GENERAL**
**REPUBLIC OF SOUTH AFRICA**

# PREFACE

The National Survey of Research and Experimental Development (R&D survey) is undertaken annually to monitor the country's investments in research and development (R&D). The survey provides important information to profile the size and shape of the R&D landscape. It also supports the production of statistics for use in system-level planning, monitoring and evaluation.

The 2011/12 R&D survey registered a recovery, with gross expenditure on research and development (GERD) increasing for the first time following two consecutive years of decline, namely in 2009/10 and 2010/11. All the sectors targeted by the survey have increased their R&D expenditure, with a notable increase coming from the higher education sector.

GERD as a percentage of gross domestic product (GDP) remained at 0,76%, the same level as in 2010/11. In global terms, this ratio is below the world average of 1.77. This indicates that, even if South Africa is among the leading developing countries in terms of investment in R&D and innovation, it needs to intensify its efforts to improve its competitiveness in the global knowledge economy.

The government has been steadily increasing its funding for R&D since the introduction of the National Research and Development Strategy in 2002, and has become the largest funder of R&D since 2007. As a result of this strategy, South Africa was able to more than double its nominal expenditure in R&D over this period. This demonstrates that the government is playing a strategic role to boost the capacity for new knowledge creation and innovation to support growth and development.

South Africa is among the world's leading countries for the proportion of women researchers at more than 40%. This needs to be maintained and incorporated in the overall plans for expanding the human resource base for science, engineering and technology (SET) in all the sectors. This is but one of the important pillars for creating attractive conditions and incentives to encourage private sector and international R&D investment.

I extend my appreciation, on behalf of the Department of Science and Technology, to the Centre for Science, Technology and Innovation Indicators (CeSTII) project team for their efforts in conducting this survey each year, and for the support of Statistics South Africa in recommending and monitoring the use of a sound methodology to promote continuous production of quality R&D statistics.

A special word of thanks goes to all the survey respondents, in both the private and public sector, who gave their time so readily to make this survey a success.

DEREK HANEKOM, MP
MINISTER OF SCIENCE AND TECHNOLOGY

# ACKNOWLEDGEMENTS

The National Survey of Research and Experimental Development (R&D Survey) is conducted annually by the Human Sciences Research Council's Centre for Science, Technology and Innovation Indicators (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. Olive Shisana, Chief Executive Officer of the HSRC, Dr Temba Masilela, Deputy CEO: Research of the HSRC, and Mr Pali Lehohla, Statistician-General, for their support of the R&D Survey.

The support and contributions of Mr Imraan Patel, Mr Godfrey Mashamba, Ms Tshidi Mamogobo, Ms Rose Msiza, Mr Katlego Ledwaba and Ms Kgomotso Matlapeng of the DST are much appreciated. We further acknowledge the contributions of HSRC-CeSTII administrative staff, Valda West and Benelton Jumath, and as well as ICT support by Noor Fakier and Siphamandla Bidli.

Technical inputs and advice by the DST and Statistics South Africa (Stats SA) teams as well as the Clearance Committee for Science, Technology and Innovation Statistical Reports helped improve the quality of this publication and are appreciated. Interactions with the Organisation for Economic Co-operation and Development's (OECD) Working Party of National Experts on Science and Technology Indicators (NESTI) have provided invaluable assistance in improving the quality and standard of the South African R&D Surveys and analysis of the results.

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

The CeSTII project team for the 2011/12 R&D Survey comprised (in alphabetical order): Nuraan Allie, Thomson Batidzirai, Lindsay Bell, William Blankley, Mario Clayford, Demetre Labadarios, Vaughan Leiberum, Natalie le Roux, Bonelwa Mabovu, Hlamulo Makelane, Zandile Matshaya, Neo Molotja, Cheryl Moses, Nazeem Mustapha, Nolitha Nkobole, Sibusisiwe Ntisa, Saahier Parker, Madalitso Phiri, Guia Ritacco, Julien Rumbelow, Natasha Saunders, Moses Sithole and Natalie Vlotman.

# LIST OF ABBREVIATIONS

| | |
|---|---|
| **AIDS** | Acquired immune deficiency syndrome |
| **AU** | African Union |
| **BERD** | Business expenditure on R&D |
| **BRICS** | Brazil, the Russian Federation, India, China and South Africa |
| **CEO** | Chief executive officer |
| **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 expenditure on R&D |
| **HERD** | Higher education expenditure on R&D |
| **HIV** | Human immunodeficiency virus |
| **HSRC** | Human Sciences Research Council |
| **ICT** | Information and communication technology |
| **NEPAD** | New Partnership for Africa's Development |
| **NESTI** | National Experts on Science and Technology Indicators |
| **NPO** | Not-for-Profit |
| **OECD** | Organisation for Economic Co-operation and Development |
| **PPP** | Purchasing power parity |
| **QMP** | Quality Management Plan |
| **R** | Rand (South African currency) |
| **R&D** | Research and experimental development |
| **SASQAF** | South African Statistical Quality Assessment Framework |
| **SEO** | Socio-economic objective |
| **SIC** | Standard Industrial Classification |
| **SOE** | State-owned enterprise |
| **SPII** | Support Programme for Industrial Innovation |
| **Stats SA** | Statistics South Africa |
| **SVC** | Statistical Value Chain |
| **TB** | Tuberculosis |
| **UIS** | UNESCO Institute for Statistics |
| **UNESCO** | United Nations Educational, Scientific and Cultural Organisation |
| **USS** | User Satisfaction Survey |

# DEFINITION OF TERMS

The definitions used in the survey are from the Organisation for Economic Co-operation and Development's (OECD) Frascati Manual (OECD 2002) unless otherwise stated.

**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.

**BERD** refers to business expenditure on research and experimental development.

**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 expenditure** is the annual gross expenditure on fixed assets used in the R&D programmes of statistical units. Such expenditure is reported in full in the period in which it took place and is registered as an element of depreciation. Capital expenditure includes expenditure on land, buildings, instruments and equipment.

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

**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)** refers to the number of hours (person years of effort) spent on R&D activities.

**GOVERD** refers to government expenditure on R&D.

**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 (Statistics South Africa)

**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.

**Headcount** refers to the actual number of people directly involved in or supporting R&D (i.e. the total number of R&D personnel).

**HERD** refers to higher education expenditure on research and experimental development

**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, and payroll taxes. The labour costs of persons providing indirect services that 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 from labour costs and included in other current expenditure.

**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.

**Other current expenditure** comprises non-capital purchases of materials, supplies and equipment to support R&D performed by the statistical unit in a given year

**Other support staff** include skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects.

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

**Public enterprises** (are public corporations and quasi-corporations owned by government units). These are referred to as state owned enterprises (SOE) in South Africa

**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 humanity, culture and society, and the use of this stock of knowledge to devise new applications.

**Researchers** are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned.

**R&D intensity** refers to gross expenditure on R&D as a percentage of GDP.

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

**R&D-performing sectors** comprise the government, science councils, higher education, business and not-for-profit sectors.

**Socio-economic objectives (SEO).** The SEO classification provides an indication of the main beneficiary(ies) of R&D activities.

**Standard Industrial Classifications (SIC)** are codes used by Statistics South Africa (Stats SA) for all economic activities of industries.

**Technicians and equivalent staff** are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences, or social sciences and humanities.

**Total employment** is the total employment in the economy. This statistic is obtained from Statistics South Africa's Labour Force Survey series P0211 where employed persons are those aged 15 to 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).

**Year-on-year changes** are calculated as follows: Current year's figure - previous year's figure / previous year's figure × 100%.

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# EXECUTIVE SUMMARY

The National Survey of Research and Experimental Development (R&D) is undertaken annually to monitor the country's investments in R&D. The survey presents annual statistics on the resources devoted to R&D in five sectors, namely, the government, business, not-for-profit, science councils and higher education.

South Africa's gross domestic expenditure on R&D (GERD) amounted to R22.209 billion at current Rand value for the period 2011/12. This represents a nominal increase of 9.7% from the R20.254 billion recorded in 2010/11. At constant 2005 Rand value, GERD amounted to R14.507 billion in 2011/12, representing a real increase of 3.4% from 2010/11.

GERD as a percentage of gross domestic product (GDP) was 0.76% in 2011/12. This ratio is the same as reported in the 2010/11 survey. The real increases in both GERD and GDP for the comparable period were approximately the same at 3.4% and 3.5% respectively. The trend indicates that South Africa increased this ratio from 0.60% in 1997/98, peaking at 0.95% in 2006/07, and declining since then until it reached 0.76%, where it has remained for two consecutive years (2010/11 and 2011/12).

Other important trends noted in the 2011/12 R&D Survey are as follows:

- All the sectors increased their nominal R&D expenditure in 2011/12. The higher education sector was the largest contributor to the increase in GERD, contributing an additional R1.184 billion in R&D expenditure, which was 60.6% of the increase in GERD between 2010/11 and 2011/12. Higher education expenditure on research and development (HERD) increased from R5.425 billion in 2010/11 to R6.609 billion in 2011/12.
- The business sector remained the largest performer of R&D in South Africa, spending R10.464 billion in 2011/12, which was 47.1% of GERD. The proportion of BERD to GERD has declined over time, from a seven year average of 56.5% between 2003/04 and 2009/10.
- The government and business sectors were the main sources of funding for R&D in 2011/12. Funding from government was distributed mainly between the higher education institutions and science councils, while the business sector funded most of its own R&D. The proportion of R&D expenditure funded by foreign sources increased by 2.9 percentage points to 15.0%, a large proportion (46.9%) of which funded the business sector R&D.
- In terms of research types, applied research accounted for the largest proportion of R&D expenditure in 2011/12, comprising 42.3%, followed by experimental development at 33.2% and basic research at 24.5%. In 2007/08 by comparison, 45.2% of GERD was devoted to experimental development, 34.2% to applied research and 20.6% to basic research.
- Disaggregation of GERD by research field indicates that the largest percentage of GERD during 2011/12 was spent on the medical and health sciences (17.2%), followed by the engineering sciences (17.0%), information, computer and communication technologies (12.8%) and social sciences (12.6%). The remaining 40.4% was spread across the other research fields. R&D expenditure on the medical and health sciences increased from R3.1 billion in 2008/09 to R3.8 billion in 2011/12, while R&D expenditure on the engineering sciences declined from R5.1 billion to R3.8 billion over the same period.
- The total number of R&D personnel (headcount) stood at 59 487 in 2011/12, which was an increase of 3 956 from 55 531 in 2010/11. Researchers accounted for 68.3% of the total R&D workforce of 40 653 in 2011/12. The higher education sector had the largest number of researchers, with a headcount totalling 30 399 in 2011/12; 14 699 of these researchers were post-doctoral fellows and doctoral students. The number of full-time equivalent (FTE) researchers per 1 000 in total employment was 1.5 in 2011/12. This ratio has stagnated between 1.4 and 1.5 over the previous seven years.

- In terms of the demographics of researchers, White researchers accounted for 58.2% of the total headcount of researchers in 2011/12, followed by African researchers at 27.7%, Indian researchers at 8.5% and Coloured researchers at 5.5%. The number of female researchers in 2011/12 was 17 184, indicating a 12.0% increase from the 15 794 recorded in 2010/11. Female researchers as a proportion of total researchers increased from 41.7% in 2010/11 to 42.3 % in 2011/12.
- International comparisons indicate that South Africa's R&D intensity at 0.76% for 2011/12 was below the world average of 1.77%[1], the European Union's average of 1.94% and the OECD's average of 2.37%. Among the BRICS countries, R&D intensity was above 1% in Brazil, China and the Russian Federation, and below 1% in South Africa and India (2007 data).

*1 Data for the world average, Brazil and India are from the UNESCO Institute for Statistics; data for the EU and OECD averages, China and the Russian Federation are from the OECD Main Science, Technology and Innovation Indicators 2013/1.*

# INTRODUCTION

This report provides the main analysis and detailed commentary on the results of the 2011/12 South African National Survey of Research and Experimental Development (R&D Survey).

This report is accompanied by the Statistical Report which presents key findings and trend data from previous instances of the survey. The data in the Main report as well as the Statistical Report are presented as dimensions of research and experimental development (R&D) expenditure, sources of funding and human resources:

- Gross domestic expenditure on research and development (GERD);
- GERD by R&D-performing sectors;
- Sources and flows of funding for R&D;
- R&D expenditure by sector, field of research and socio-economic objective;
- R&D personnel by occupation (researchers, technicians and support staff) and the time devoted to R&D; and
- R&D involving local and international collaborations.

The survey covered the formal sectors that perform R&D in South Africa, namely the business, not-for-profit, government, science councils and higher education sectors. This is directly comparable with the 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).

The description of the survey methodology is contained in Annexure I of this report.

# 1. R&D INDICATORS IN CONTEXT

## 1.1. THE IMPORTANCE OF R&D STATISTICS

R&D is a long-term contributor to economic growth, development and competitiveness. It is in this context that governments around the world have been designing and implementing policies to ensure increased investments in R&D and to exploit its outcomes.

The R&D Survey produces statistics that show the quantum and composition of R&D expenditure and the stock of human capital devoted to R&D. The R&D statistics are part of the indicators used for assessing the functioning and performance of innovation systems. The R&D indicators go beyond the development of the knowledge base for targeting policy objectives; they also assist in creating a stronger empirical basis for research concerning R&D and innovation.

The overall objective of the survey is to provide an overview of the status of R&D activities in South Africa. The collected data serve as the basis for the development of science policy in the setting of research priorities, government research funding levels, human capital development, and R&D and innovation incentive schemes. Where available, comparisons are made with the R&D data of other countries.

The headline indicator, GERD as a percentage of GDP, highlights the country's R&D intensity and is commonly used internationally for benchmarking and comparison purposes. Generally, R&D intensity is used in conjunction with other indicators such as GERD per capita or R&D personnel per thousand employed, because these statistics are influenced by the structure of the economy and demographics as well as the propensity to perform R&D.

The survey provides information that can be used in addressing a range of socio-economic issues in South Africa. Strategic policy documents such as the White Paper on Science and Technology (DACST 1996a), the National Research and Development Strategy (DACST 2002), the Ten Year Innovation Plan for South Africa (2008–2018) and the National Development Plan (NPC 2011) make specific commitments with respect to the country's scientific and technological activities, including R&D, in order to attain national goals. The measurement and monitoring of R&D is therefore also linked to other mechanisms for understanding the output of R&D and its impact on the economy and society.

## 1.2. KEY INDICATORS

The R&D survey produces a number of indicators. The key indicators for 2011/12 are presented in Table 1.1 compared with the equivalent indicators for 2010/11 and 2009/10.

### TABLE 1.1: KEY INDICATORS FOR 2011/12 AND COMPARATIVE FIGURES FOR 2010/11 AND 2009/10

| KEY INDICATOR | VALUE | | |
|---|---|---|---|
| | 2011/12 | 2010/11 | 2009/10 |
| Gross domestic expenditure on R&D (GERD) (Rand million) | 22 209 | 20 254 | 20 955 |
| Gross domestic product (GDP) at current prices (Rand million) | 2 917 539 | 2 664 269 | 2 395 967 |
| GERD as a percentage of GDP | 0.76 | 0.76 | 0.87 |
| Civil GERD as a percentage of GDP | 0.72 | 0.71 | 0.82 |
| Basic research (Rand million) | 5 440 | 4 848 | 5 553 |
| Total R&D personnel (FTE*) | 30 978.4 | 29 486.4 | 30 891.3 |
| Total researchers # (FTE*) | 20 115.1 | 18 719.6 | 19 793.1 |
| Total researchers # (FTE*) per 1 000 in total employment | 1.5 | 1.4 | 1.5 |
| Total R&D personnel (FTE*) per 1 000 in total employment | 2.3 | 2.2 | 2.3 |
| Total researchers (headcount) | 40 653 | 37 901 | 40 797 |
| Female researchers (headcount) as a percentage of total researchers # | 42.3 | 41.7 | 40.8 |

| | |
|---|---|
| *DEFINITIONS* | ***Research and experimental development (R&D)*** *is creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humanity, culture and society, and the use of this stock of knowledge to devise new applications (Frascati Manual, OECD 2002).*<br>***Gross domestic expenditure on R&D*** *(GERD) is total intramural expenditure on R&D performed within the national territory during a given period.* |
| *DATA SOURCES* | *South African National Survey of Research and Experimental Development, 2010/11 to 2011/12.*<br>*GDP values: Stats SA (2012) series P0441 3rd Quarter 2012. GDP.*<br>*Total employment value: Stats SA Labour Force Survey series P0211* |
| *DATA NOTE* | ** FTE = Full-time equivalent.*<br>*# Following OECD practice, doctoral students and post-doctoral fellows are included as researchers.* |

# 2. R&D EXPENDITURE

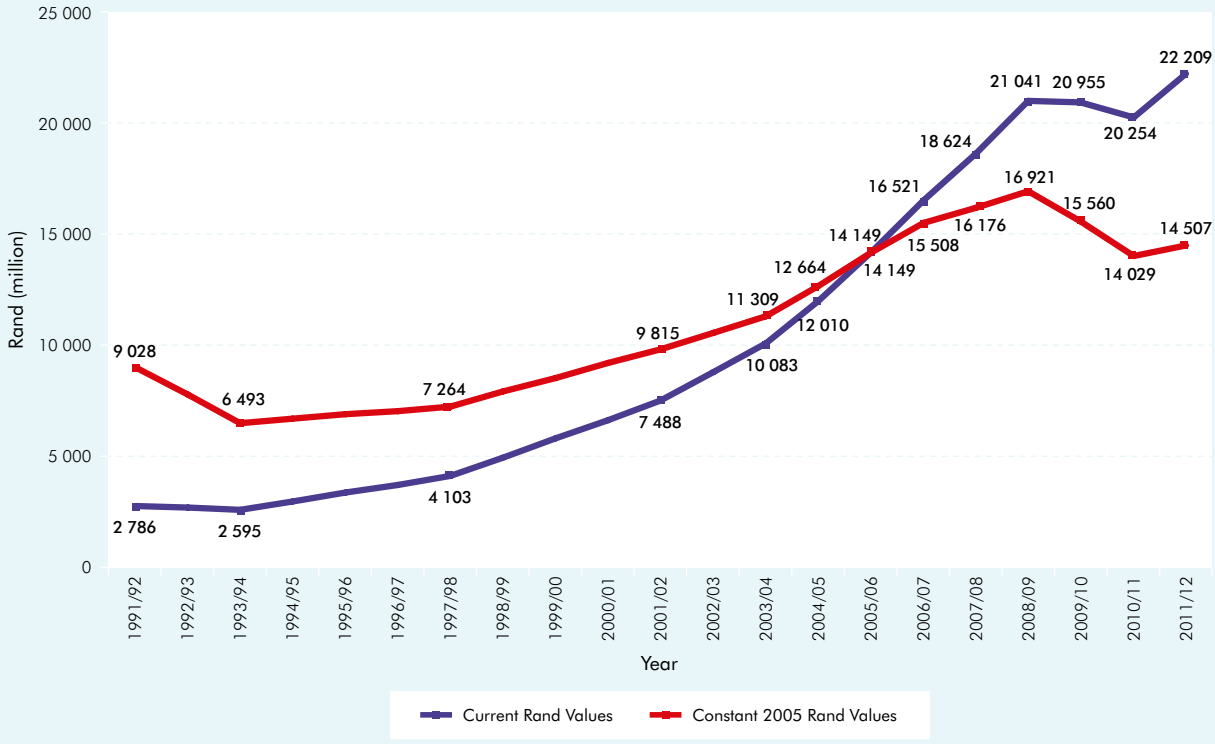
## 2.1. GROSS DOMESTIC EXPENDITURE ON R&D

Gross domestic expenditure on research and development (GERD) in 2011/12 amounted to R22.209 billion. This represents a nominal increase of 9.7% from the R20.254 billion recorded in 2010/11. At constant 2005[2] Rand value, GERD amounted to R14.507 billion in 2011/12 and represented a real growth of 3.4% from 2010/11.

The 2011/12 R&D Survey registered the first increase in GERD following the declines recorded in the previous two consecutive years, 2009/10 and 2010/11.

All the sectors increased their nominal R&D expenditure in 2011/12, with a robust increase particularly by the higher education sector.

### FIGURE 2.1: GERD IN CURRENT AND CONSTANT 2005 RAND VALUES, 1993/94 TO 2011/12

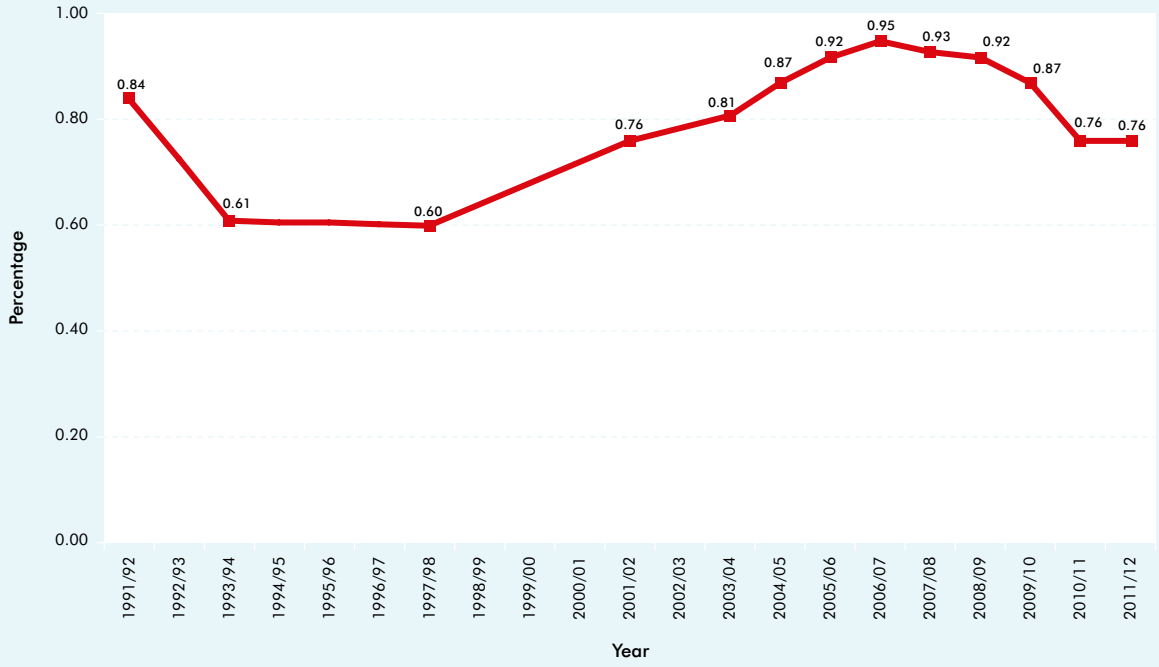



| | |
|---|---|
| ***DATA NOTE*** | *The GDP deflator value of 153.0925863, derived from the Stats SA GDP series P0441 published in November 2012 (Stats SA 2012), was used to calculate constant 2005 prices.* |
| ***DEFINITIONS*** | ***Research and experimental development*** *(R&D) is creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humanity, culture and society, and the use of this stock of knowledge to devise new applications.*<br>***Gross domestic expenditure on R&D*** *(GERD) is total intramural expenditure on R&D performed within the national territory during a given period.*<br>***Constant 2005 GERD*** *is calculated each year, using the most recent data, as GERD x (Constant 2005 GDP / GDP).* |
| ***DATA SOURCES*** | *South African National Survey of Research and Experimental Development, 1991/92 to 2011/12.*<br>*GDP values: Stats SA P0441: GDP, 3rd Quarter (2012); South African Reserve Bank for 1991/92 GDP.* |

## 2.2. GERD AS A PERCENTAGE OF GDP

GERD expressed as a percentage of GDP, which is an indicator of the concentration or intensity of R&D in an economy, was 0.76% in 2011/12. This ratio is the same as reported in the 2010/11 survey. GERD as a percentage of GDP is one of the indicators used to compare countries' research efforts and competitiveness internationally. The trend shows that GERD as a percentage of GDP in South Africa increased from 0.60% in 1997/98 and peaked at 0.95% in 2006/07, but has since declined to 0.76% in the previous two consecutive years, 2010/11 and 2011/12.

### FIGURE 2.2: GERD AS A PERCENTAGE OF GDP, 1991/92 TO 2011/12




| | |
|---|---|
| ***DATA NOTE*** | *Each new annual composite indicator point remains until the R&D Survey advises of a data revision.* |
| ***DEFINITION*** | *GERD expressed as a percentage of GDP is an indicator of the intensity of R&D in an economy.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 1991/92 to 2011/12.*<br>*GDP 2011: Stats SA P0441: GDP, 3rd Quarter (2012).* |

## 2.3. GERD BY SECTOR

The business sector remained the largest performer of R&D in South Africa. Business expenditure on research and development (BERD), in current Rand value, amounted to R10.464 billion in 2011/12, which was 47.1% of GERD. This amounted to R6.835 billion BERD at constant 2005 Rand value for 2011/12, a decrease of 1.9% from the R6.968 billion recorded in 2010/11. This is noteworthy considering that BERD in constant 2005 Rand value declined by larger percentage values for the previous two consecutive years, 2009/10 and 2010/11 (with decreases of 16.6% and 15.8% respectively).

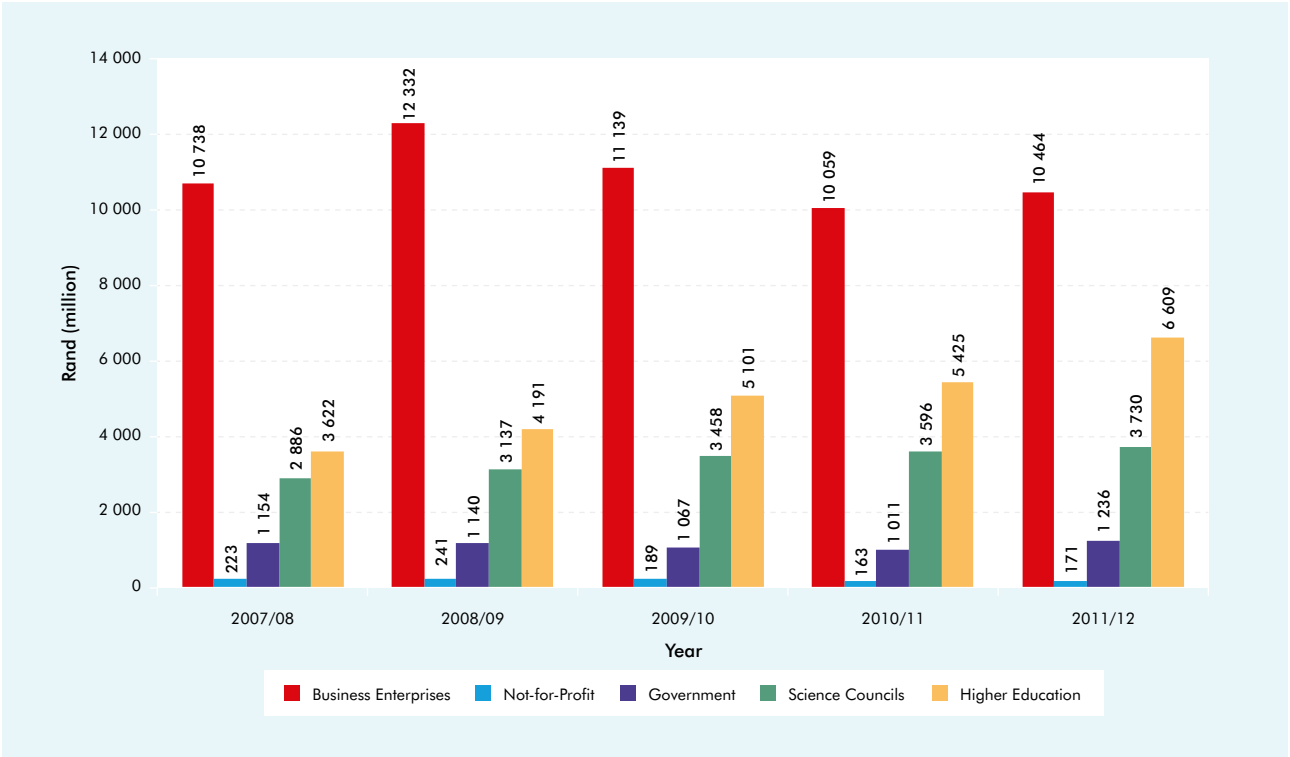
Higher education expenditure on R&D (HERD) in current Rand value grew from R5.425 billion in 2010/11 to R6.609 billion in 2011/12. At constant 2005 Rand value, this equates to an increase of 14.9%, from R3.757 billion in 2010/11 to R4.317 billion in 2011/12.

Government expenditure on R&D (GOVERD) in current Rand value was R1.011 billion in 2010/11 and R1.236 billion in 2011/12, an increase of R225 million. At constant 2005 Rand value, this corresponds to an increase of 15.2%, from R701 million in 2010/11 to R807 million in 2011/12.

R&D expenditure by science councils rose from R3.596 billion in 2010/11 to R3.730 billion in 2011/12. At constant 2005 Rand value, this corresponds to a decline of 2.2%, from R2.491 billion in 2010/11 to R2.436 billion in 2011/12.

Not-for-profit organisations (NPOs) recorded an increase in R&D expenditure from R163 million in 2010/11 to R171 million in 2011/12. This reflects relatively constant performance. In constant 2005 Rand value, this represents a decline from R113 million in 2010/11 to R111 million in 2011/12.

### FIGURE 2.3: R&D EXPENDITURE BY SECTOR (R MILLION), 2007/08 TO 2011/12




| | |
|---|---|
| *DEFINITION* | ***R&D-performing sectors** are defined, according to the Frascati Manual (OECD 2002), as comprising the government, higher education, business and not-for-profit sectors. For these statistics, GERD has been disaggregated by sector of performance as recorded in the R&D Survey.* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

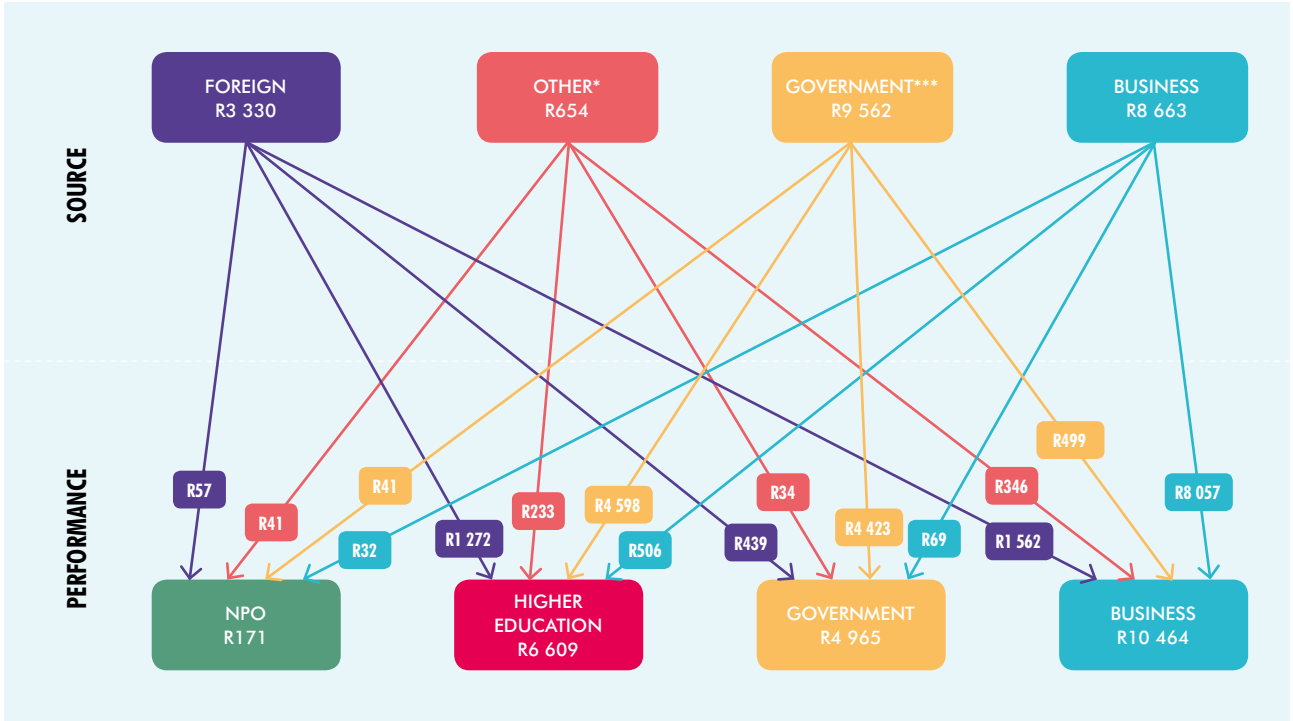
# 3. FUNDING FOR R&D

## 3.1. MAJOR FLOWS OF R&D FUNDING IN SOUTH AFRICA

The government sector and the business sector were the largest funders of R&D in 2011/12, funding 43.1% and 39.0% respectively. The business sector funded 77.0% of its R&D (worth R8.057 billion) from its own sources. This sector attracted funding worth R1.562 billion from foreign sources in 2011/12, a large part of which traditionally comes from foreign parent companies of local subsidiaries (52.8% or R761 million in 2010/11 and 44.5% or R685 million in 2009/10). The contribution of government towards R&D in the business sector amounted to 4.8% of BERD in 2011/12 (totalling R499 million).

The bulk of the R&D funded by government was undertaken by higher education institutions and science councils. The higher education sector experienced a substantial increase in its funding from foreign sources, government and the business sector. This sector received R4.598 billion (which represented 69.6% of their R&D funding) from government in 2011/12, while government institutions, including science councils, received R4.423 billion (89.1% of their R&D funding) from government in the same year.

### FIGURE 3.1: MAJOR FLOWS OF R&D FUNDING (MILLION), 2011/12

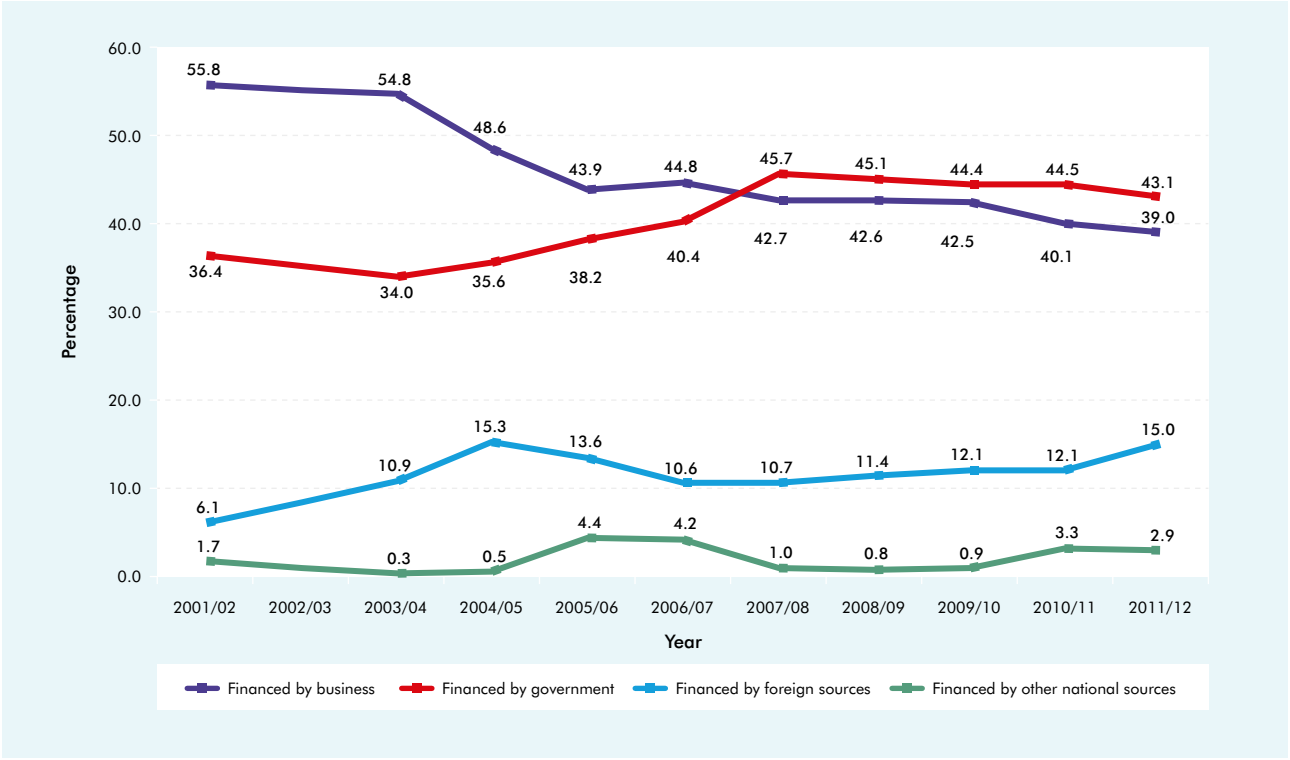



| | |
|---|---|
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2011/12.* |
| *DATA NOTE* | **'Other' includes contributions from higher education, not-for-profit organisations and individual donations.*<br>***Government includes science councils.* |

## 3.2. R&D BY SOURCES OF FUNDS

Government and business enterprises have traditionally funded the largest proportions of GERD in South Africa. Government has been the largest funder of R&D since 2007/08. In 2001/02, 55.8% of GERD was financed by the business sector, but this expenditure as a proportion of all R&D funded nationally has decreased gradually to the 39.0% of GERD recorded in 2011/12. Government financed 36.4% of GERD in 2001/02, increasing to a peak of 45.7% in 2007/08, before decreasing in subsequent years to the 43.1% recorded in 2011/12. The proportion of GERD financed from abroad increased in recent years from 10.6% in 2006/07 to 15.0% in 2011/12.

### FIGURE 3.2: GERD BY SOURCE OF FUNDS PERCENTAGE, 2001/02 TO 2011/12




| | |
|---|---|
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2001/02 to 2011/12.* |

## 3.3. BUSINESS-FUNDED R&D

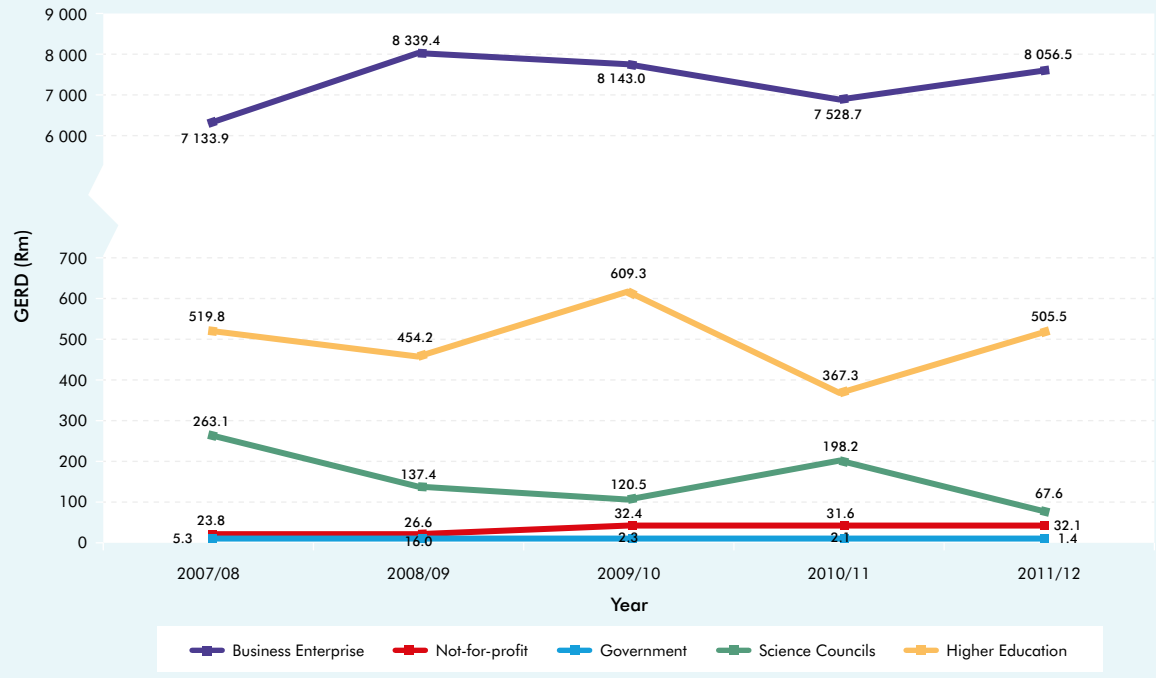
The business sector has traditionally funded most of its own R&D. In the period between 2007/08 to 2011/12, this self-funding peaked at R8.339 billion in 2008/09, and has since declined to R8.057 billion in 2011/12.

Business sector funding for R&D in the higher education and science councils sectors fluctuated between 2007/08 and 2011/12. In 2011/12, R506 million of higher education R&D was funded by the business sector. Business-funded R&D at science councils decreased from R263 million in 2007/08 to R68 million in 2011/12.

### TABLE 3.1: BUSINESS-FUNDED R&D BY SECTOR OF PERFORMANCE (R'000), 2007/08 TO 2011/12

| SECTOR | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 |
|---|---|---|---|---|---|
| Business | 7 133 913 | 8 339 379 | 8 142 996 | 7 528 667 | 8 056 545 |
| Not-for-profit | 23 791 | 26 591 | 32 427 | 31 627 | 32 081 |
| Government | 5 343 | 15 980 | 2 326 | 2 406 | 1 355 |
| Science councils | 263 098 | 137 356 | 120 528 | 198 206 | 67 614 |
| Higher education | 519 804 | 454 184 | 609 250 | 367 340 | 505 510 |
| **Total (current Rand values)** | **7 945 949** | **8 973 490** | **8 907 527** | **8 128 246** | **8 663 105** |
| **Total (constant 2005 Rand values)** | **6 901 487** | **7 216 201** | **6 614 370** | **5 630 165** | **5 658 736** |

### FIGURE 3.3: BUSINESS-FUNDED R&D BY SECTOR OF PERFORMANCE (R MILLION), 2007/08 TO 2011/12




*DATA SOURCE* *National Survey of Research and Experimental Development, 2007/08 to 2011/12.*

## 3.4. GOVERNMENT FUNDING OF DOMESTIC R&D

Higher education institutions and science councils were the largest recipients of government funding for R&D in 2011/12, receiving R4.598 billion and R3.311 billion respectively. Government funding of R&D undertaken within government institutions (other than science councils) increased to R1.112 billion in 2011/12 from R990 million in 2010/11. The business sector received R499 million for R&D from government in current Rand value in 2011/12, while not-for-profit organisations received R41 million in the same period.

Total government-funded R&D in constant 2005 Rand value peaked in 2008/09 at R7.638 billion before decreasing to R6.246 billion in 2011/12.

### TABLE 3.2: GOVERNMENT-FUNDED R&D (R'000), 2007/08 TO 2011/12

| SECTOR | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 |
|---|---|---|---|---|---|
| Business | 2 326 728 | 2 567 140 | 1 429 766 | 832 173 | 499 298 |
| Not-for-profit | 33 399 | 32 711 | 38 484 | 41 830 | 40 992 |
| Government | 1 091 049 | 1 068 527 | 1 008 475 | 990 290 | 1 112 307 |
| Science councils | 2 297 322 | 2 602 458 | 2 917 683 | 2 932 489 | 3 310 894 |
| Higher education | 2 761 557 | 3 226 674 | 3 918 620 | 4 222 092 | 4 598 426 |
| **Total (current Rand value)** | **8 510 055** | **9 497 510** | **9 313 028** | **9 018 874** | **9 561 917** |
| **Total (constant 2005 Rand value)** | **7 391 444** | **7 637 601** | **6 915 479** | **6 247 073** | **6 245 839** |

| | |
|---|---|
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.*<br>*Constant 2005 GDP values: Stats SA (2012).* |

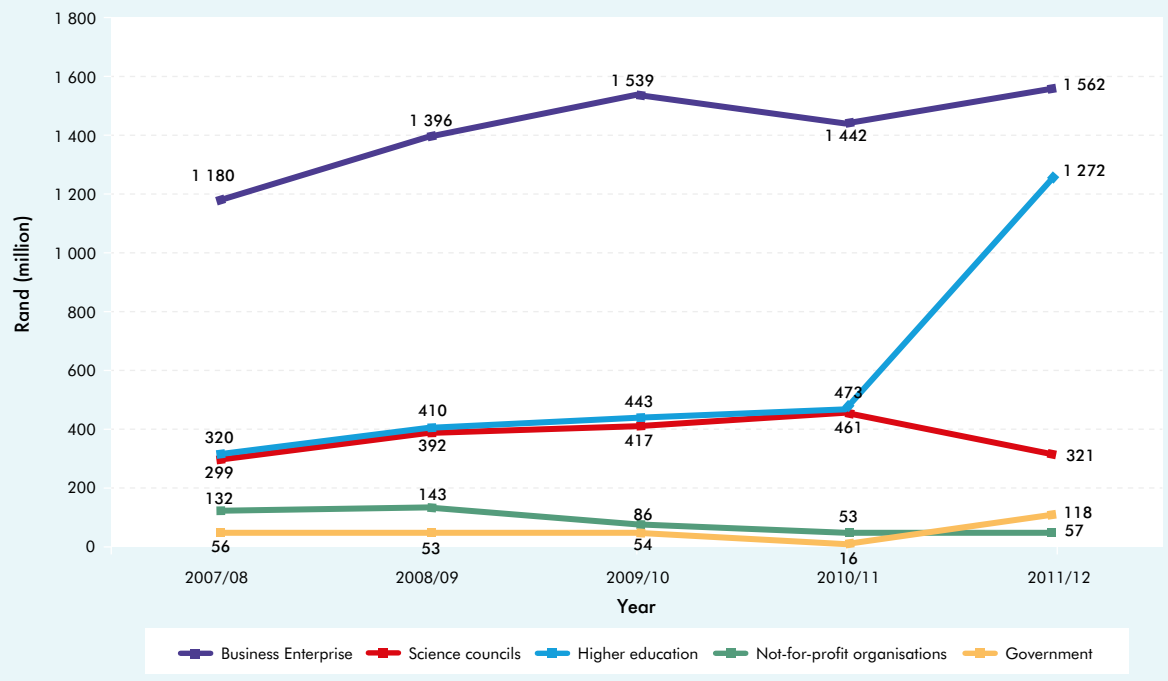
## 3.5. FOREIGN FUNDING OF DOMESTIC R&D

Most of the foreign funding for R&D went to the business sector (46.9%) and the higher education sector (38.2%). The proportion of foreign-funded R&D has been consistently highest in the business sector, with funding increasing from R1.180 billion in 2007/08 to R1.562 billion in 2011/12 in current Rand value. Foreign funding of higher education R&D increased by R799 million, or 168.9%, between 2010/11 and 2011/12, mostly due to a confirmed spike in foreign funding at one university.

Science councils received less foreign funding of R&D in 2011/12 (R321 million) than in 2010/11 (R461 million).

Not-for-profit organisations and government received the lowest amount of foreign funding for R&D between 2007/08 and 2010/11, with not-for-profit organisations recording R57 million in 2011/12 and government recording R118 million in the same year.

### FIGURE 3.4: FOREIGN-FUNDED R&D BY SECTOR OF PERFORMANCE (R MILLION), 2007/08 TO 2011/12




| | |
|---|---|
| *DATA NOTE* | *Foreign sources include all funding from foreign sources from all sectors.* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

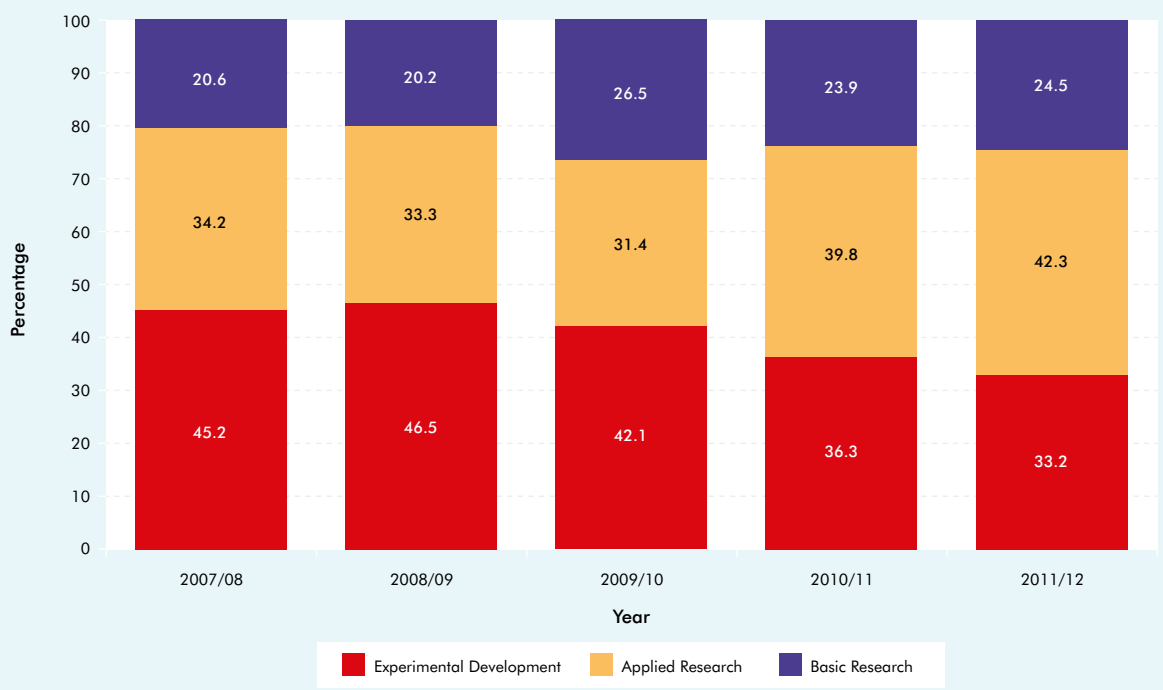
# 4. CATEGORIES OF GERD

## 4.1. GERD BY TYPE OF RESEARCH

R&D expenditure on applied research accounted for the largest proportion of R&D expenditure in 2011/12 at 42.3%, followed by experimental development at 33.2% and basic research at 24.5%.

The pattern towards increased expenditure on applied research continued and consolidated the shift in the overall composition of GERD by type of research. The share of GERD apportioned to basic research increased from 20.6% in 2007/08 to 24.5% in 2011/12. The proportion of applied research also increased over the same period, from 34.2% in 2007/08 to 42.3% in 2011/12, while the proportion of experimental development decreased from 45.2% in 2007/08 to 33.2% in 2011/12.

### FIGURE 4.1: GERD BY TYPE OF RESEARCH (PERCENTAGE), 2007/08 TO 2011/12

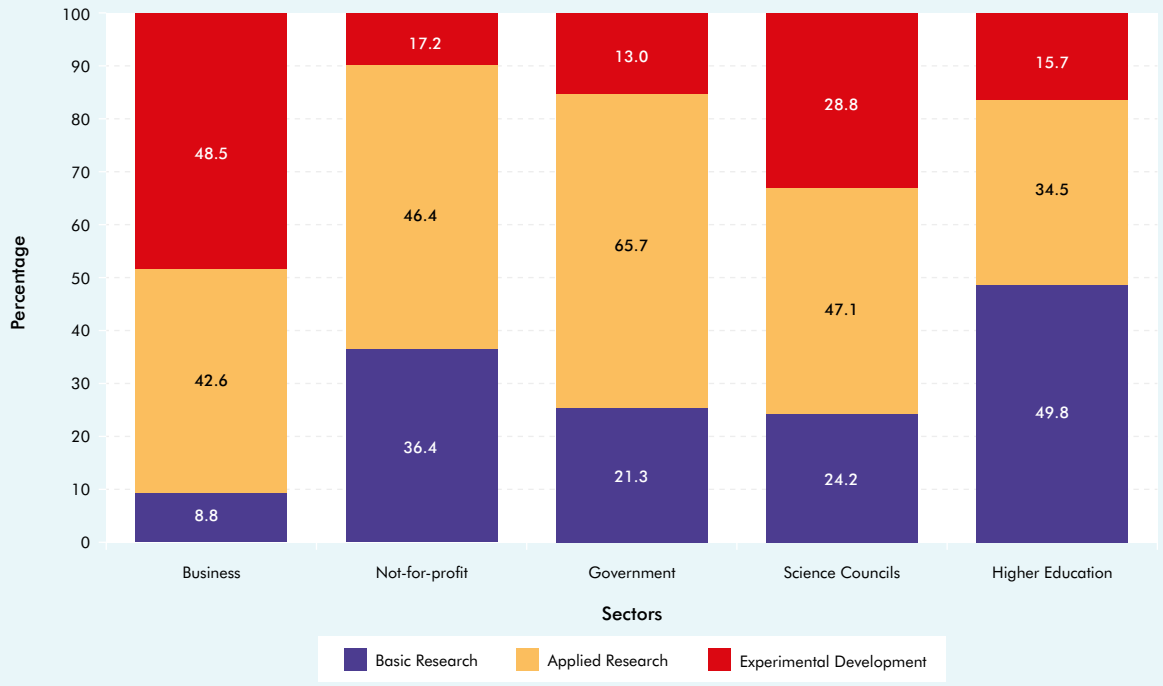



| | |
|---|---|
| *DEFINITIONS* | ***Basic research*** *is research undertaken primarily to extend the boundaries of knowledge, with no specific application in view.*<br>***Applied research*** *is original investigation to acquire new knowledge with a specific application in view.*<br>***Experimental 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.*<br>***R&D*** *covers both formal R&D in R&D units and informal or occasional R&D in other units or across an organisation.* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

# 4.2. GERD BY TYPE OF RESEARCH AND SECTOR OF PERFORMANCE

The higher education sector remained the largest performer of basic research, while R&D activities in the business sector were inclined towards experimental development. Applied research has remained more dominant in government, NPOs and science councils.

## FIGURE 4.2: GERD BY TYPE OF RESEARCH AND SECTOR OF PERFORMANCE (PERCENTAGE), 2011/12



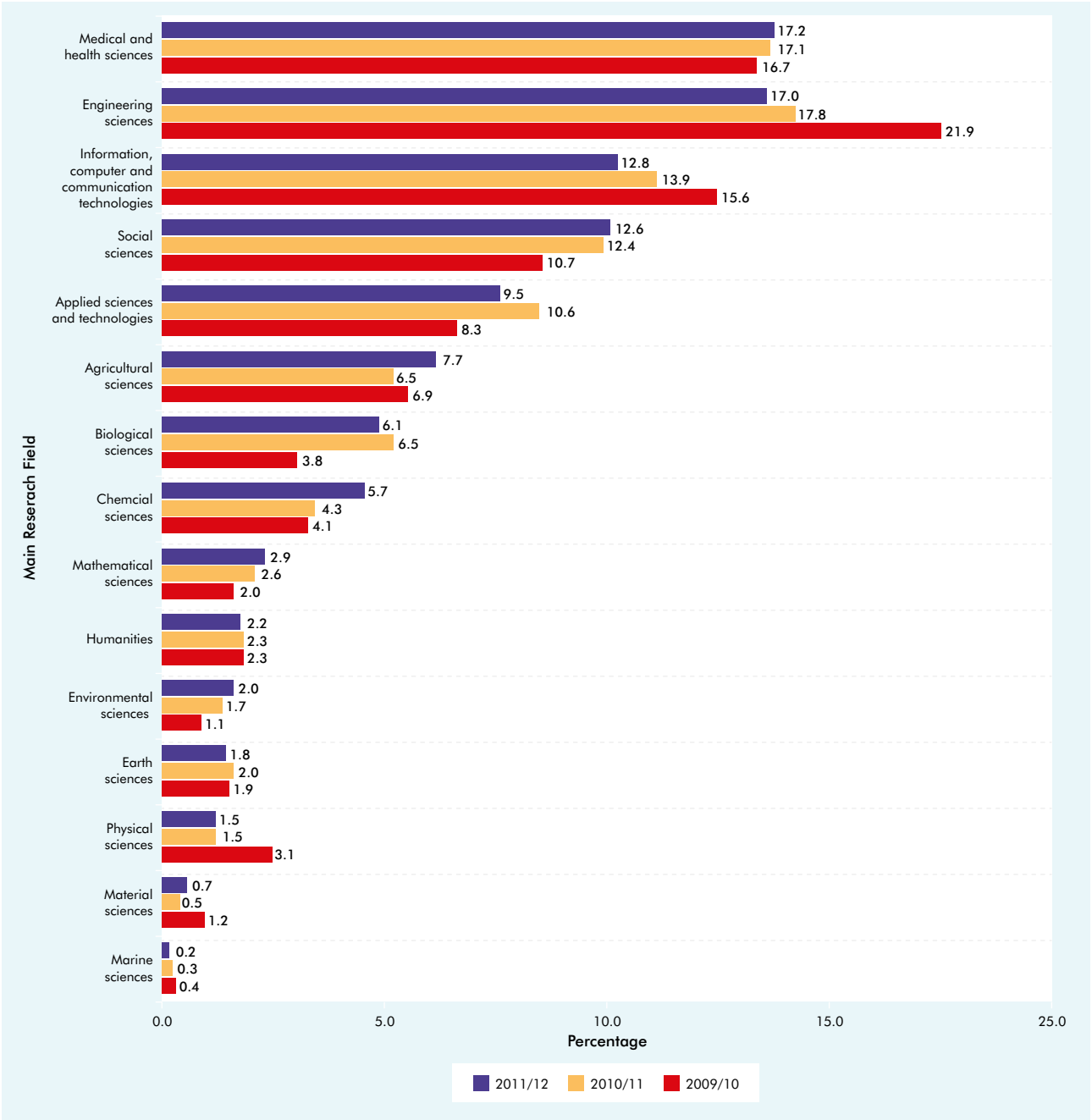

| | |
|---|---|
| *DEFINITIONS* | ***Basic research*** *is research undertaken primarily to extend the boundaries of knowledge, with no specific application in view.*<br>***Applied research*** *is original investigation to acquire new knowledge with a specific application in view.*<br>***Experimental 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.*<br>***R&D*** *covers both formal R&D in R&D units and informal or occasional R&D in other units or across an organisation.* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

# 4.3. GERD BY MAJOR RESEARCH FIELDS

The largest percentage of GERD in South Africa during 2011/12 was spent on the medical and health sciences (17.2%), followed by engineering sciences (17.0%); information, computer and communication technologies (12.8%); and social sciences (12.6%). The remaining 40.4% was spread among the other research fields.

R&D expenditure on the medical and health sciences increased from R3.1 billion in 2008/09 to R3.8 billion in 2011/12, while R&D expenditure on the engineering sciences declined from R5.1 billion to R3.8 billion over the same period.

## FIGURE 4.3: GERD BY RESEARCH FIELD (PERCENTAGE), 2009/10 TO 2011/12



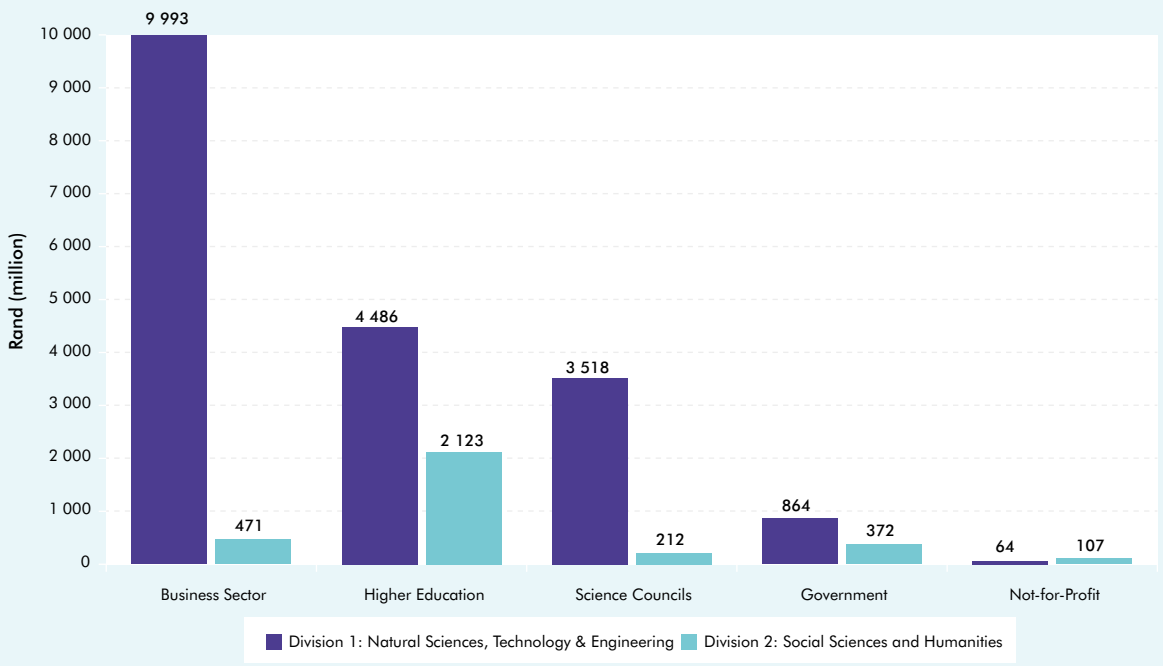

| | |
|---|---|
| ***DATA NOTE*** | *GERD according to research fields as measured in the R&D Survey.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2009/10 to 2011/12.* |

## 4.4. GERD BY DIVISION OF RESEARCH FIELD AND SECTOR OF PERFORMANCE

Division 1, which includes the natural sciences, technology and engineering, remained the dominant field of R&D expenditure in 2011/12, accounting for 85.2% of GERD. Division 2, which represents the social sciences and humanities, accounted for the remaining 14.8% of GERD. The higher education sector contributes the largest proportion of R&D spending on the social sciences and humanities.

R&D in the social sciences and humanities increased from R2.979 billion in 2010/11 to R3.285 billion in 2011/12.

### FIGURE 4.4: R&D EXPENDITURE BY RESEARCH FIELD (R MILLION), 2011/12

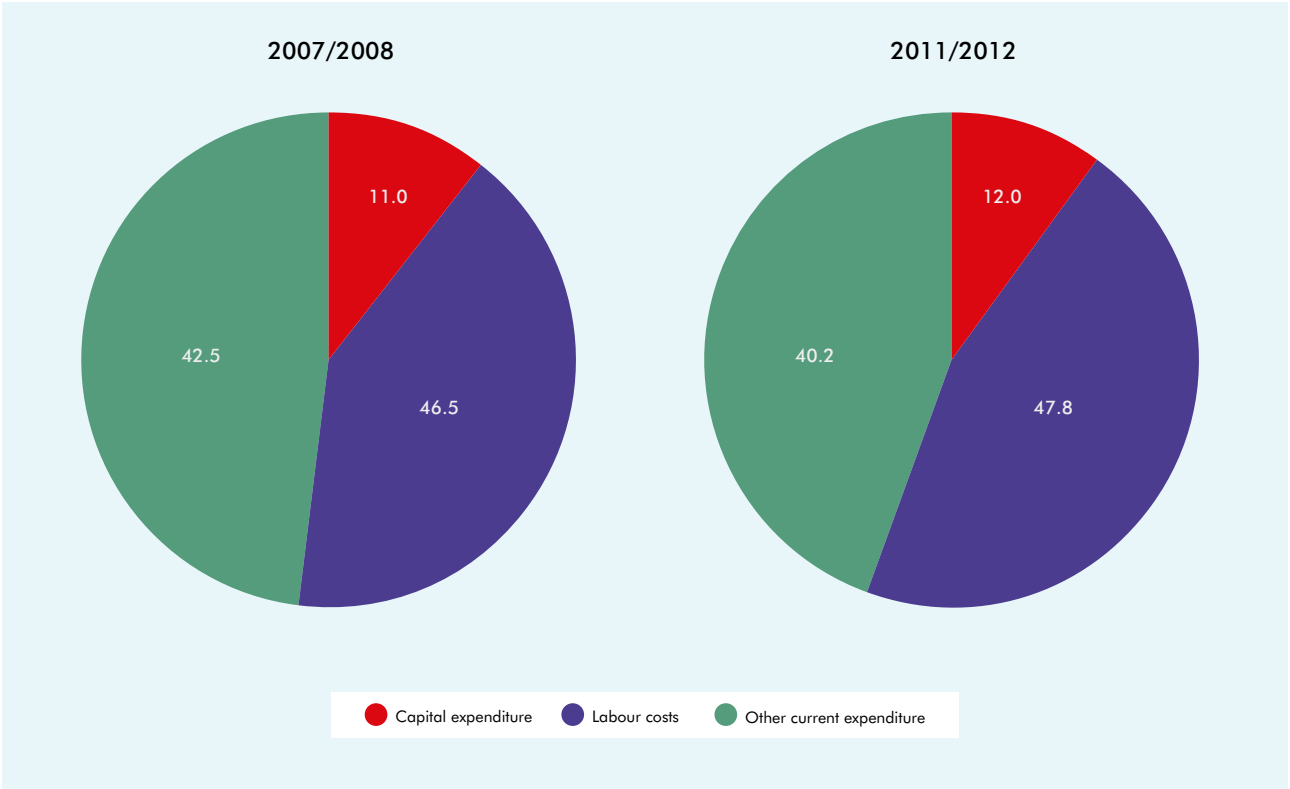



| | |
|---|---|
| ***DATA NOTE*** | *Research field codes are used to classify research expenditure according to defined scientific disciplines into two divisions: Division 1 (Natural sciences, technology and engineering) and Division 2 (Social sciences and humanities).* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2011/12.* |

# 4.5. R&D EXPENDITURE BY ACCOUNTING CATEGORY

The proportion of R&D expenditure allocated to labour costs increased from 46.5% in 2007/08 to 47.8% in 2011/12, while the percentage of R&D expenditure allocated to other current expenditure decreased from 42.5% in 2007/08 to 40.2% in 2011/12 (Figure 4.5). The percentage of R&D expenditure on capital expenditure increased from 11.0% in 2007/08 to 12.0% in 2011/12.

## FIGURE 4.5: R&D EXPENDITURE BY ACCOUNTING CATEGORY (PERCENTAGE), 2007/08 AND 2011/12

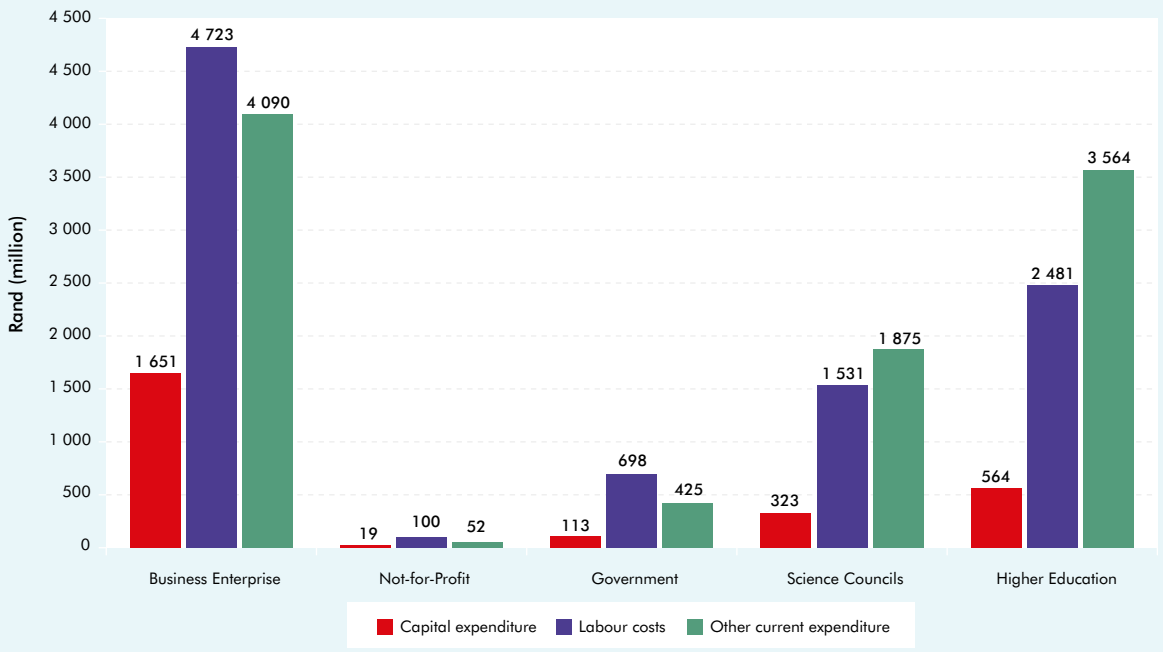



| | 2007/08 | | 2011/12 | |
|---|---|---|---|---|
| **SECTOR** | **R&D EXPENDITURE** | **%** | **R&D EXPENDITURE** | **%** |
| Capital expenditure | R 2 054 324 | 11.0 | R 2 669 737 | 12.0 |
| Labour costs | R 8 666 368 | 46.5 | R 10 608 345 | 47.8 |
| Other current expenditure | R 7 903 321 | 42.5 | R 8 931 110 | 40.2 |
| **Total** | **R 18 624 013** | **100.0** | **R 22 209 192** | **100.0** |

| | |
|---|---|
| *DEFINITION* | ***Other current expenditure*** *comprises non-capital purchases of materials, supplies and equipment to support R&D performed by the statistical unit in a given year* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

Capital expenditure contributed the smallest share to total R&D expenditure across all sectors in 2011/12. Labour costs and other current expenditure accounted for approximately equal percentages of total R&D expenditure in the business sector. Labour costs in the higher education, not-for-profit and science councils sectors totalled more than half the amount spent on other current expenditure, while in the business and government sectors, labour costs were higher than other current expenditure.

## FIGURE 4.6: R&D EXPENDITURE BY ACCOUNTING CATEGORY (R MILLION), 2011/12




| | |
|---|---|
| *DEFINITIONS* | ***Capital expenditure*** *is the annual gross expenditure on fixed assets used in the R&D programmes of statistical units. Such expenditure is reported in full in the period in which it took place and is registered as an element of depreciation. Capital expenditure includes expenditure on land, buildings, instruments and equipment.*<br>***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, and payroll taxes. The labour costs of persons providing indirect services that 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 from labour costs and included in other current expenditure.*<br>***Other current expenditure*** *comprises non-capital purchases of materials, supplies and equipment to support R&D performed by the statistical unit in a given year.* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2011/12.* |

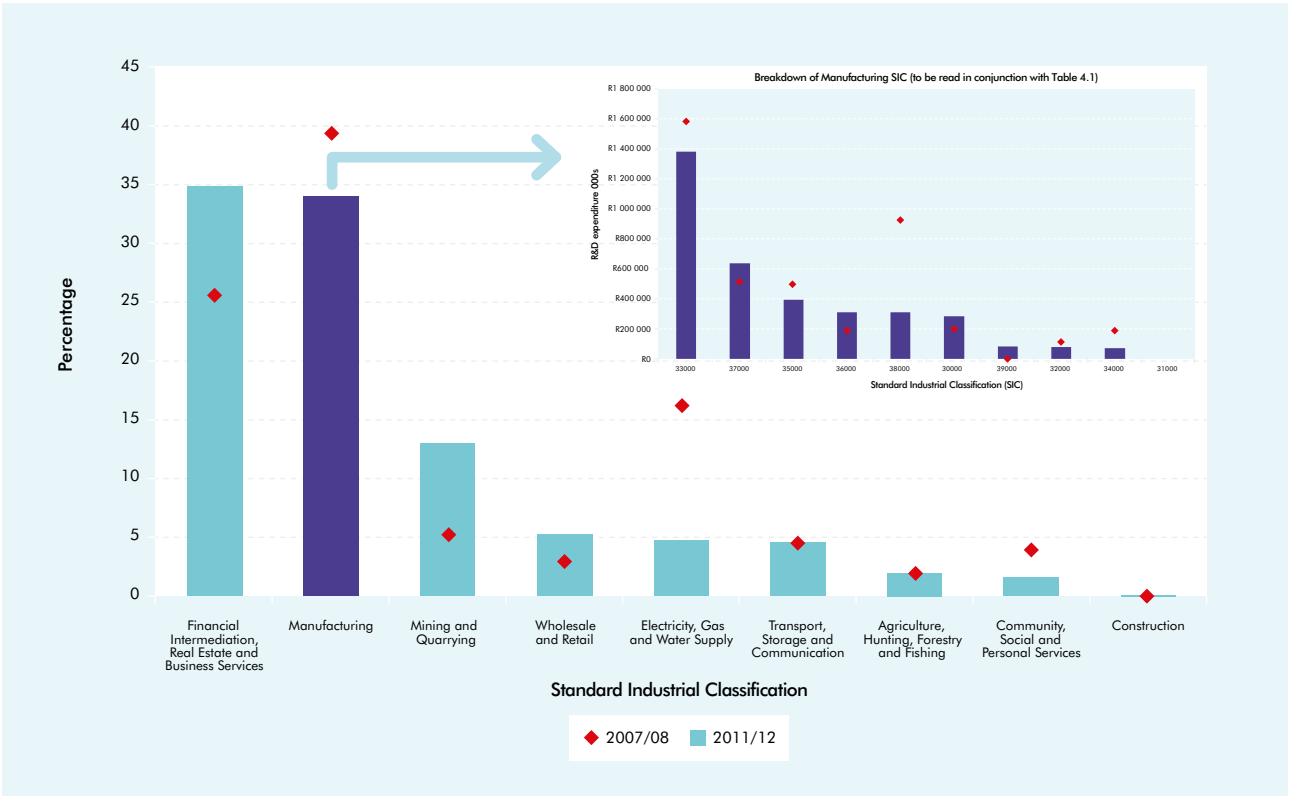
# 4.6. BUSINESS SECTOR R&D EXPENDITURE BY STANDARD INDUSTRIAL CLASSIFICATION (SIC)

The overall composition of business expenditure on R&D (BERD) by standard industrial classification (SIC) remained generally unchanged from 2001/02 until 2010/11. In the 2011/12 R&D Survey, for the first time, however, the financial, intermediation, real estate and business services sector accounted for a larger proportion of BERD than the manufacturing sector. In 2011/12, the financial and business services sector spent R3.646 billion, compared to the manufacturing sector's expenditure of R3.551 billion.

Mining and quarrying remained the third-largest contributor to BERD, with expenditure of R1.353 billion. This sector also experienced the largest increase in spending of all the sectors between 2007/08 and 2011/12, with increased R&D expenditure of 141.9%. Similarly, the year-on-year increase in expenditure in the mining and quarrying sector between 2010/11 and 2011/12 was 28.1%.

There was a large decrease in expenditure on R&D in the manufacture of transport equipment category within the manufacturing sector between 2010/11 (R 882.0 million) and 2011/12 (R 310.1 million). The survey results indicated that this could be attributed to the cut on R&D expenditure by some firms in this sector.

### FIGURE 4.7: BUSINESS R&D EXPENDITURE BY STANDARD INDUSTRIAL CLASSIFICATION (SIC) CATEGORY (AS A PERCENTAGE OF GERD), 2007/08 AND 2011/12




| | |
|---|---|
| ***DEFINITION*** | *Industry classification is based on Stats SA's five-digit Standard Industrial Classification (SIC) codes, which are used to classify businesses according to their economic activities.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 and 2011/12.* |

TABLE 4.1: STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES

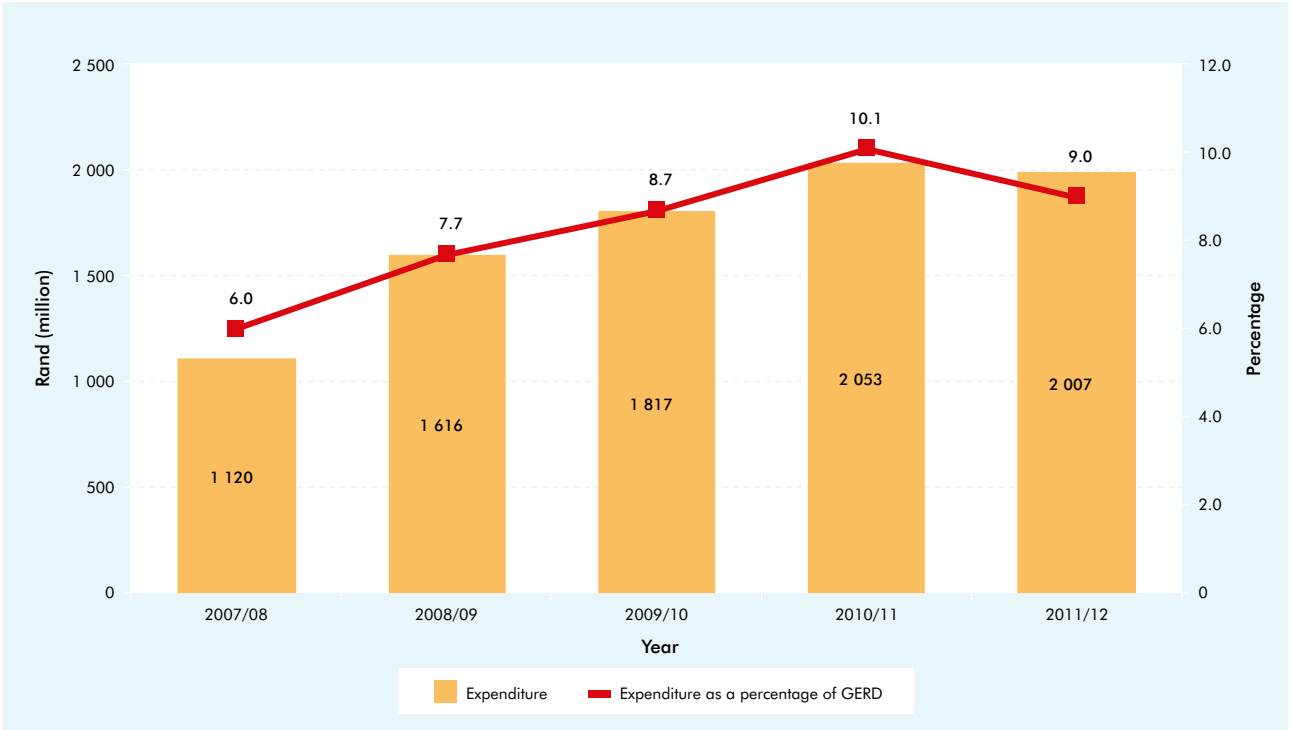
| | |
|---|---|
| 30000 | Manufacture of Food Products, Beverages and Tobacco Products |
| 31000 | Manufacture of Textiles, Clothing and Leather Goods |
| 32000 | Manufacture of Wood and Products, Paper and Printing |
| 33000 | Manufacture of Refined Petroleum, Nuclear Fuel, Chemicals (incl. Pharmaceuticals), Rubber and Plastic |
| 34000 | Manufacture of Non-Metallic Mineral Products |
| 35000 | Manufacture of Basic Metals, Metal Products, Machinery & Equipment and Office Machinery |
| 36000 | Manufacture of Electrical Machinery and Apparatus |
| 37000 | Manufacture of Radio, Television and Communication Equipment, Medical and Optical Instruments |
| 38000 | Manufacture of Transport Equipment |
| 39000 | Manufacture of Furniture, Recycling, Manufacturing not elsewhere classified |

# 4.7 AREAS OF SPECIAL INTEREST

## 4.7.1. R&D on tuberculosis, HIV/AIDS and malaria

R&D expenditure on tuberculosis (TB), HIV/AIDS and malaria decreased by R46 million to R2.007 billion in 2011/12 (from R 2.053 billion in 2010/11). This expenditure expressed as a percentage of GERD decreased from 10.1% in 2010/11 to 9.0% in 2011/12.

FIGURE 4.8: R&D EXPENDITURE ON TB, HIV/AIDS AND MALARIA (R MILLION AND AS A PERCENTAGE OF GERD), 2007/08 TO 2011/12

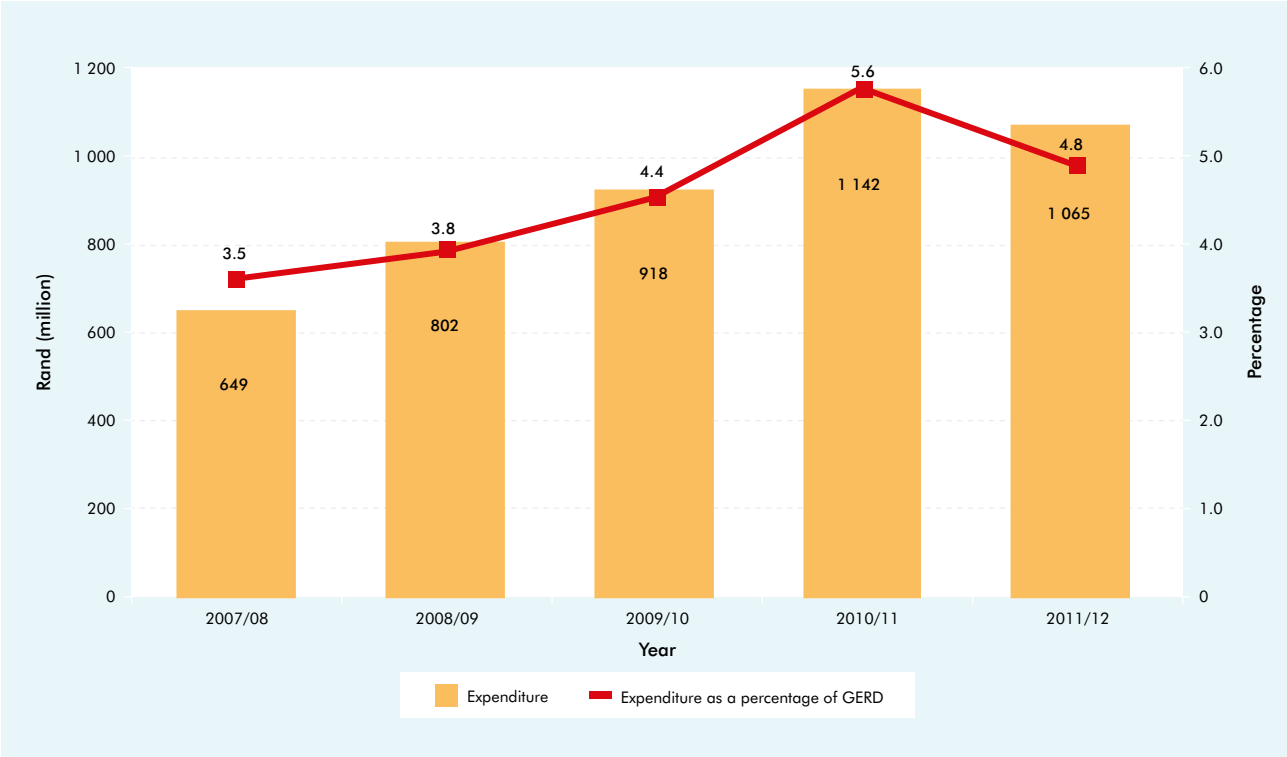



*DATA SOURCE* *National Survey of Research and Experimental Development, 2007/08 to 2011/12.*

### 4.7.2. Biotechnology-related R&D

R&D expenditure on biotechnology decreased from R1.142 billion in 2010/11 to R1.065 billion in 2011/12. R&D expenditure on biotechnology accounted for 4.8% of GERD in 2011/12, having decreased from 5.6% in 2010/11.

**FIGURE 4.9: R&D EXPENDITURE ON BIOTECHNOLOGY (R MILLION AND AS A PERCENTAGE OF GERD), 2007/08 TO 2011/12**




| | |
|---|---|
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

# 5. PEOPLE IN R&D

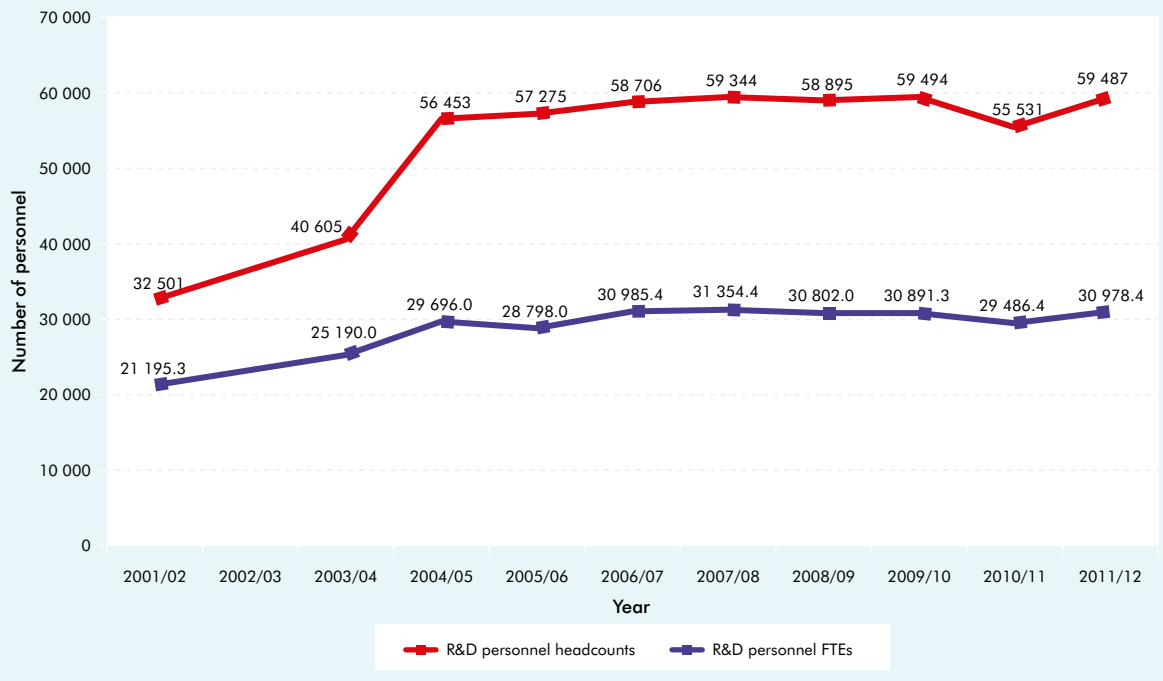
## 5.1. R&D PERSONNEL

R&D personnel (headcount) totalled 59 487 in 2011/12, which was 3 956 more R&D personnel than in 2010/11. About 90.6% (3 586) of the increase in R&D personnel came from the higher education sector, with the key driver being doctoral students and post-doctoral fellows.

The trend shows that significant increases in R&D personnel were reported between 2001/02 and 2004/05, but from 2005/06 onwards the headcount increased only marginally each year. A decrease in headcount occurred between 2009/10 and 2010/11, with the business and science councils sectors contributing most to the decline. An increase in personnel headcount was reported in 2011/12; with significant improvements in higher education sector researchers, especially doctoral students.

FTE R&D personnel increased by 5.1% between 2010/11 and 2011/12, totalling 30 987.4 in 2011/12. The trend for full-time equivalent (FTE) R&D personnel showed increases between 2001/02 and 2004/05 and then remained largely unchanged until 2011/12.

### FIGURE 5.1: R&D PERSONNEL (HEADCOUNT AND FTES), 2001/02 TO 2011/12

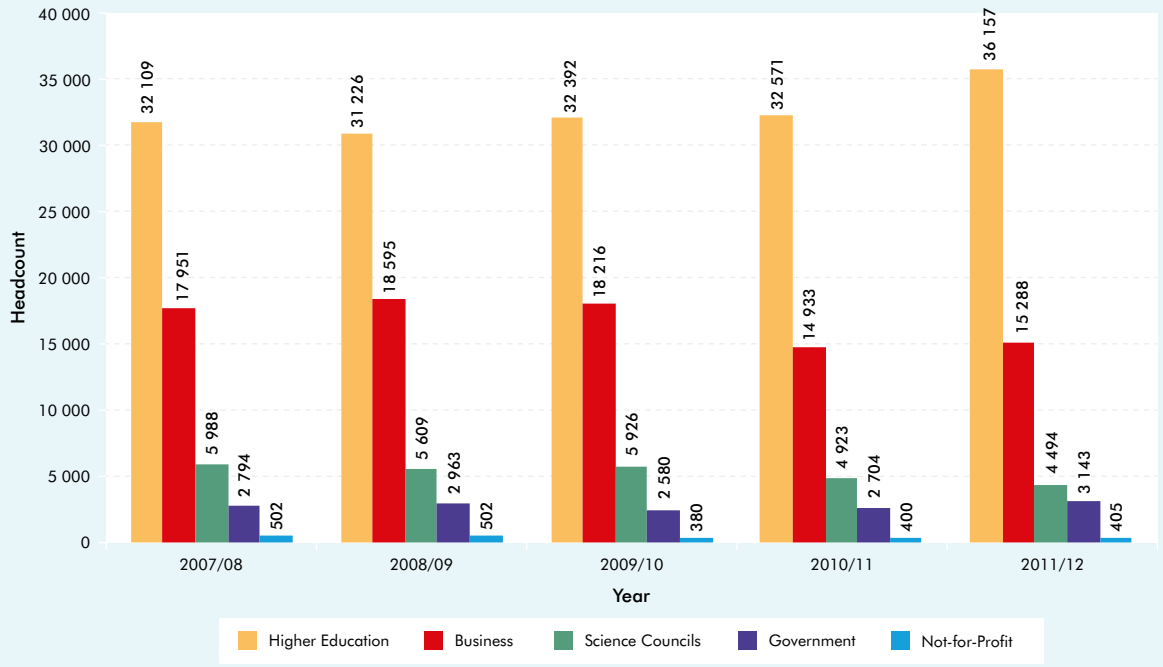



| | |
|---|---|
| *DATA NOTE* | *Following OECD practice, doctoral students and post-doctoral fellows are counted as researchers.* |
| *DEFINITIONS* | ***R&D personnel** include all persons employed directly on R&D activities, as well as those providing direct services such as R&D managers, administrators and clerical staff.*<br>***Headcount** refers to the actual number of people directly involved in or supporting R&D activities. This includes researchers, technicians and other personnel directly supporting R&D.*<br>***Full-time equivalent** (FTE) refers to the number of hours (in terms of person years of effort) spent on R&D activities.* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2001/02 to 2011/12.* |

### 5.1.1. R&D personnel headcount by sector of performance

The higher education sector employs the most R&D personnel, followed by the business, science councils, government and not-for-profit sectors. This pattern has remained generally unchanged over the years and defines the landscape of R&D personnel and the researcher workforce in South Africa.

**FIGURE 5.2: R&D PERSONNEL BY SECTOR (HEADCOUNT), 2007/08 TO 2011/12**

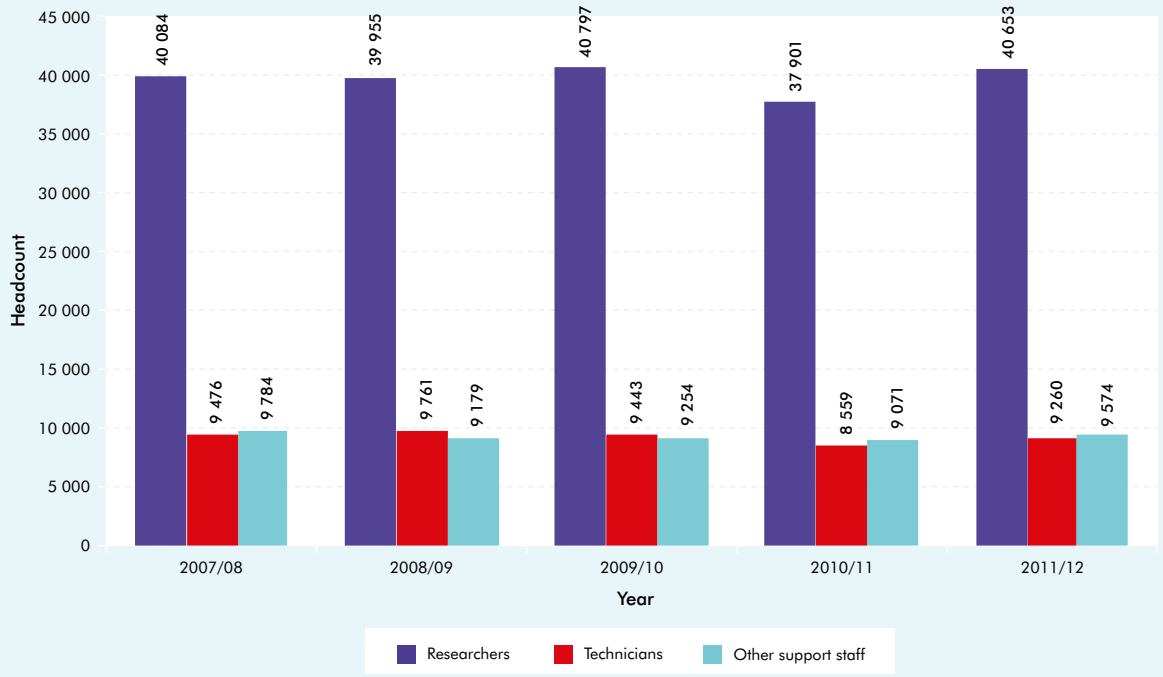



| | |
|---|---|
| ***DATA NOTE*** | *Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category. The Frascati Manual recommends that masters students should not be counted as researchers. However, data on masters students are considered very important and reported on in selected sections, due to the potential of these students to possibly pursue a doctoral degree.* |
| ***DEFINITIONS*** | ***R&D personnel*** *include all persons employed directly on R&D activities, as well as those providing direct services such as R&D managers, administrators and clerical staff.*<br>***Headcount*** *refers to the actual number of people directly involved in or supporting R&D. It is international best practice to include post-doctoral fellows and doctoral students as research personnel.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

## 5.1.2. R&D personnel by occupation

Researchers totalled 40 653 (headcount) in 2011/12 and accounted for 68.3% of the R&D personnel. The headcount of researchers averaged approximately 40 000 between 2007/08 and 2010/11. Researchers increased from 37 901 in 2010/11, to 40 653 in 2011/12. The headcount of technicians and other support staff directly supporting R&D remained below 10 000 for each of these categories between 2007/08 and 2011/12.

### FIGURE 5.3: R&D PERSONNEL BY OCCUPATION (HEADCOUNT), 2007/08 TO 2011/12



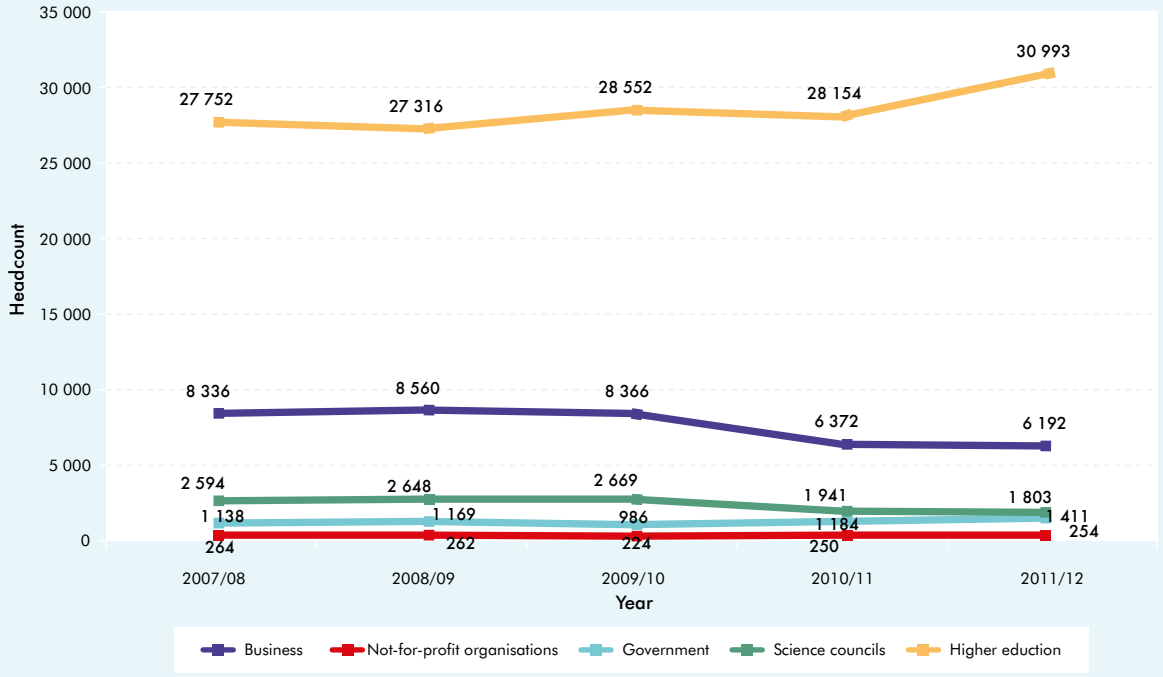

| | |
|---|---|
| *DATA NOTE* | *Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category.* |
| *DEFINITIONS* | ***Researchers** are professionals engaged in the conception or creation of new knowledge, products processes, methods and systems, and in the management of the projects concerned.*<br>***Technicians and equivalent staff** are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences, or social sciences and humanities.*<br>***Other support** staff include skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects.* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

# 5.2 RESEARCHERS

## 5.2.1. Researchers by sector of performance

The higher education sector had the largest number of researchers, with a headcount totalling 30 993, in 2011/12. The total number of researchers in higher education increased by 10.1% between 2010/11 and 2011/12; doctoral students contributed the most to this increase, with 1 879 more doctoral students in 2011/12 than in 2010/11. There were evident decreases in the number of researchers in both the business and science councils sectors between 2010/11 and 2011/12. The headcount of researchers in the government and not-for-profit sectors remained generally unchanged between 2007/08 and 2011/12.

### FIGURE 5.4: RESEARCHERS BY SECTOR (HEADCOUNT), 2007/08 TO 2011/12

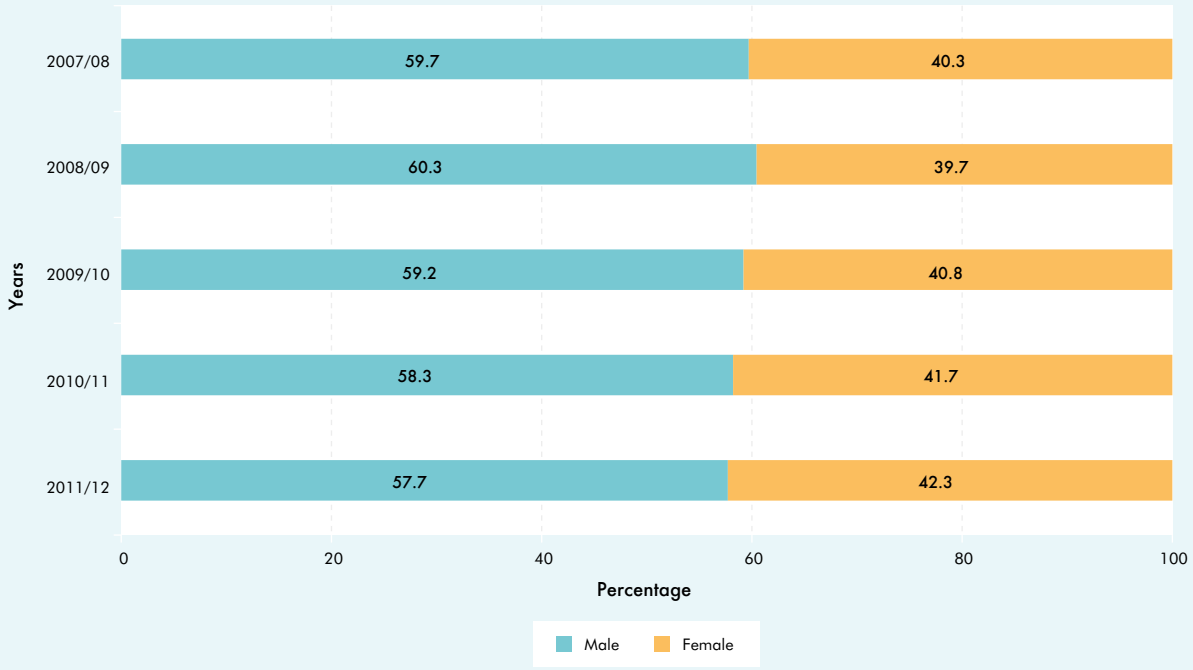



| | |
|---|---|
| ***DATA NOTE*** | *Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

## 5.2.2. Researcher headcount by gender

Researchers, including post-doctoral fellows and doctoral students, remained predominantly male between 2007/08 and 2011/12 at 59.7% and 57.7% respectively. The proportion of female researchers to the total researcher population increased from 39.7% to 42.3% between 2008/09 and 2011/12. This has largely been the result of an increase over this period in the headcount number of female researchers that exceeded the overall increase in total researcher numbers, which includes research staff, post-doctoral fellows and doctoral students.

### FIGURE 5.5: RESEARCHERS BY GENDER (HEADCOUNT, %), 2007/08 TO 2011/12.




| | |
|---|---|
| ***DATA NOTE*** | *Higher education R&D personnel include post-doctoral fellows and doctoral students under the 'researcher' category.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

### 5.2.3. Researchers (excluding doctoral students and post-doctoral fellows) by population group

As regards the composition of the researcher workforce by population group, White researchers accounted for 58.2% of the total headcount of researchers in 2011/12, followed by African researchers at 27.7%, Indian researchers at 8.5% and Coloured researchers at 5.5%.

The overall racial composition of the researcher workforce has shifted over time. The proportion of African researchers increased from 22.5% in 2007/08 to 27.7% in 2011/12, while the proportion of Coloured researchers increased from 4.8% to 5.5%, and that of White researchers decreased from 64.5% to 58.2% over the same period.

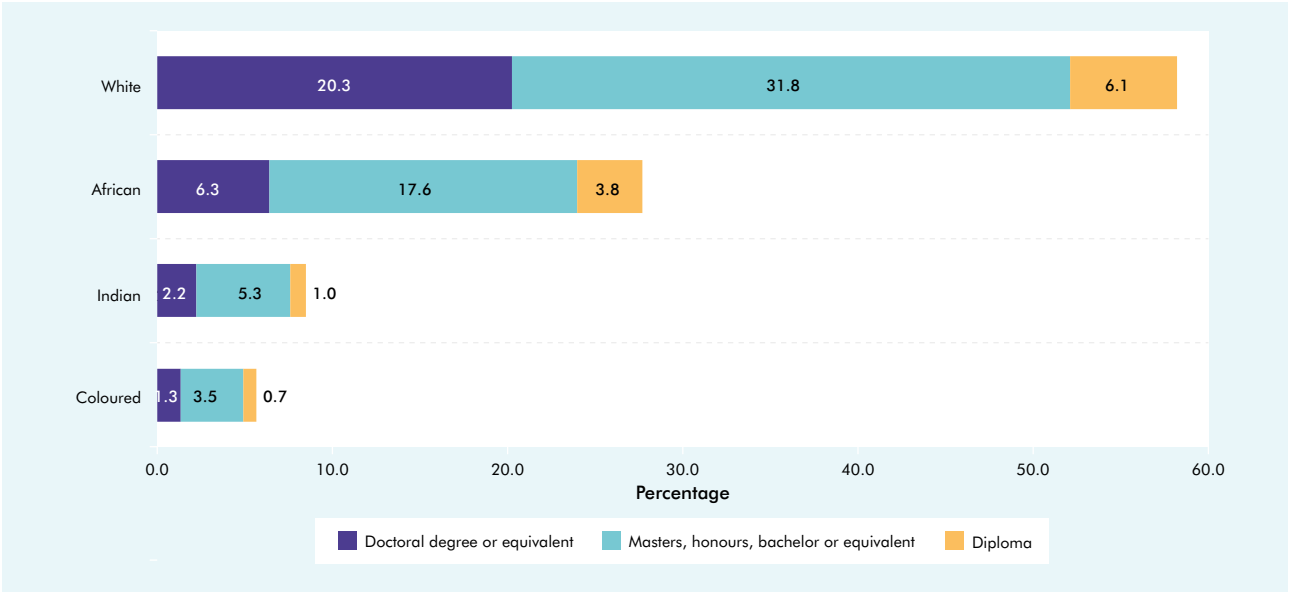
**FIGURE 5.6: RESEARCHERS (EXCLUDING DOCTORAL STUDENTS AND POST-DOCTORAL FELLOWS) BY POPULATION GROUP (PERCENTAGE), 2007/08 TO 2011/12**


| | |
|---|---|
| ***DATA NOTE*** | *Higher education researchers do not include post-doctoral fellows and doctoral students under the 'researcher' category.* |
| ***DEFINITION*** | *The population is classified according to the following race groups: African, Coloured, Indian and White.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 and 2011/12.* |

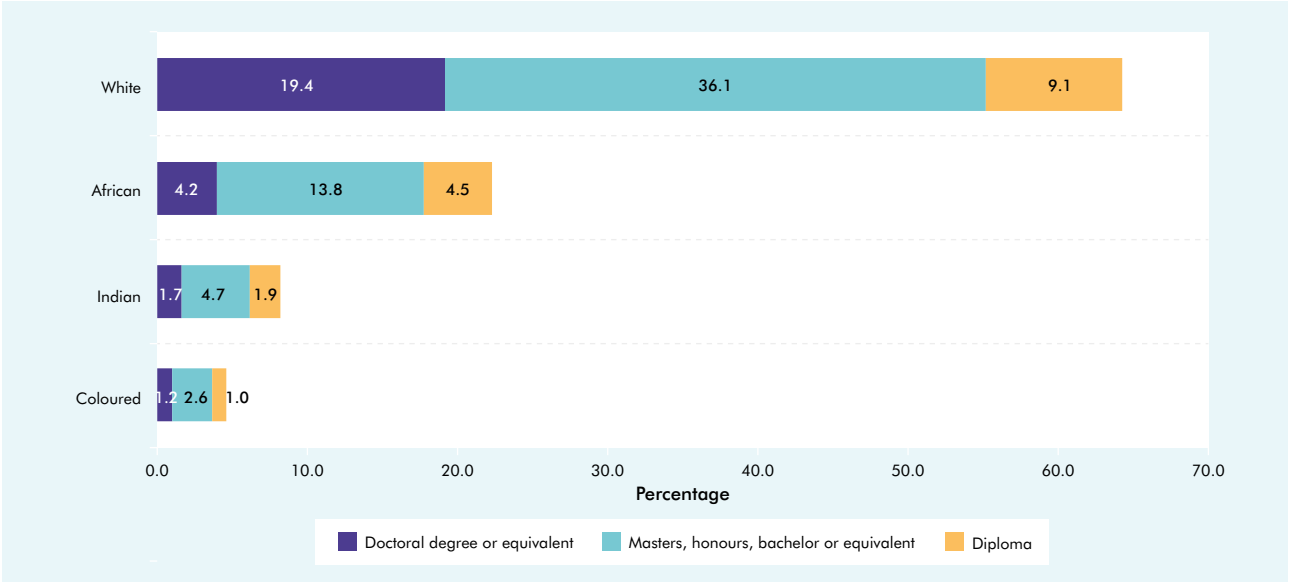
## 5.2.4. Researchers (excluding doctoral students and post-doctoral fellows) by qualification and population group

The 2011/12 R&D Survey showed that the majority of researchers with a doctoral qualification were still in the White population group. African researchers with a doctoral degree increased from 4.2% of all researchers in 2007/08 to 6.3% in 2011/12. The greatest proportion of South African researchers held a masters, honours, bachelor or equivalent degree in 2007/08 and 2011/12.

### FIGURE 5.7: RESEARCHERS (EXCLUDING DOCTORAL STUDENTS AND POST-DOCTORAL FELLOWS) BY QUALIFICATION AND POPULATION GROUP (PERCENTAGE), 2011/12




### FIGURE 5.8: RESEARCHERS (EXCLUDING DOCTORAL STUDENTS AND POST-DOCTORAL FELLOWS) BY QUALIFICATION AND POPULATION GROUP (PERCENTAGE), 2007/08

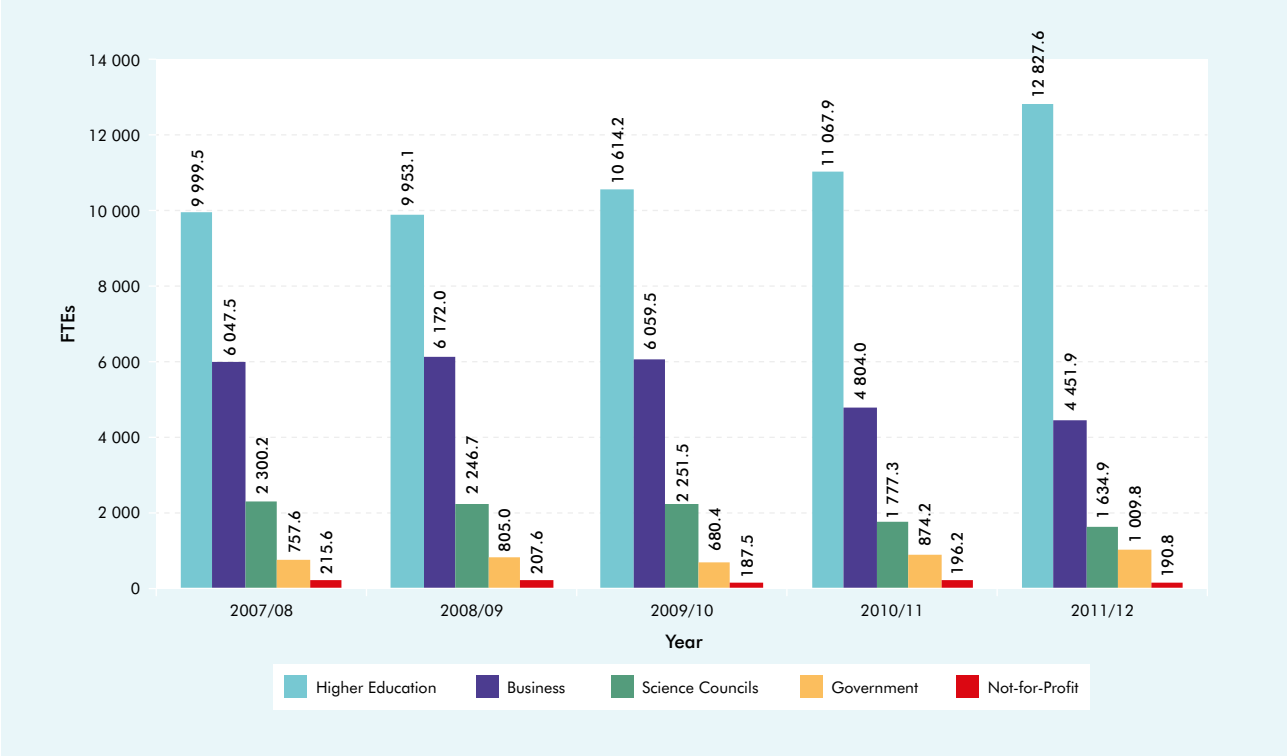



| | |
|---|---|
| ***DATA NOTE*** | *Higher education researchers do not include post-doctoral fellows and doctoral students under the 'researcher' category.* |
| ***DEFINITION*** | *The population is classified according to the following race groups: African, Coloured, Indian and White.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 and 2011/12.* |

## 5.2.5. Full-time equivalent (FTE) researchers by sector

Researchers (FTE) in most of the sectors, with the exception of the higher education sector, followed a similar declining trend to that observed for R&D personnel (FTE). The higher education sector showed an increase in FTE researchers between 2010/11 and 2011/12 and accounted for 12 827.6 FTE researchers in 2011/12.

### FIGURE 5.9: RESEARCHERS BY SECTOR (FTEs), 2007/08 TO 2011/12



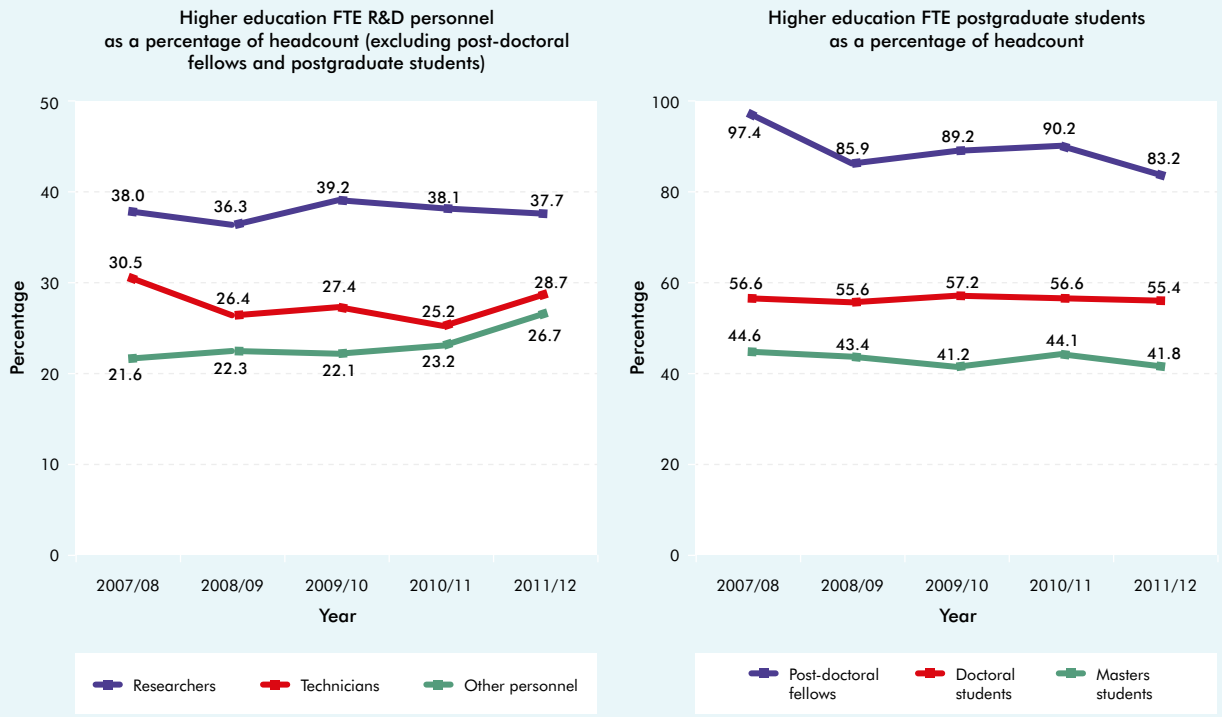

| | |
|---|---|
| ***DATA NOTE*** | *Higher education researchers include post-doctoral fellows and doctoral students under the 'researcher' category.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

# 5.3 HIGHER EDUCATION R&D PERSONNEL

## 5.3.1. Higher education R&D personnel: FTEs as a percentage of headcount

The higher education sector was the largest contributor to R&D personnel in South Africa in 2011/12. Higher education researchers (excluding post-doctoral fellows and postgraduate students) spent 21.6% of their time on research in 2007/08, and this percentage increased to 26.7% in 2011/12. Doctoral students spent an average of less than 60% of their time on research activities between 2007/08 and 2011/12, while masters students spent approximately 40% of their time on research over the same period. Post-doctoral fellows spent most of their time on research; however, a decrease in the time they spent on research was evident in 2011/12.

### FIGURE 5.10: HIGHER EDUCATION R&D PERSONNEL AND STUDENTS (FTEs AS A PERCENTAGE OF HEADCOUNT), 2007/08 TO 2011/12

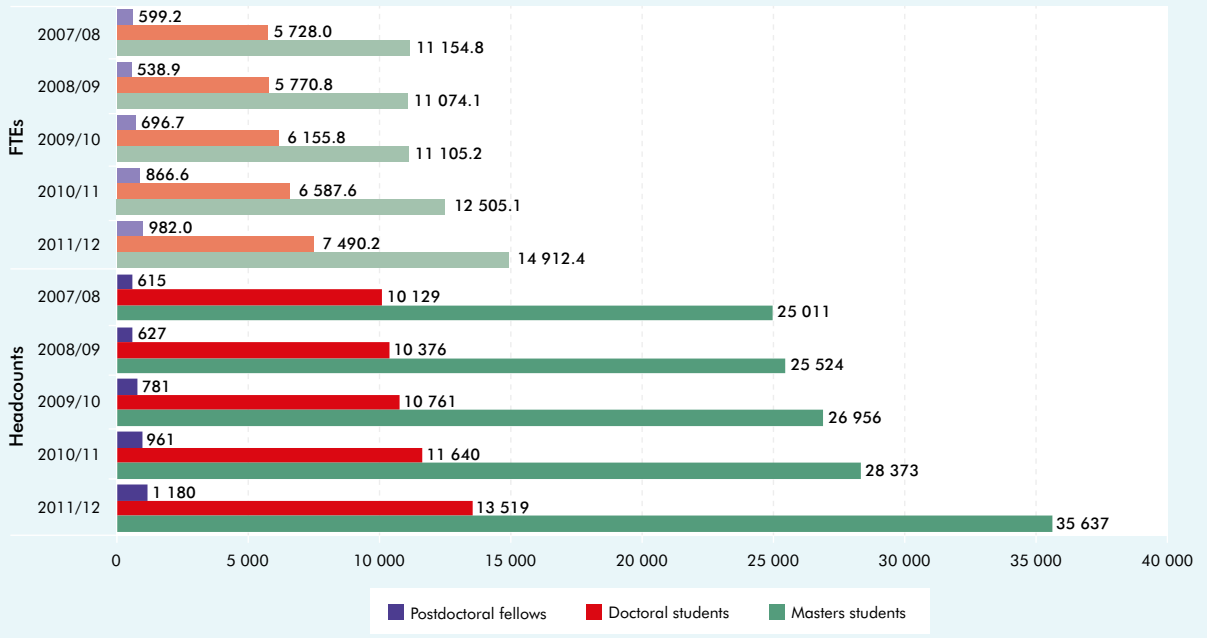



| | |
|---|---|
| *DATA NOTE* | *FTEs as a percentage of headcount.* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

## 5.3.2. Post-doctoral fellow and post-graduate student headcount and full-time equivalents (FTEs)

There was a constant upward trend in headcount and FTEs among post-doctoral fellows, and doctoral and masters students between 2007/08 and 2011/12. The doctoral headcount exceeded 10 000 in 2007/08, reaching 13 519 in 2011/12 and spending an average of 55.4% of their time on research. The headcount of masters students increased to 35 637 in 2011/12, which is the highest value recorded to date; these masters students spent an average of 41.8% of their time on research.

### FIGURE 5.11: HIGHER EDUCATION POST-DOCTORAL FELLOWS AND POSTGRADUATE STUDENTS (HEADCOUNT AND FTEs), 2007/08 TO 2011/12

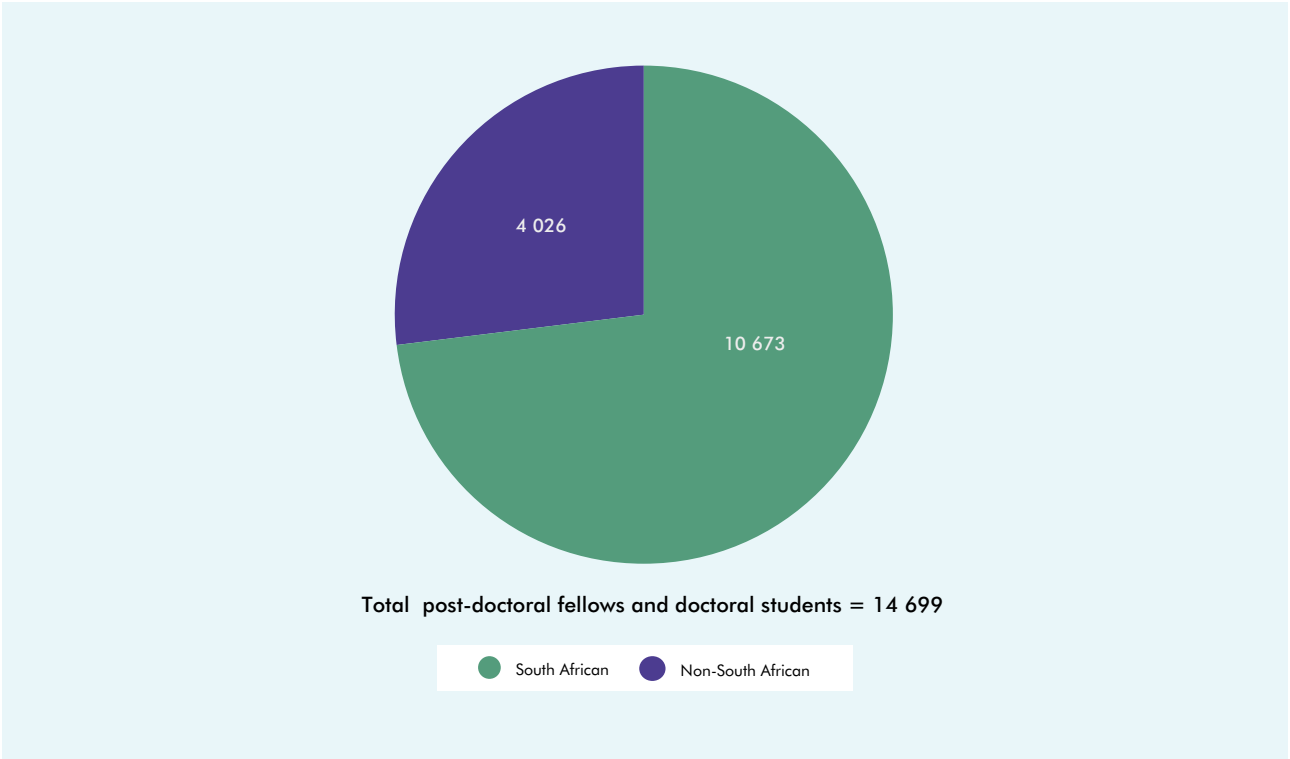



| | |
|---|---|
| ***DATA NOTE*** | *Masters students are not counted as R&D personnel according to the Frascati Manual (OECD 2002).* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2007/08 to 2011/12.* |

### 5.3.3. Profile of South African and non-South African postgraduate students

The 2011/12 survey captured postgraduate students' data according to race, gender and whether they were South African nationals or not. Of the total post-doctoral fellow and doctoral student headcount (14 699) reported for 2011/12, approximately 72.6% were South Africans and 27.4% were non-South Africans.

**FIGURE 5.12: HIGHER EDUCATION POST-DOCTORAL FELLOWS AND DOCTORAL STUDENTS BY NATIONALITY (HEADCOUNT), 2011/12**

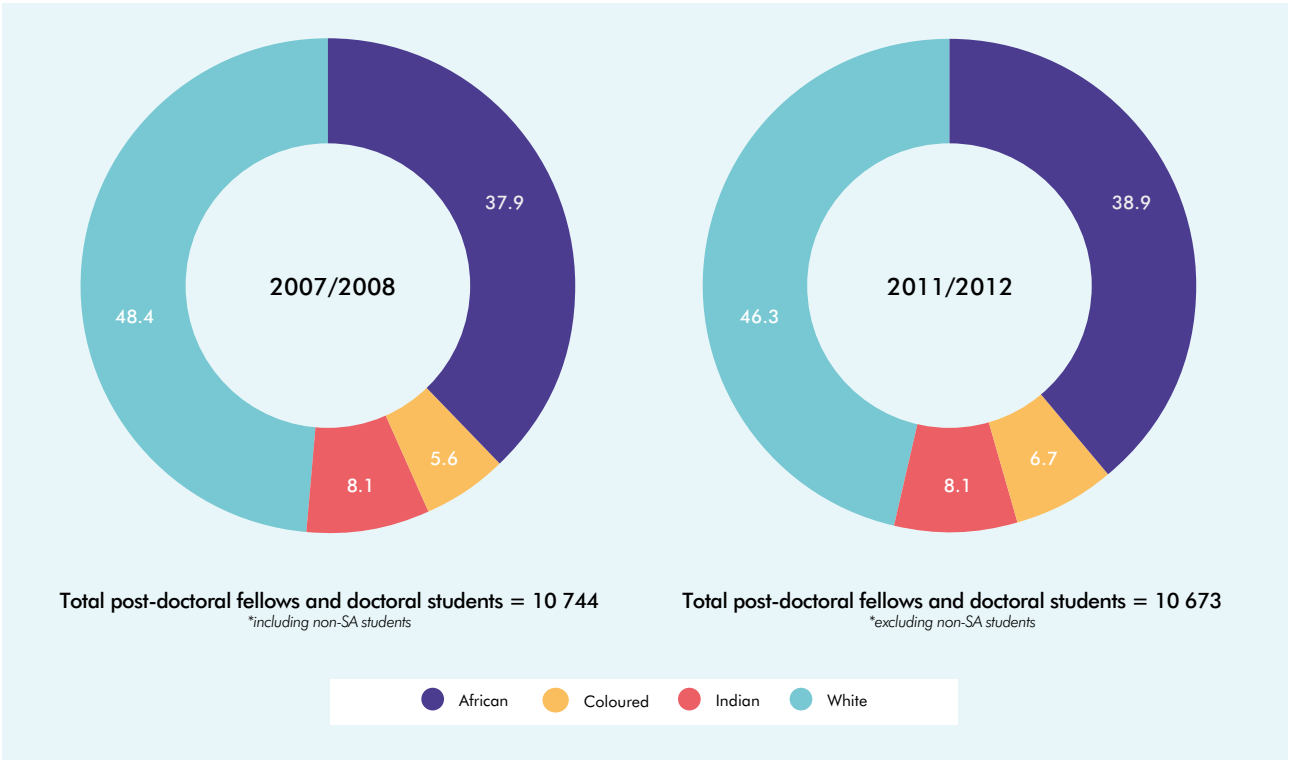



| | |
|---|---|
| ***DATA NOTE*** | *The 2011/12 survey distinguished between South African and non-South African nationals.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2010/11 and 2011/12.* |

## 5.3.4. Post-doctoral fellows and doctoral students by population group (headcount)

In 2007/08, 48.4% of all post-doctoral fellows and doctoral students were White and 37.9% were African; these included non-South African students. The 2011/12 survey found that of the South African post-doctoral fellows and doctoral students, approximately 46.3% were White and 38.9% were African. The percentage of Indian postgraduate students remained almost constant between 2007/08 and 2011/12, while Coloured postgraduate students increased to from 5.6% in 2007/08 to 6.7% in the 2011/12 survey.

### FIGURE 5.13: HIGHER EDUCATION POST-DOCTORAL FELLOWS AND DOCTORAL STUDENTS BY POPULATION GROUP (HEADCOUNT), 2007/08 AND 2011/12

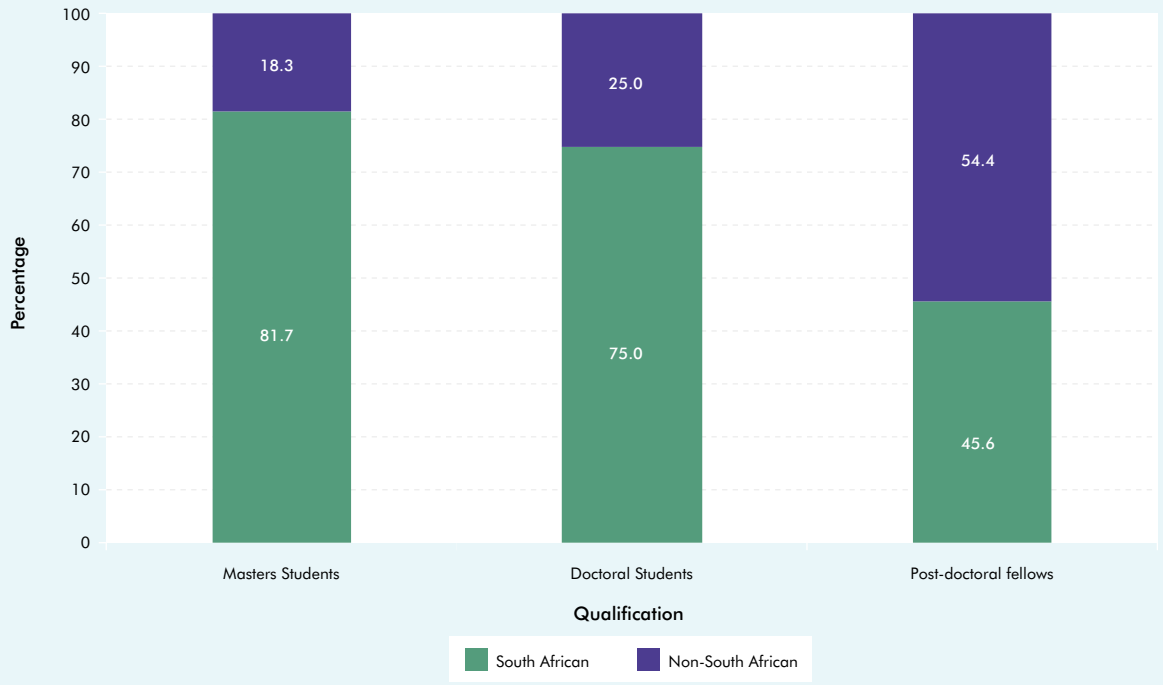



| | |
|---|---|
| ***DATA NOTE*** | *The data on post-doctoral fellows and doctoral students for 2007/08 included non-South African students. The 2011/12 survey distinguished between South African and non-South African nationals.* |
| ***DEFINITION*** | *The population is classified according to the following race groups: African, Coloured, Indian and White.* |
| ***DATA SOURCE*** | *National Survey of Research and Experimental Development, 2010/11 and 2011/12.* |

## 5.3.5. South African and non-South African postgraduate students by qualification

The breakdown by qualification shows that the majority of masters and doctoral students were South African nationals, with the exception of the category of post-doctoral fellows, where non-South African nationals were in the majority (54.4%).

### FIGURE 5.14: HIGHER EDUCATION POSTGRADUATES BY QUALIFICATION (HEADCOUNT), 2011/12




### TABLE 5.1: HIGHER EDUCATION POSTGRADUATES BY QUALIFICATION (HEADCOUNT), 2011/12

| | SOUTH AFRICAN | NON-SOUTH AFRICAN | TOTALS |
|---|---|---|---|
| Masters students | 29 131 | 6 506 | 35 637 |
| Doctoral students | 10 135 | 3 384 | 13 519 |
| Post-doctoral fellows | 538 | 642 | 1 180 |
| **Total** | **39 804** | **10 532** | **50 336** |

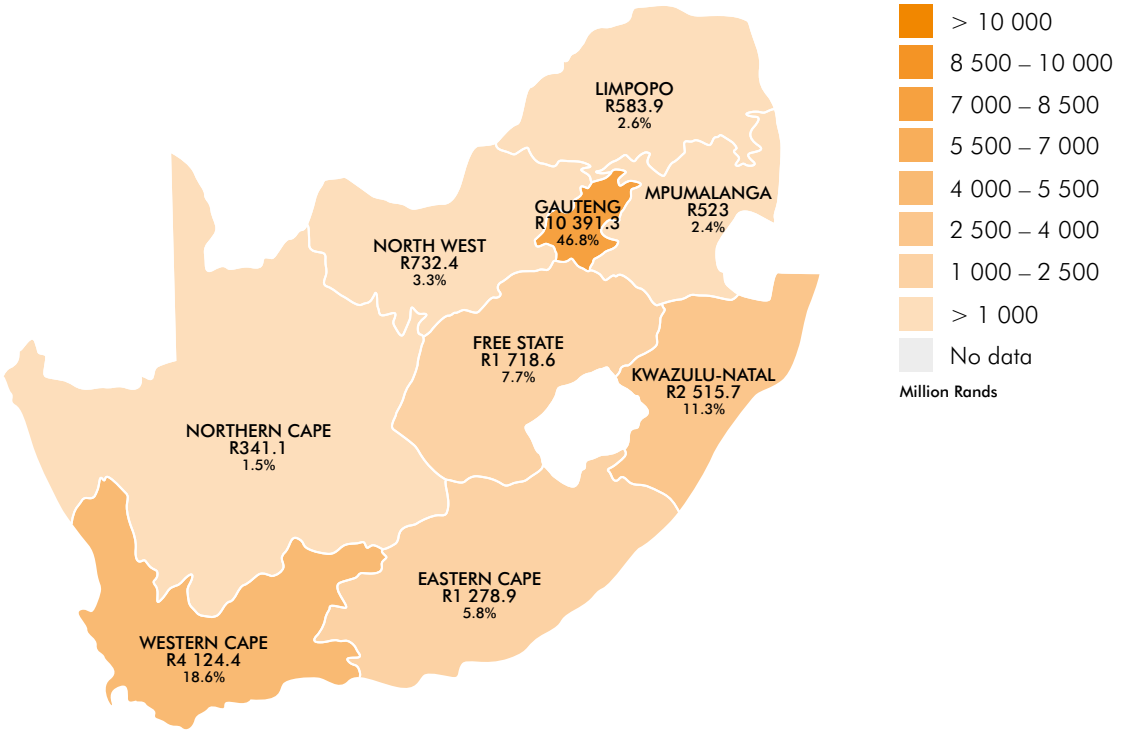
| | |
|---|---|
| *DATA NOTE* | *The 2011/12 survey captured postgraduate students according to race, gender and whether they were South African nationals or not.*<br>*Masters students are not counted as R&D personnel according to the Frascati Manual (OECD 2002).* |
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2011/12.* |

# 6. GEOGRAPHIC DIMENSIONS OF R&D

## 6.1. R&D EXPENDITURE BY PROVINCE

R&D expenditure in South Africa is concentrated in the Gauteng, Western Cape and KwaZulu-Natal provinces. The respective shares of GERD in 2011/12 were R10.391 billion (46.8%) for Gauteng, followed by the Western Cape with R4.124 billion (18.6%) and KwaZulu-Natal with R2.516 billion (11.3%). These three provinces combined accounted for 76.7% of total GERD for the 2011/12 R&D Survey. The data show that the proportion of GERD spent in the other six provinces has increased over the years, from 17.4% in 2007/08 to 23.3% in 2011/12.

### FIGURE 6.1: R&D EXPENDITURE BY PROVINCE (R BILLION), 2011/12




### TABLE 6.1: R&D EXPENDITURE BY PROVINCE (R'000), 2007/08

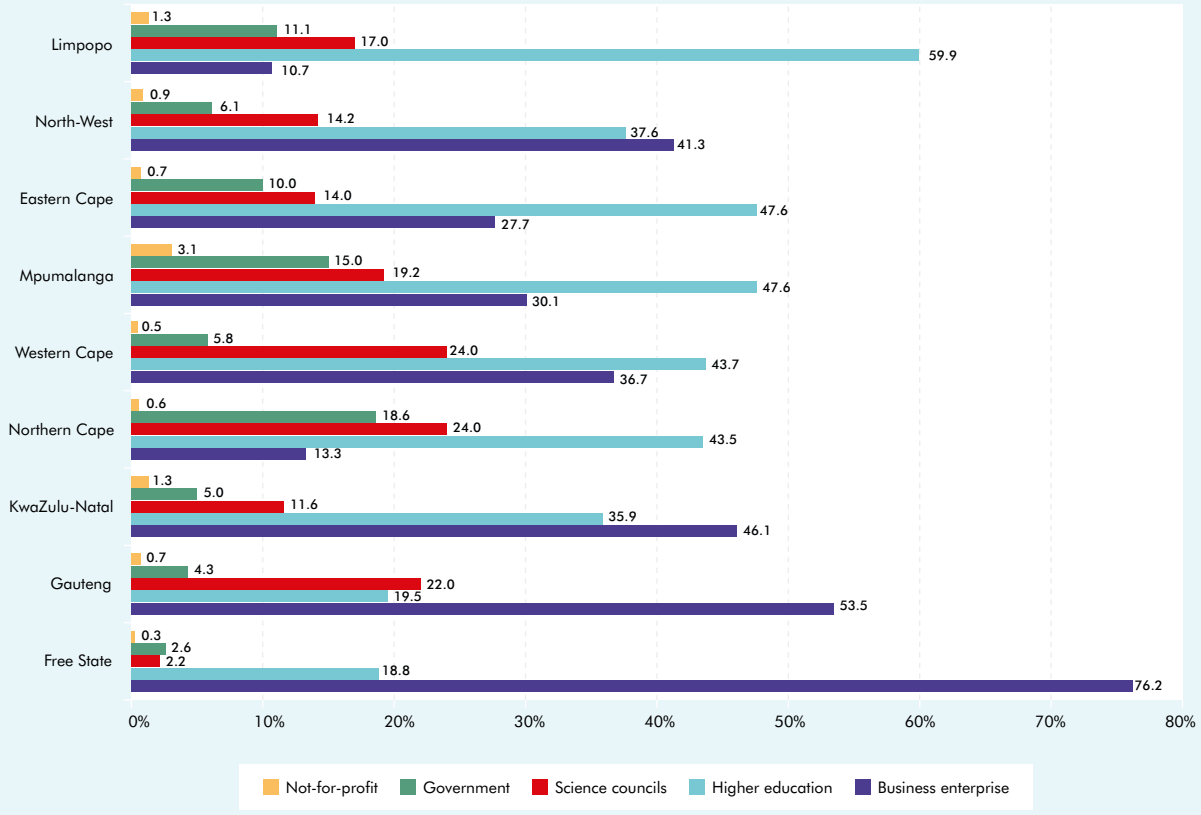
| | TOTAL | GAUTENG | WESTERN CAPE | KWAZULU-NATAL | FREE STATE | EASTERN CAPE | MPUMALANGA | NORTH-WEST | LIMPOPO | NORTHERN CAPE |
|---|---|---|---|---|---|---|---|---|---|---|
| Rand'000 | 18 624 013 | 9 620 752 | 3 656 717 | 2 081 166 | 1 098 210 | 826 925 | 452 950 | 453 574 | 263 784 | 169 937 |
| % of GERD | 100.0 | 51.7 | 19.6 | 11.2 | 5.9 | 4.4 | 2.4 | 2.4 | 1.4 | 0.9 |

*DATA SOURCE* *National Survey of Research and Experimental Development R&D, 2007/08 and 2011/12.*

# 6.2. PROPORTIONS OF R&D EXPENDITURE BY SECTOR IN PROVINCES

The proportions of sectoral contributions to provincial R&D expenditure differed across the provinces. The business sector accounted for a significant proportion of R&D expenditure in the Free State, Gauteng, KwaZulu-Natal and Northern Cape provinces, whereas the higher education sector contributed significant proportions of R&D expenditure in the Limpopo, North-West and Eastern Cape provinces. Table 6.2 shows similar results for 2007/08.

## FIGURE 6.2: R&D BY PROVINCE AND SECTOR OF PERFORMANCE (PERCENTAGE), 2011/12



## TABLE 6.2: R&D EXPENDITURE BY PROVINCE AND SECTOR OF PERFORMANCE (R'000 AND PERCENTAGE), 2007/08

| | BUSINESS ENTERPRISE | | GOVERNMENT | | HIGHER EDUCATION | | NOT-FOR-PROFIT | | SCIENCE COUNCILS | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PROVINCE | R'000 | % | R'000 | % | R'000 | % | R'000 | % | R'000 | % | R'000 |
| Eastern Cape | 283 488 | 34.3 | 122 191 | 14.8 | 276 740 | 33.5 | 6 164 | 0.7 | 138 342 | 16.7 | 826 925 |
| Free State | 786 225 | 71.6 | 62 116 | 5.7 | 180 713 | 16.5 | 1 255 | 0.1 | 67 901 | 6.2 | 1 098 210 |
| Gauteng | 6 142 233 | 63.8 | 292 757 | 3.0 | 1 260 991 | 13.1 | 115 499 | 1.2 | 1 809 272 | 18.8 | 9 620 752 |
| KwaZulu-Natal | 1 302 260 | 62.6 | 76 458 | 3.7 | 459 299 | 22.1 | 42 141 | 2.0 | 201 009 | 9.7 | 2 081 166 |
| Limpopo | 71 687 | 27.2 | 40 217 | 15.2 | 79 716 | 30.2 | 4 602 | 1.7 | 67 562 | 25.6 | 263 784 |
| Mpumalanga | 196 368 | 43.4 | 74 690 | 16.5 | 105 629 | 23.3 | 9 930 | 2.2 | 66 333 | 14.6 | 452 950 |
| North-West | 193 339 | 42.6 | 42 500 | 9.4 | 166 137 | 36.6 | 2 207 | 0.5 | 49 390 | 10.9 | 453 574 |
| Northern Cape | 7 450 | 4.4 | 66 921 | 39.4 | 48 277 | 28.4 | 2 038 | 1.2 | 45 250 | 26.6 | 169 937 |
| Western Cape | 1 755 404 | 48.0 | 376 550 | 10.3 | 1 044 360 | 28.6 | 39 367 | 1.1 | 441 036 | 12.1 | 3 656 717 |
| **Total** | **10 738 456** | | **1 154 399** | | **3 621 862** | | **223 203** | | **2 886 094** | | **18 624 014** |

*Note: Subject to rounding errors*

| | |
|---|---|
| *DATA SOURCE* | *National Survey of Research and Experimental Development, 2007/08 and 2011/12.* |

# 7. INTERNATIONAL COMPARISONS

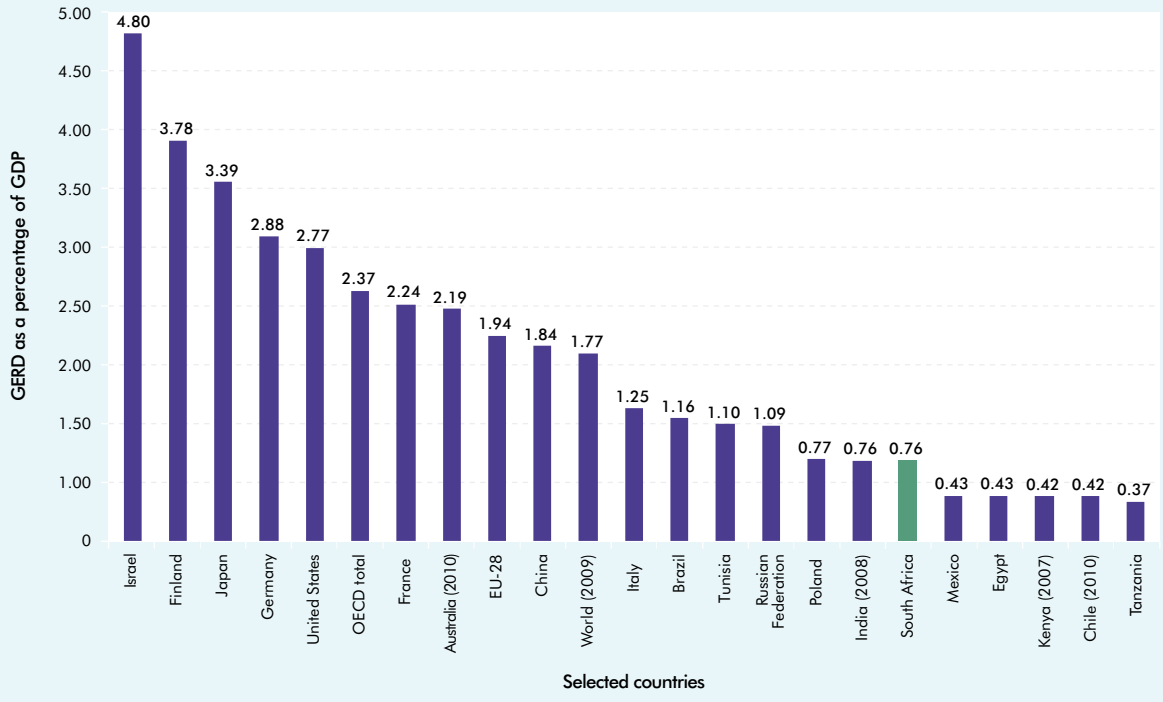
## 7.1 GROSS DOMESTIC EXPENDITURE ON R&D (GERD)

### 7.1.1. GERD as a percentage of GDP

South Africa's R&D intensity of 0.76% was below the world average GERD/GDP ratio of 1.77%; the European Union's (EU) average of 1.94% and the OECD's average of 2.37% in 2011/12. Among the BRICS countries, R&D intensity was above 1% in Brazil,China and the Russian Federation and below 1% in India and South Africa.

R&D performance globally is concentrated in the developed countries, especially in North America, Asia and most European countries. Among the leading countries with respect to R&D intensity are Israel (4.80%), Finland (3.78%), Japan (3.39%), Germany (2.88%) and the United States of America (USA) (2.77%). With the exception of Tunisia, which had a GERD/GDP ratio of 1.10%, all other African countries illustrated in Figure 7.1 had an R&D share of GDP of between 0.5% and 1.0%, which was less than the 1.0% target for African countries (AU, 2007).

**FIGURE 7.1: GERD AS A PERCENTAGE OF GDP FOR SELECTED COUNTRIES, 2011/12 OR LATEST YEAR AVAILABLE**




| | |
|---|---|
| *DATA NOTE* | *Reported data are for the 2011/12 financial year, or the latest available data are indicated in brackets.*<br>*Calculations are based on current national currencies.* |
| *DATA SOURCES* | *OECD (2013/1).*<br>*Brazil, Egypt, India, Tunisia and World: UNESCO Institute of Statistics (2012a).*<br>*Kenya and Senegal: AU–NEPAD (2010).*<br>*OECD (2013/1).* |

## 7.1.2. GERD for selected countries

South Africa's gross expenditure on R&D in USA dollar purchasing power parity (US$PPP) increased from $4.009 billion in 2010/11 to $4.158 billion in 2011/12. International comparison estimates (in US$PPP) showed that the USA had the largest R&D expenditure in the world in 2011/12 ($415.193 billion), followed by China ($208.172 billion) and Japan ($146.537 billion). Other countries with high R&D expenditure included Germany ($93.055 billion), Korea ($59.890 billion), France ($51.891 billion), the Russian Federation ($35.045) and Brazil ($25.292 in 2010/11).

### TABLE 7.1: GERD FOR SELECTED COUNTRIES (BILLION CURRENT PPP$), 2009/10 TO 2011/12 OR LATEST YEARS AVAILABLE

| | GERD (BILLION CURRENT PPP$) | | | | | |
|---|---|---|---|---|---|---|
| **COUNTRY** | **2009/10** | | **2010/11** | | **2011/12** | |
| OECD Total | 970.559 | b | 994.566 | b | 1 034.024 | b |
| Australia | .. | | 20.578 | | .. | |
| Chile | 1.127 | a | 1.331 | | .. | |
| United States | 405.072 | d | 408.657 | d | 415.193 | d |
| European Union (28) | 298.422 | b | 305.834 | b | 320.456 | b |
| China | 154.025 | | 178.168 | | 208.172 | |
| Japan | 135.952 | | 139.626 | | 146.537 | |
| Germany | 82.361 | | 86.280 | | 93.055 | c |
| Korea | 46.729 | | 52.844 | | 59.890 | |
| France | 49.480 | | 49.934 | | 51.891 | |
| Russian Federation | 34.158 | | 33.425 | | 35.045 | |
| Italy | 24.511 | | 24.541 | | 24.812 | e |
| Spain | 20.440 | | 20.232 | | 19.763 | |
| Turkey | 8.818 | | 9.713 | | 10.827 | |
| Mexico | 7.030 | | 7.931 | | 8.209 | |
| Finland | 7.473 | | 7.534 | | 7.635 | |
| Poland | 4.838 | | 5.625 | | 6.228 | |
| Brazil | 23.470 | | 25.292 | | …. | |
| Argentina | 3.467 | | 3.980 | | 4.641 | |
| **South Africa** | **4.416** | | **4.009** | | **4.158** | |

| | |
|---|---|
| *DATA NOTES* | *a) Break in series with previous year for which data are available.*<br>*b) Secretariat estimate or projection based on national sources.*<br>*c) National estimate or projection.*<br>*d) Excludes most or all capital expenditure.*<br>*e) Provisional.*<br>*Brazil and Chile: No data for 2011*<br>*Australia: R&D Survey is undertaken every 2 years.* |
| *DATA SOURCES* | *OECD (2012).*<br>*Brazil: UNESCO Institute of Statistics (2012a).* |

## 7.1.3. GERD by source of funds

The composition of funding sources for R&D varied among countries. Funding of R&D from government and abroad was prominent in developing countries, while business sector funding of R&D was more pronounced in developed countries. In South Africa, the government and business sectors have traditionally funded the largest proportion of GERD.

Government funding of R&D in South Africa amounted to 43.1% of GERD in 2011/12. Among the countries selected for comparison, government funding of R&D was also above 40.0% in Argentina, Brazil, Poland, the Russian Federation, Senegal, Spain and Italy. Business funding of R&D was more prominent in China, Germany, Finland, France and Mexico, exceeding 50.0% of total R&D funding.

### FIGURE 7.2: GERD BY SOURCE OF FUNDS IN SELECTED OECD AND OTHER COUNTRIES (PERCENTAGE), 2011/12 OR LATEST YEAR AVAILABLE

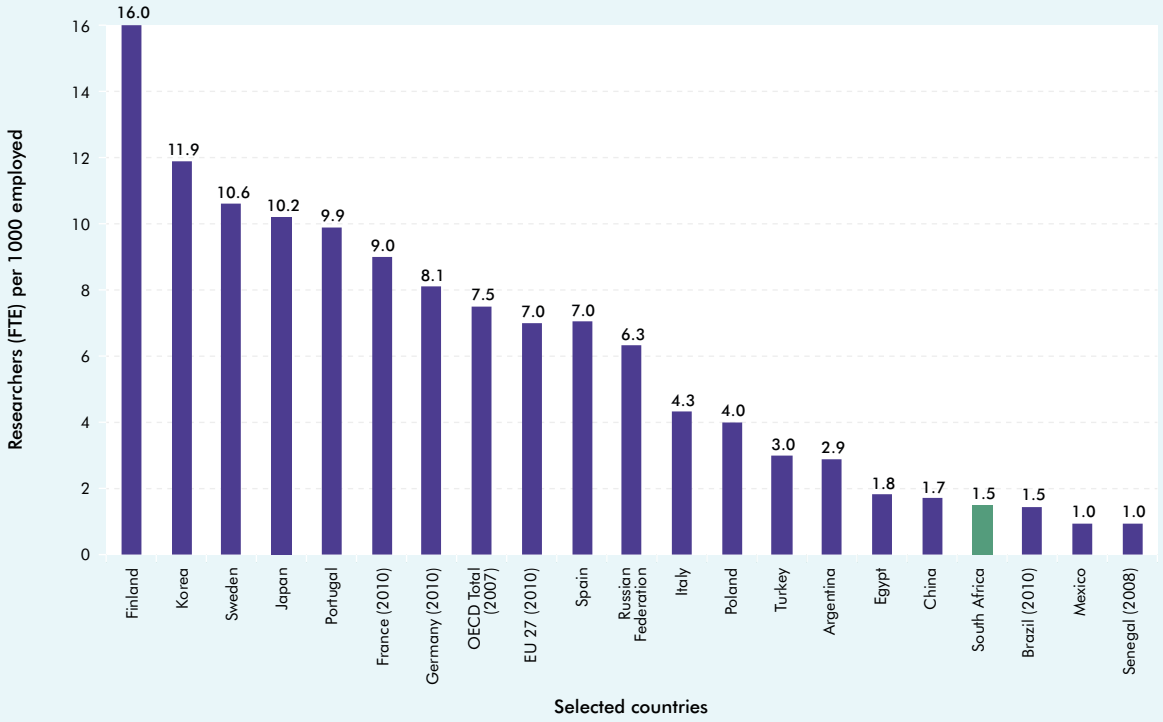

| | |
|---|---|
| *DATA NOTE* | *Data are for 2011/12 or the latest available data are indicated in brackets.*<br>*Other national sources include the not-for-profit and higher education sectors.* |
| *DATA SOURCES* | *Country data:*<br>*South Africa: National Survey of Research and Experimental Development, 2011/12.*<br>*France, China, Finland, Spain, Italy, the Russian Federation, Turkey, Poland, Argentina, Mexico, Chile: OECD (2013/1).*<br>*Kenya, Senegal: African Union–NEPAD (2010).*<br>*Brazil: UNESCO Institute of Statistics (2012a).* |

# 7.2. R&D PERSONNEL

## 7.2.1. Researchers full-time equivalent (FTE) per 1 000 in total employment

South Africa had 1.5 FTE researchers per thousand in total employment in 2011/12. This fluctuated between 1.4 and 1.5 over the last six years. The numbers of full-time equivalent (FTE) researchers per 1 000 employed in South Africa in 2011/12 were comparable to numbers in China and Brazil. These numbers were low in comparison with countries with at least 6 FTE researchers per 1 000 in their employment, such as the Russian Federation and Spain; and countries with at least 10 FTE researchers per 1 000 employed, such as Korea, Sweden and Japan.

### FIGURE 7.3: RESEARCHERS (FULL-TIME EQUIVALENT) PER 1 000 IN TOTAL EMPLOYMENT IN SELECTED COUNTRIES, 2011/12 OR LATEST YEAR AVAILABLE

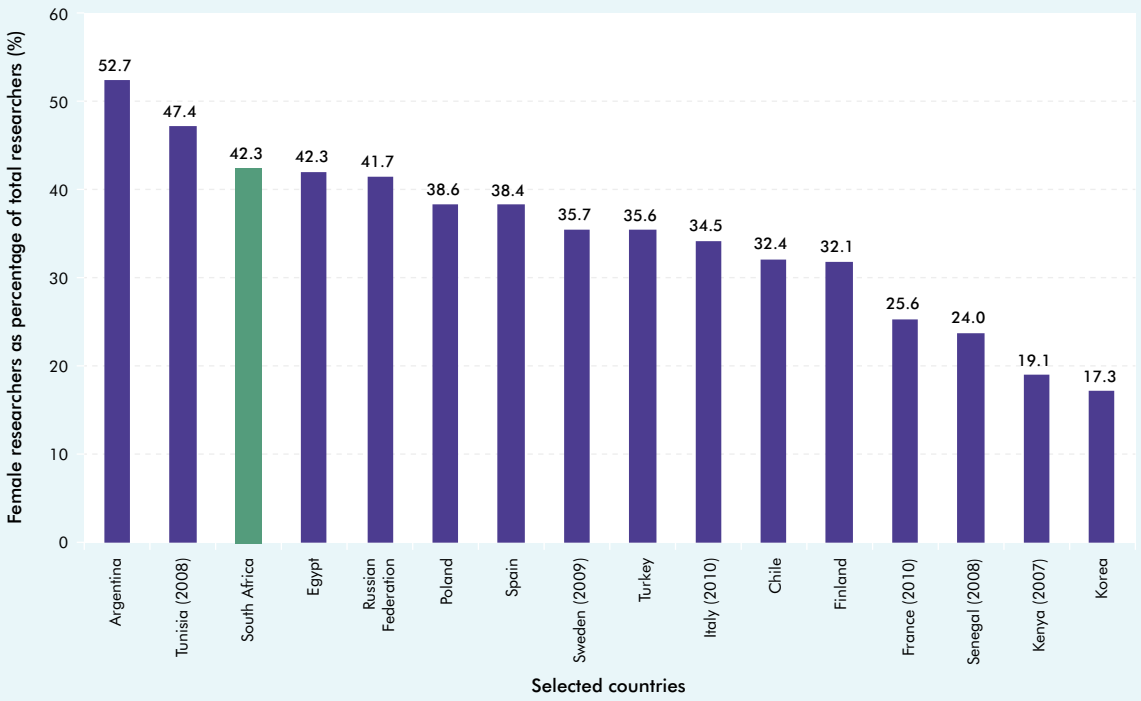



| | |
|---|---|
| ***DATA NOTE*** | *Data are for 2011/12 or the latest available year indicated in brackets.* |
| ***DEFINITION*** | *Full-time equivalent (FTE) refers to the number of hours (in terms of person years of effort) spent on R&D activities.* |
| ***DATA SOURCES*** | *Country data:*<br>*OECD (2013/1).*<br>*Brazil, Egypt and Senegal: UNESCO Institute of Statistics (2012a).* |

## 7.2.2. Female researchers as a percentage of total researchers

South Africa is one of the leading countries with regard to the proportion of female researchers in the R&D workforce. Female researchers in South Africa increased by 0.6 percentage point, from 41.7% in 2010/11 to 42.3% in 2011/12. Argentina and Tunisia were the only countries among those selected for comparison with a higher ratio of female researchers than South Africa. South Africa's performance was comparable to that of Egypt and the Russian Federation. The representation of female researchers in Korea, France, Finland, Italy and Spain was generally lower than the proportion of female researchers in the developing countries selected for comparison.

### FIGURE 7.4: FEMALE RESEARCHERS AS A PERCENTAGE OF TOTAL RESEARCHERS (HEADCOUNT) IN SELECTED OECD AND OTHER COUNTRIES, 2011/12 OR LATEST YEAR AVAILABLE




| | |
|---|---|
| ***DATA NOTE*** | *Data on female researchers as a percentage of total researchers were not available for the 2011/12 financial year for the selected countries except for South Africa. Data are for the 2010/11 financial year or the latest available data are indicated in brackets.*<br>*The percentage of female researcher is the headcount of female researchers divided by the total number of researchers.* |
| ***DATA SOURCE*** | *OECD (2013/1).*<br>*Egypt and Tunisia: UNESCO Institute of Statistics (2012b).*<br>*Kenya and Senegal: AU–NEPAD (2010).* |

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# ANNEXURE I: METHODOLOGY

The survey was conducted according to the OECD guidelines presented in the Frascati Manual. The Frascati Manual defines R&D as follows:

- Research and experimental development (R&D) is creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humanity, culture and society, and the use of this stock of knowledge to devise new application. (OECD 2002)

The Frascati Manual proposes several approaches to surveying R&D-performing entities, including a census, a sample survey or a hybrid of the census and sample survey approaches, comprising a census of all large R&D performers and a stratified random sample survey of the remaining R&D-performing entities. In South Africa, the survey is currently conducted using the census approach in all the sectors except the business and not-for-profit (NPO) sectors, where in each case, a purposive sample of the entities is surveyed. As with the previous R&D Surveys, the 2011/12 survey followed this approach. In accordance with the Frascati Manual, the survey covered the following sectors: business, government, higher education, not-for-profit and science councils sectors.

The sectors were surveyed during the period October 2012 to May 2013.

For science councils and all government departments, the survey covered expenditure in the year beginning 1 April 2011 and ending 31 March 2012. The data collected for the business and NPO sectors were for the financial year ending 28 February 2012 (or the nearest complete financial year). Data for the higher education sector correspond to the 2011 academic (calendar) year. Therefore, the survey mainly recorded R&D activities that took place in the 2011/12 fiscal year.

In addition to following the guidelines in the Frascati Manual, the survey was conducted according to a project plan aligned with the phases of the Statistical Value Chain (SVC) as described in the South African Statistical Quality Assessment Framework (SASQAF). As with previous surveys, the survey was conducted so as to ensure that it is compliant with certain SASQAF criteria for data quality on official statistics, as detailed in the Quality Management Plan (QMP). The resultant reports were subjected to a data quality clearance process, managed by a clearance committee established by the DST especially for that purpose.

The full and detailed methodology is presented in the Technical Notes section of the Statistical Report.

**STRICTLY CONFIDENTIAL**

science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

HSRC
Human Sciences
Research Council

Statistics
South Africa

# NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT (R&D) INPUTS: BUSINESS - 2011/12 FINANCIAL YEAR

| Company | 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 a component of Official Statistics, as defined in the Statistics Act No. 6 of 1999. As such, it is required to provide accurate information about South Africa's R&D performance. Organisations are therefore legally required to respond to this request for data. All data gathered for this survey is confidential. Only the survey team see individual organisation data. 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/CCUP-RnD-7.phtml. This survey covers the Financial Year 1 March 2011 to 28 February 2012 (or your nearest complete financial year).

## DUE DATE

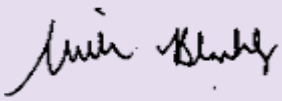
Kindly complete and return this questionnaire by …… to: **R&D Survey, Private Bag X2, Vlaeberg 8018**

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

## ASSISTANCE

Should you require any assistance in completing this document, please contact one of the following researchers:

| Name | Contact Number | E-mail |
|---|---|---|
| Ms Nolitha Nkobole | 021 466 7837 | nnkobole@hsrc.ac.za |
| Mr Julien Rumbelow | 021 466 7834 | jrumbelow@hsrc.ac.za |
| Mr Madalitso Phiri | 021 466 7811 | mphiri@hsrc.ac.za |
| Mr Saahier Parker | 021 466 7814 | sparker@hsrc.ac.za |



**Mr. William Blankley**
Director: CeSTII
Human Sciences Research Council
wblankley@hsrc.ac.za.
Tel: 021 466 7806

## DETAILS OF PERSON COMPLETING THE QUESTIONNAIRE:

| | | | | |
|---|---|---|---|---|
| **Name (with title)** | | | **Tel** | ( ) |
| **Designation** | | | **Fax** | ( ) |
| **Date** | | | **Cell** | ( ) |
| **Sign** | | | **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, services 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.

**Examples:**

Investigating electrical conduction in crystals is basic research; application of crystallography to the properties of alloys is applied research.

New chip designs involve development.

Investigating the limiting factors in chip element placement lies at the border between basic and applied research, and increasingly involves nanotechnology.

Much services R&D involves software development where the completion of the project is dependent on a scientific or technological advance and the aim of the project is the systematic resolution of a scientific or technological uncertainty.

**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 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
- Management of personnel who are either directly engaged in R&D or are providing professional, technical or clerical support to those performing R&D
- Software development where the aim of the project is the systematic resolution of a scientific or technological uncertainty
- Research work in the biological, physical and social sciences, and the humanities
- Social science research including economic, cultural, educational, psychological and sociological research
- Research work in engineering and the medical sciences
- R&D projects performed for other parties
- “Feedback R&D” directed at solving problems occurring beyond the original R&D phase, for example technical problems arising during initial production runs.

**R&D Excludes:**

The following ROUTINE activities are excluded, except where they are an essential part of in-house R&D activity:

- 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.

## PART 1: GENERAL INFORMATION

**1a. Registered name of company**

**1b. Trading as (if applicable)**

**2a. If you are reporting R&D for subsidiary companies (e.g. as a head office with several subsidiary companies), please list the companies below (append a page if required).**

**2b. List the principal activities and/or Standard Industrial Classification (SIC) code (see Appendix A in code book) from which your company derives its main income.**

| Activities | SIC | Company Income Obtained (%) |
|---|---|---|
| | | % |
| | | % |
| | | % |

**3. Parent Company (if applicable) with % ownership**

%

**3.a Is this company a state owned enterprise (SOE)** Yes ☐ No ☐

**Definition**: ***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.

**4. Approximate foreign/local ownership split**
(By ultimate ownership if complex holding structures exist)

| | |
|---|---|
| **South Africa** | % |
| ***Rest of* Africa** | % |
| **Europe** | % |
| **USA** | % |
| **China** | % |
| ***Rest of* Asia** | % |
| **Other** | % |

**5. Financial year (dd/mm/yyyy) for which you are reporting in this survey**

From to

**6. Total number of all employees** (include staff on contract for six months or longer)

**7. Gross Sales Revenue or Turnover (R'000 Excl. VAT)**

**8. Did the company make use of the enhanced tax allowance for R&D in its annual return to SARS?**

| | (Please tick) |
|---|---|
| **Yes** | ☐ |
| **No** | ☐ |

**If YES state the date of the Annual Return (mm/yy)** ☐

**8b. Did the company perform any <u>IN-HOUSE R&D</u> in South Africa during the 2011/12 financial year?**

| **Yes** | ☐ |
|---|---|
| **Continue with Question 9 - 20** | |

| **No** | ☐ |
|---|---|
| **Continue below** | |

If No, do you think your organisation will perform in-house R&D in the future?

| (Please tick) | 2012-2013 | 2013-2014 | 2014-2015 |
|---|---|---|---|
| **Yes** | ☐ | ☐ | ☐ |
| **No** | ☐ | ☐ | ☐ |

**8c. Did your company <u>Outsource</u> R&D during the 2011/12 financial year?**

**Yes** ☐ **Proceed to Part 5: Question 21 and 22 on <u>Outsourced</u> R&D**

If your company does *not* do any IN-HOUSE and/or any Outsourced R&D, tick this box and return the questionnaire.

**No** ☐ **i.e. No IN-HOUSE nor out-sourced R&D.**

**Thank you for providing "General Information" on your company (part 1).**

**We now proceed with information on your <u>IN-HOUSE R&D</u> (parts 2, 3 & 4).**

## PART 2: IN-HOUSE R&D PERSONNEL

**Report for all R&D personnel, permanent and contract (6 months or longer).**

**Researchers**
Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the planning and management of the projects concerned.

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

**Other personnel directly supporting R&D**
Other supporting staff includes skilled and unskilled crafts persons, secretarial and clerical staff participating in R&D projects or directly associated with such Projects.

**NOTE**: Do not include personnel **indirectly** supporting R&D: Typical examples are transportation, storage, cleaning, repair, maintenance and security activities, as well as administration and clerical activities undertaken not exclusively for R&D (such as the activities of central finance and personnel departments).

Allowance for these should be made under overheads in R&D expenditure (current expenditure – Question 11 D) but such persons should not be included as R&D Personnel.

### 9. HEADCOUNT OF R&D PERSONNEL

**Provide the headcount of all R & D personnel according to categories below**

| Personnel Categories and Highest Qualification | African | | Coloured | | Indian | | White | | Subtotal | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | |
| **Researchers (incl. Research Exec.'s & Research Managers)** | | | | | | | | | | | |
| Doctorates | | | | | | | | | | | |
| Masters/Hons/Bachelors or equivalent | | | | | | | | | | | |
| Diplomas and other qualifications | | | | | | | | | | | |
| **RESEARCHER TOTAL** | | | | | | | | | | | |
| **Technicians/Technologists directly supporting R&D** | | | | | | | | | | | |
| 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 qualifications | | | | | | | | | | | |
| **TECHNICIAN TOTAL** | | | | | | | | | | | |

**Carry subtotals over to Q 10**

## 10. HEADCOUNTS, FULL-TIME EQUIVALENTS (FTEs) AND LABOUR COST OF R&D PERSONNEL

**Provide an estimate of <u>Person Years of effort on R & D (or Full Time Equivalents)</u>, according to the categories below.**

**CALCULATING 'FULL TIME EQUIVALENT' (FTE) PERSONS**

Note: For the purpose of this survey, an employee can work a maximum of 1 FTE in a 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 fulltime male researchers spending 40% of their time on R&D during the survey year:
20 x 0.4 x 1 = 8

NOTE: please calculate FTE's for all R&D personnel

| R&D Personnel Categories | Headcounts (From Q9) | | | Total Full Time Equivalents (FTE's) | | | Average annual labour cost per person | Calculated labour cost of R&D |
|---|---|---|---|---|---|---|---|---|
| | M | F | Total | M | F | Total (A) | R'000 (Excl. VAT) (B) | R'000 (Excl. VAT) (A x B) |
| **Researchers (incl. Research Executives and Research Managers)** | | | | | | | | |
| **Technicians directly supporting R&D** | | | | | | | | |
| **Other personnel directly supporting R&D** | | | | | | | | |
| **TOTAL LABOUR COST OF R&D** | | | | | | | | |

**Carry over total calculated labour cost of R&D personnel to Question 11C**

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

### 11. ALLOCATE IN-HOUSE R&D EXPENDITURE AS FOLLOWS

#### CAPITAL EXPENDITURE ON R&D

- The full value of capital expenditure must be reported in the year of purchase (do not depreciate).
- If the asset has been/will be used for more than one activity, include an estimate of the portion used for R&D.

| ***Including - but not limited to:*** | ***Excluding:*** |
|---|---|
| • Expenditure on fixed assets used in the R&D projects of your business.<br>• Acquisition of software for R&D, including fees, expected to be used for more than one year.<br>• Purchase of databases expected to be used for more than one year.<br>• Major repairs & improvements on land & buildings used for R&D. | • Other repairs and maintenance expenses.<br>• Depreciation provisions.<br>• Proceeds from the sale of R&D assets. |

| | | **R'000 (Excl. VAT)** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Vehicles, plant, machinery and equipment | **A** | | | | | | | |
| Land, buildings and other structures | **B** | | | | | | | |

#### LABOUR COSTS OF R&D

| | | **R'000 (Excl. VAT)** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Labour costs of R&D **(To match Question 10)** | **C** | | | | | | | |

#### OTHER CURRENT EXPENDITURE ON R&D

| ***Including - but not limited to:*** | ***Excluding:*** |
|---|---|
| • Materials, fuels and other inputs (including all running costs).<br>• Water, electricity and other overhead expenses.<br>• Repair and maintenance expenses.<br>• Payments to outside organisations for use of specialised testing facilities.<br>• Payments to outside organisations for analytical work, engineering or other specialised services in support of R&D projects carried out by your business.<br>• Commission/consultant expenses for research projects carried out by your business.<br>• Other R&D expenses and indirect costs not specified in 11 A, B or C. | • R&D activities where the research project is carried out elsewhere by others on behalf of your business.<br>• Payments for purchases of technical know-how.<br>• Payments for patent searches.<br>• Depreciation provisions. |

| | | **R'000 (Excl. VAT)** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Other Current Expenditure | **D** | | | | | | | |

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

**ESTIMATED FUTURE R&D EXPENDITURE:**

**12. Please estimate future in-house R&D expenditure:**

| In-House R&D *(Report in R'000 Excl. VAT)* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2012/13** | | | | | | | **2013/14** | | | | | | |
| | | | | | | | | | | | | | |

**13. <u>SOURCES OF FUNDS</u> OF IN-HOUSE R&D**

**Provide a breakdown of the total R&D expenditure (as reported in Question 11 according to sources of funds.**

| ***Company*** | **R'000 (Excl. VAT)** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Own funds** | | | | | | | |

***Government (includes Science Councils e.g. CSIR, Departments and Institutes)***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Grants (including SPII, Innovation Fund etc)** | | | | | | | |
| **Contracts to perform R&D** | | | | | | | |

***Other Local Businesses (including Trade Associations)***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Contracts to perform R&D** | | | | | | | |

***Other South African Sources***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Not for Profit Organizations* (including Foundations)** | | | | | | | |
| **Individual Donations** | | | | | | | |
| **Higher Education** | | | | | | | |

***Foreign***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **All sources** | | | | | | | |

| | **R'000 (Excl. VAT)** | | | | | | |
|---|---|---|---|---|---|---|---|
| **TOTAL R&D EXPENDITURE (to equal Question 11)** | | | | | | | |

*Non-profit organisations primarily serving households. Funding from non-profit organisations primarily serving Business, Higher Education or Government should be allocated to these sectors

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

**14a. If your organisation received no R&D funding from foreign sources kindly tick N/A here and move to question 15:**

**N/A** ☐

**14b. Kindly categorise Foreign R&D funding (from Question 13) by sector and region.**

| *Foreign funding of R&D* | | 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*** | | | | | | | | | |
| **Not-for-Profit Organisations** / Individuals** | | | | | | | | | |
| **Foundations** | | | | | | | | | |
| **Government** | | | | | | | | | |
| **Higher Education** | | | | | | | | | |
| **TOTAL** | | **TOTAL to correspond with Foreign funds in Q 13** | | | | | | | |

* ***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.

## 15. PROVINCIAL EXPENDITURE ON R&D

**Please state the location where your company carried 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/financed from.

| | |
|---|---|
| Eastern Cape | % |
| Free State | % |
| Gauteng | % |
| KwaZulu-Natal | % |
| Limpopo | % |

| | |
|---|---|
| Mpumalanga | % |
| Northern Cape | % |
| North-West | % |
| Western Cape | % |
| **TOTAL** | **100 %** |

## PART 4: CATEGORIES OF IN-HOUSE R&D EXPENDITURE

### 16. IN-HOUSE R&D CURRENT EXPENDITURE BY TYPE OF R&D.

**Specify the percentage of total IN-HOUSE LABOUR COSTS and OTHER CURRENT R&D expenditure by <u>type of R&D.</u>**

**Basic Research**

| | Percentage |
|---|---|
| • Work undertaken primarily to extend the boundaries of disciplinary knowledge.<br>• The analysis of properties, structures and relationships with a view to formulating and testing hypotheses, theories or laws.<br>• The results of basic research are usually published in peer-reviewed scientific journals. | |

**Applied Research**

| | Percentage |
|---|---|
| • Original investigation to acquire new knowledge with a specific application in view.<br>• Activities that determine the possible uses for the findings of basic research.<br>• The results of applied research are intended primarily to be valid for a single or limited number of products, operations, methods or systems.<br>• Applied research develops ideas into operational form and may be published in peer-reviewed journals or subjected to other forms of intellectual property protection. | |

**Experimental Development**

| | Percentage |
|---|---|
| • Systematic work using existing knowledge for creating new or improved materials, products, processes or services, or improving substantially those already produced or installed. | |

| TOTAL | 1 | 0 | 0 |
|---|---|---|---|

### 17. Classify R&D according to Standard Industrial Classification (SIC). (See Appendix A in code book) with associated % expenditure.

- SICs indicate the classification that best describes company R&D according to the intended **use** of the product.

| SIC Codes | | | | | | Percentage | |
|---|---|---|---|---|---|---|---|
| SIC | | | | | | | |
| SIC | | | | | | | |
| SIC | | | | | | | |
| SIC | | | | | | | |
| SIC | | | | | | | |

| SIC Codes | | | | | | Percentage | | |
|---|---|---|---|---|---|---|---|---|
| SIC | | | | | | | | |
| SIC | | | | | | | | |
| SIC | | | | | | | | |
| SIC | | | | | | | | |
| SIC | | | | | | | | |
| **Total** | | | | | | **1** | **0** | **0** |

## 18a. RESEARCH FIELD (RF)

**Classify R&D according to Research Fields (RF) with associated % expenditure. (See Appendix B in code book.)**

- The RF Codes are based on recognised academic disciplines and emerging areas of study.

| RF Codes | | | | | | Percentage | |
|---|---|---|---|---|---|---|---|
| RF | | | | | | | |
| RF | | | | | | | |
| RF | | | | | | | |
| RF | | | | | | | |
| RF | | | | | | | |

| RF Codes | | | | | | Percentage | |
|---|---|---|---|---|---|---|---|
| RF | | | | | | | |
| RF | | | | | | | |
| RF | | | | | | | |
| RF | | | | | | | |
| RF | | | | | | | |

| Total | 1 | 0 | 0 |
|---|---|---|---|

## 18b. MULTI-DISCIPLINARY R&D

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

- 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.

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

| No R&D in these areas | ☐ | ◄--- TICK if no such R&D is done |
|---|---|---|

## 18c. SPECIFIC AREAS OF R&D

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

- National R&D strategies emphasise 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%.

| Specific Areas of Interest | % of R&D expenditure |
|---|---|
| Open source software | % |
| New materials | % |
| Tuberculosis (TB), HIV/AIDS, Malaria | % |
| Environment / Environment related | % |

| No R&D in these areas | ☐ | ◄--- TICK if no such R&D is done |
|---|---|---|

**19. Classify R&D according to Socio-economic objectives with associated % expenditure. (See Appendix C in code book.)**

- The SEO classification provides an indication of the main beneficiary of your R&D activities.

| SEO Codes | | | | | | Percentage | |
|---|---|---|---|---|---|---|---|
| SEO | | | | | | | |
| SEO | | | | | | | |
| SEO | | | | | | | |
| SEO | | | | | | | |
| SEO | | | | | | | |

| SEO Codes | | | | | | Percentage | | |
|---|---|---|---|---|---|---|---|---|
| SEO | | | | | | | | |
| SEO | | | | | | | | |
| SEO | | | | | | | | |
| SEO | | | | | | | | |
| SEO | | | | | | | | |
| | | | | | **Total** | **1** | **0** | **0** |

**20. COLLABORATIVE R&D**

**20a**. Does your company collaborate on R&D with persons / organisations outside your own organisation?

**Yes** ☐ **Continue with Question 20.b** **No** ☐ **Go to Question 21**

**20b**. 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.

| (Tick as appropriate) | South Africa | Foreign | **Foreign consisting of . . .** (tick as appropriate) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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 | | | | | | | | | | |
| Other Companies (including specialist consultants, business 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

**21.** State value of R&D outsourced **inside South Africa.**

| R'000 (Excl. VAT) | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

**21a**. Please indicate the name of the organisation(s) that conducted the outsourced R&D with the associated expenditure **inside South Africa.**

| Outsourced to: | Approximate Value R'000s (excl. VAT) |
|---|---|
| | |
| | |
| | |
| | |

**22.** State value of R&D outsourced **outside South Africa.**

| R'000 (Excl. VAT) | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

**22a. If you have indicated R&D outsourced to outside South Africa in question 22, kindly provide the sector and geographic location of this outsourced R&D expenditure.**

| R&D outsourced outside South Africa | | SUB TOTAL (R'000s) made up of: | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Category SUB-TOTAL** | **Africa (outside SA)** | **Middle East** | **Europe** | **USA / Canada** | **Central & South America** | **China** | **Rest of Asia** | **Other** |
| **Business** | | | | | | | | | |
| **Not-for-Profit Organisations* / Individuals** | | | | | | | | | |
| **Foundations** | | | | | | | | | |
| **Government** | | | | | | | | | |
| **Higher Education** | | | | | | | | | |
| **TOTAL** | | | | | | | | | |

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

**THANK YOU FOR YOUR TIME AND EFFORT**

# ANNEXURE III: USER SATISFACTION SURVEY

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 e-mail to sparker@hsrc.ac.za or mclayford@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 | | International organisation | |
| Private enterprise | | Media | |
| Public enterprise | | Not-for-profit organisation | |
| Academic or research institution | | 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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