SOUTH AFRICAN NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT

STATISTICAL 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)

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USER FEEDBACK

A User Satisfaction Survey (USS) questionnaire is included as **Annexure in F** of this report. It would be very much appreciated if users could complete the questionnaire and return it by fax to +27 (0)21 461 1255 or by 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.

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 Cooperation 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.

CESTII PROJECT TEAM

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

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

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.

ABBREVIATIONS

AIDS	Acquired immune deficiency syndrome
BERD	Business expenditure on R&D
CAGR	Compound annual growth rate
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
HEMIS	Higher Education Management Information System
HIV	Human immunodeficiency virus
HSRC	Human Sciences Research Council
ICT	Information, computer and communication technologies
NESTI	National Experts on Science and Technology Indicators
NPO	Not-for-profit organisation
OECD	Organisation for Economic Cooperation and Development
R	Rand
R&D	Research and experimental development
SA	South Africa
SASQAF	South African Statistical Quality Assessment Framework
SEO	Socio-economic Objective
SIC	Standard Industrial Classification
SMRS	Survey Management and Results System
SPII	Support Programme for Industrial Innovation
Stats SA	Statistics South Africa
SVC	Statistical Value Chain
TB	Tuberculosis
USS	User Satisfaction Survey
VAT	Value added tax

DEFINITIONS AND DESCRIPTIONS

The definitions used in the survey are consistent with those of the OECD's Frascati Manual (OECD, 2002).

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

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

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

Capital 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.

Compound annual growth rate (CAGR) is a term used for the geometric mean that is used to calculate the average rate per period on a financial quantity that is compounded over multiple periods. It provides a constant rate of return over the full time period.

Compound annual growth rate of GERD over the n-year period from the end of year 0 to the end of year n is calculated as $(\text{GERD in year n}/\text{GERD in year 0})^{1/n} - 1$.

Constant 2005 Rands is the value of goods and services of a given year using the prices of a determined base reference year, which is 2005 in this case.

Constant 2005 GERD is calculated each year using the most recent data as GERD at current prices X (GDP at constant 2005 prices / GDP at current prices).

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 equivalents (FTEs) refers to the time (person years) spent on R&D activities.

Gross domestic product (GDP) is the gross value added at basic prices plus taxes on products minus subsidies on products. This statistic is obtained from Statistics South Africa's GDP survey series P0441.

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

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

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.

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

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.

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

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

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

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 estimated by GERD/GDP is the total intramural expenditures on R&D performed in the country in a given year relative to 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.

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

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

Standard Industrial Classification (SIC) codes are codes used by Statistics South Africa to classify economic activities of industries.

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

Year-on-year changes (in percentages) are calculated as follows: (Current year's figure - previous year's figure) / previous year's figure × 100.

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A. INTRODUCTION

This Statistical Report presents selected data tables of the 2011/12 South African National Survey of Research and Experimental Development (R&D survey). The Statistical Report is published together with the Main Analysis Report which provides trends and brief analysis of the survey data. The tables in this report cover the following main dimensions of R&D statistics, in terms of expenditure 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 economic sector, field of research and socio-economic objectives;
- R&D personnel by occupation (researchers, technicians and support staff) and the time devoted to R&D;
- R&D involving local and international collaborations.

The survey covered the sectors that perform R&D in South Africa, namely the business, not-for-profit, government, science councils and higher education sectors. This approach is followed in order to maintain consistency with the sector categorisation recommended by the Organisation for Economic Cooperation 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 the 'Technical notes' section of this report.

B. KEY FINDINGS FOR 2011/12

GERD has increased in both nominal and real terms in 2011/12, while maintaining the level of R&D intensity of GERD over GDP at 0.76% as in the year 2010/11.

GERD for 2011/12 was R22.209 billion, representing a nominal increase of R1.955 billion or 9.7% from R20.254 billion reported in 2010/11. The 2011/12 survey recorded the first increase in GERD following the declines recorded in the two preceding years.

- At constant 2005 prices[1], GERD amounted to R14.507 billion, which is a real increase of 3.4% year-on-year.
- GERD as a percentage of GDP, an indicator of R&D intensity in the economy, was 0.76% in 2011/12. This ratio is the same as the one reported in the 2010/11 survey.
- Table B.1 shows the key R&D indicators for the 2011/12 reference period, with comparative figures for the years 2009/10 and 2010/11.

TABLE B.1: KEY INDICATORS (2011/12 AND COMPARATIVE FIGURES FOR 2009/10 AND 2010/11)

KEY INDICATOR	2011/12	2010/11	2009/10
Gross domestic expenditure on R&D (GERD) at current prices (Rand millions)	22 209	20 254	20 955
Gross domestic product (GDP) at current prices (Rand millions)	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 at current prices (Rand millions)	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# (headcounts)	17 184	15 794	16 628
Female researchers (headcounts) as a percentage of total researchers#	42.3	41.7	40.8

** FTE = Full-time equivalent*

 # Researchers include doctoral students and postdoctoral fellows

1 *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.*

B.1 COMMENTARY

All the sectors have increased their nominal R&D expenditures in 2011/12, with a robust increase coming particularly from the higher education sector.

The higher education sector was the largest contributor to the increase in GERD, contributing an additional R1.184 billion in R&D expenditure, which is 60.6% of the recorded increase in GERD from 2010/11 to 2011/12.

- Since 2001/02, the higher education sector has consistently increased its R&D expenditures, from R1.896 billion to R6.609 billion in 2011/12.
- The business sector contributed the second largest proportion of the increase with R405 million (20.7%), followed by the government sector with R224 million (11.5%), the science council sector with R134 million (or 6.8%) and the not-for-profit sector with R7 million (0.4%).

The business sector remained the largest contributor to GERD, despite the decline in its R&D expenditure between 2009/10 and 2010/11.

- The business sector remained the largest performer of R&D in South Africa, spending R10.464 billion on R&D in 2011/12.
- Business expenditure on research and development (BERD) constituted 47.1% of GERD, a decline from 49.7% of 2010/11. These ratios are lower than the seven year average of 56.5% that the BERD has contributed to GERD between 2003/04 and 2008/09. This has resulted from slower increases or declining BERD, and the relatively higher rates of increases in higher education and government sector R&D expenditures.
- BERD as a percentage of GDP declined by two basis points to 0.36% in 2011/12 from the 0.38% value of 2010/11. This is a further decline from 0.46% recorded in 2009/10.
- The past trends indicate that prior to 2009/10 the business sector was consistently the largest contributor to increases in the level of GERD in both nominal and real terms. This has, however, not been the case in the years 2009/10 and 2010/11, where the business sector experienced a decline in R&D expenditure, effectively contributing to the decrease in the level of GERD in those years.
- Disaggregation of BERD by industrial sector in 2011/12 indicated that:-
  - For the first time, the financial intermediation, real estate and business services sector accounted for the largest proportion of BERD. The manufacturing sector was relegated to the second largest contributor to BERD. Trend data also indicate that this has resulted from a gradual shift over time. The financial and business services sector increased its R&D expenditure by a compound annual growth rate (CAGR) of 5.7% between 2007/08 and 2011/12, while the manufacturing sector declined by CAGR of 3.4% over the same period. Mining and quarrying was the third largest contributor to BERD in 2011/12, with 12.9%. This sector has consistently increased its R&D spending by CAGR of 19.3% between 2007/08 and 2011/12. The electricity, gas and water supply sector has experienced significant decline in R&D expenditure over the same period.
  - Within the manufacturing sector, the manufacture of refined petroleum, coke, nuclear fuel, chemicals (including pharmaceuticals), rubber and plastic contributed the largest proportion of R&D expenditure.

There was a continuing trend of gradual shifts in the composition of GERD by research types in favour of applied research

- 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 research at 33.2% and basic research at 24.5%. Trends indicate a gradual shift in the overall composition of GERD by type of research towards applied research. The composition was different in 2007/08, where 45.2% of GERD was devoted to experimental development, 34.2% to applied research and 20.6% on basic research.
- The broad research field of natural sciences, technology and engineering constituted 85.2% of GERD in 2011/12, whilst 14.8% was spent on social sciences and humanities research fields. Further disaggregation of expenditure by research fields indicate that the largest percentage of GERD during 2011/12 was spent in medical and health sciences (17.2%); which has since overtaken the engineering sciences which contributed 17.0%. This is followed by information, computer and communications technology (ICT) with 12.8%; social sciences with 12.6%; applied sciences and technologies with 9.5%; and the remaining 28.9% spread amongst the rest of the research fields.

Government and business sectors were the main sources of funding for R&D in 2011/12

- The government sector funded 43.1% of R&D expenditure incurred while the business sector funded 39.0% in 2011/12.
- The business sector funded 92.0% of its own R&D in 2011/12, while funding from government was distributed mainly between the higher education (48.0%) and science councils sectors (34.6%).
- 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 the funding from abroad was spent in the business sector and in the higher education sector (38.2%).
- The other contributions to funding R&D activities in South Africa came from not-for-profit organisations (1.9%), individual donations (0.9%) and higher education institutions (0.1%).

There has been an increase in the total R&D personnel from 2010/11, the bulk of which consists of researchers in higher education

- The R&D personnel headcount totalled 59 487 in 2011/12, a year-on-year increase of 7.1% from 55 531 in 2010/11. The majority of the increase in R&D personnel came from the higher education sector, with a key driver being the doctoral and postdoctoral fellows. Researchers made up the largest proportion of R&D personnel headcounts, accounting for 68.3% (40 653) of total personnel engaged in R&D.
- The number of FTE researchers per 1 000 in total employment was 1.5. This ratio has remained between 1.4 and 1.5 since 2005.
- The number of female researchers in 2011/12 was 17 184, indicating an increase of 8.8% from 15 794 recorded in 2010/11. As a proportion of total researcher workforce, female researchers increased by 0.6 of a percentage point from 41.7% in 2010/11 to 42.3% in 2011/12.

C. TABLES

Notes:

- Totals in the tables may not add up to the sum of their constituent items due to rounding effects.
- There is no data for the 2002/03 R&D survey because it was not conducted.

C.1 OVERALL SURVEY FINDINGS

C.1.1 Expenditure on Research and Experimental Development

TABLE C.1: IN-HOUSE R&D EXPENDITURE BY SECTOR, R'000 (2001/02 TO 2011/12)

YEAR	GERD (ALL SECTORS)	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2001/02	**7 488 074**	203 110	1 294 454	1 896 156	4 023 576	70 778
2003/04	**10 082 559**	465 367	1 745 493	2 071 351	5 591 325	209 023
2004/05	**12 009 981**	515 331	1 996 050	2 533 971	6 766 361	198 268
2005/06	**14 149 239**	844 640	2 102 094	2 732 215	8 243 776	226 514
2006/07	**16 520 584**	1 021 355	2 744 718	3 298 808	9 243 165	212 538
2007/08	**18 624 013**	1 154 399	2 886 094	3 621 862	10 738 456	223 202
2008/09	**21 041 046**	1 139 676	3 137 343	4 191 366	12 332 012	240 649
2009/10	**20 954 677**	1 067 302	3 458 074	5 101 224	11 139 237	188 840
2010/11	**20 253 805**	1 011 340	3 596 023	5 424 602	10 059 010	162 830
2011/12	**22 209 192**	1 235 669	3 729 680	6 609 216	10 464 022	170 605

TABLE C.2: R&D EXPENDITURE COMPOSITION BY SECTOR, PERCENTAGE (2001/02 TO 2011/12)

YEAR	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2001/02	2.7	17.4	25.3	53.7	0.9
2003/04	4.6	17.3	20.5	55.5	2.1
2004/05	4.3	16.6	21.1	56.3	1.7
2005/06	6.0	14.9	19.3	58.3	1.6
2006/07	6.2	16.6	20.0	55.9	1.3
2007/08	6.2	15.5	19.4	57.7	1.2
2008/09	5.4	14.9	19.9	58.6	1.1
2009/10	5.1	16.5	24.3	53.2	0.9
2010/11	5.0	17.8	26.8	49.7	0.8
2011/12	5.6	16.8	29.8	47.1	0.8

TABLE C.3: R&D EXPENDITURE AS A PERCENTAGE OF GDP BY SECTOR (2001/02 TO 2011/12)

YEAR	GERD/GDP	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2001/02	**0.76**	0.02	0.13	0.19	0.41	0.01
2003/04	**0.81**	0.04	0.14	0.17	0.45	0.02
2004/05	**0.87**	0.04	0.14	0.18	0.49	0.01
2005/06	**0.92**	0.05	0.14	0.18	0.53	0.01
2006/07	**0.95**	0.06	0.16	0.19	0.53	0.01
2007/08	**0.93**	0.06	0.14	0.18	0.54	0.01
2008/09	**0.92**	0.05	0.14	0.18	0.54	0.01
2009/10	**0.87**	0.04	0.14	0.21	0.46	0.01
2010/11	**0.76**	0.04	0.13	0.20	0.38	0.01
2011/12	**0.76**	0.04	0.13	0.23	0.36	0.01

TABLE C.4: R&D EXPENDITURE BY TYPE OF RESEARCH, R'000 (2001/02 TO 2011/12)

YEAR	GERD	BASIC RESEARCH	APPLIED RESEARCH	EXPERIMENTAL DEVELOPMENT
2001/02	**7 488 076**	2 078 456	2 987 540	2 422 078
2003/04	**10 082 559**	2 435 363	3 865 436	3 781 760
2004/05	**12 009 979**	2 237 102	4 651 528	5 121 349
2005/06	**14 149 238**	2 649 755	5 056 379	6 443 104
2006/07	**16 520 728**	3 075 263	5 794 785	7 650 671
2007/08	**18 624 013**	3 830 806	6 373 681	8 419 526
2008/09	**21 041 046**	4 243 156	7 013 082	9 784 808
2009/10	**20 954 676**	5 553 399	6 578 902	8 822 375
2010/11	**20 253 804**	4 848 283	8 058 799	7 346 722
2011/12	**22 209 192**	5 439 561	9 388 273	7 381 358

TABLE C.5: R&D EXPENDITURE BY ACCOUNTING CATEGORY, R'000 (2001/02 TO 2011/12)

YEAR	GERD	CAPITAL EXPENDITURE ON R&D			CURRENT EXPENDITURE ON R&D			
		LAND: BUILDINGS AND OTHER STRUCTURES	VEHICLES, PLANT, MACHINERY, EQUIPMENT	SUBTOTAL: CAPITAL EXPENDITURE	LABOUR COSTS	TOTAL COST OF R&D POST-GRADUATE STUDENTS	OTHER CURRENT EXPENDITURE	SUBTOTAL: CURRENT EXPENDITURE
2001/02	**7 488 076****	48 783	933 571	**982 354**	3 622 993	*	2 481 797	**6 104 790**
2003/04	**10 082 559**	190 412	944 006	**1 134 418**	4 608 946	190 892	4 148 303	**8 948 141**
2004/05	**12 009 981**	205 970	870 022	**1 075 992**	5 721 100	308 454	4 904 435	**10 933 989**
2005/06	**14 149 239**	347 342	1 619 871	**1 967 213**	6 178 386	313 645	5 689 995	**12 182 026**
2006/07	**16 520 586**	319 868	1 357 234	**1 677 102**	7 526 757	438 486	6 878 241	**14 843 484**
2007/08	**18 624 013**	367 757	1 686 567	**2 054 324**	8 171 240	495 128	7 903 321	**16 569 689**
2008/09	**21 041 046**	326 145	3 091 898	**3 418 043**	8 661 361	532 883	8 428 759	**17 623 003**
2009/10	**20 954 677**	623 089	2 067 728	**2 690 817**	8 909 301	581 140	8 773 419	**18 263 860**
2010/11	**20 253 805**	472 205	1 714 845	**2 187 050**	8 353 254	756 930	8 956 571	**18 066 755**
2011/12	**22 209 192**	454 321	2 215 416	**26 69 737**	9 534 138	1 074 207	8 931 110	**19 539 455**

** This was not measured in the 2001/02 R&D survey.*

*** The R&D survey of 2001/02 reported an unspecified expenditure of R400 930 000 that is included in the total.*

TABLE C.6: EXPENDITURE ON MULTIDISCIPLINARY AREAS OF R&D, R'000 (2005/06–2011/12)

YEAR	GERD	BIOTECHNOLOGY	NANOTECHNOLOGY
2005/06	**14 149 238**	454 332	236 479
2006/07	**16 520 584**	592 777	310 078
2007/08	**18 624 014**	648 704	248 521
2008/09	**21 041 046**	801 640	388 380
2009/10	**20 954 677**	917 917	423 865
2010/11	**20 253 805**	1 142 337	414 529
2011/12	**22 209 192**	1 065 286	596 072

Note: Data on the multidisciplinary areas of R&D were collected for the first time in the 2005/06 R&D survey.

TABLE C.7: R&D EXPENDITURE ON SELECTED AREAS OF INTEREST, R'000 (2005/06 TO 2011/12)

YEAR	GERD	OPEN SOURCE SOFTWARE	TUBERCULOSIS (TB), HIV/AIDS, MALARIA	ENVIRONMENT/ ENVIRONMENT RELATED
2005/06	**14 149 239**	101 937	733 338	N/A
2006/07	**16 520 584**	192 786	934 760	N/A
2007/08	**18 624 013**	254 808	1 120 028	N/A
2008/09	**21 041 046**	218 289	1 616 410	N/A
2009/10	**20 954 677**	172 712	1 816 901	N/A
2010/11	**20 253 805**	157 790	2 052 521	N/A
2011/12	**22 209 192**	181 320	2 006 625	1 215 855

Note: Data on the selected areas of interest were collected for the first time in the 2005/06 R&D survey.

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

TABLE C.8: R&D EXPENDITURE BY RESEARCH FIELD, R'000 (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Division 1: Natural sciences, technology and engineering	**6 606 536**	**8 892 709**	**10 516 783**	**12 404 829**	**14 568 971**	**16 306 332**	**18 419 289**	**18 236 046**	**17 274 483**	**18 924 485**
Mathematical sciences	94 672	192 441	205 285	291 122	315 773	341 624	397 512	414 234	530 693	636 153
Physical sciences	96 134	348 905	379 230	551 426	655 378	793 006	952 441	648 657	305 701	338 098
Chemical sciences	401 077	533 070	608 438	591 258	595 579	784 145	1 056 848	860 745	865 345	1 273 588
Earth sciences	215 675	254 879	266 185	365 771	426 950	524 133	563 619	402 949	403 848	409 212
Information, computer and communication technologies	904 067	1 060 623	1 534 031	1 866 314	2 314 243	2 598 218	2 763 320	3 272 679	2 808 681	2 852 251
Applied sciences and technologies	1 187 736	1 030 020	973 201	1 541 893	1 812 402	1 832 546	1 905 397	1 740 755	2 151 557	2 114 322
Engineering sciences	1 725 576	2 500 912	2 868 546	2 950 059	3 457 912	4 189 408	5 135 032	4 580 166	3 600 159	3 775 247
Biological sciences	308 913	504 349	583 545	705 410	798 835	723 280	744 144	800 435	1 326 076	1 350 716
Agricultural sciences	608 665	741 589	865 736	961 166	1 138 873	1 264 628	1 147 706	1 445 847	1 307 191	1 710 860
Medical and health sciences	736 327	1 358 092	1 779 259	2 088 399	2 489 242	2 616 439	3 139 245	3 506 472	3 461 304	3 819 180
Environmental sciences	116 968	146 423	201 042	194 867	216 710	222 514	248 625	229 186	352 139	439 719
Material sciences	161 630	165 323	191 841	246 125	284 530	365 813	306 828	254 092	109 551	166 411
Marine sciences	49 096	56 083	60 444	51 019	62 544	50 579	58 573	79 830	52 238	38 726
Division 2: Social sciences and humanities	**790 482**	**1 189 851**	**1 493 200**	**1 744 411**	**1 951 613**	**2 317 681**	**2 621 757**	**2 718 631**	**2 979 322**	**3 284 707**
Social sciences	636 520	967 790	1 159 115	1 393 471	1 559 043	1 809 308	2 024 801	2 233 521	2 512 714	2 790 339
Humanities	153 962	222 061	334 085	350 940	392 570	508 373	596 956	485 110	466 608	494 368
Total	**7 488 074***	**10 082 560**	**12 009 983**	**14 149 240**	**16 520 584**	**18 624 013**	**21 041 046**	**20 954 677**	**20 253 805**	**22 209 192**

** The R&D survey of 2001/02 reported an unspecified expenditure of R91 055 000 that is included in the total*

TABLE C.9: R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVES, R'000 (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVES	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Division 1: Defence	**683 068**	**1 006 013**	**883 101**	**906 174**	**1 091 516**	**1 135 278**	**1 196 200**	**1 276 269**	**1 341 460**	**1 069 289**
Defence	683 068	1 006 013	883 101	906 174	1 091 516	1 135 278	1 196 200	1 276 269	1 341 460	1 069 289
Division 2: Economic development	**4 420 767**	**5 765 250**	**6 990 226**	**8 817 223**	**10 017 805**	**11 724 590**	**13 312 043**	**12 341 036**	**11 231 879**	**12 174 897**
Economic development unclassified	13 456	93 498	102 936	115 029	150 668	171 520	209 400	0	0	0
Plant production and plant primary products	403 514	468 345	526 775	731 188	792 487	931 733	853 243	1 055 316	1 045 114	1 137 706
Animal production and animal primary products	184 489	272 065	299 990	272 077	337 029	279 914	289 909	354 639	293 873	565 729.179
Mineral resources (excluding energy)	933 681	688 042	979 512	1 164 691	931 909	1 075 821	995 552	1 212 226	1 123 063	1 065 384
Energy resources	66 782	312 619	335 717	438 889	574 570	709 891	1 185 455	407 091	274 220	273 390
Energy supply	268 321	317 876	326 122	273 823	347 632	364 876	515 216	540 463	623 953	676 490
Manufacturing	1 011 298	1 230 223	1 356 014	1 859 779	2 187 583	2 676 911	2 998 301	2 602 319	2 374 657	2 489 799
Construction	87 372	442 661	454 608	745 634	937 406	1 150 733	1 461 157	521 289	311 897	392 439
Transport	299 273	418 458	422 968	438 848	515 262	595 065	704 404	924 183	905 571	984 225
Information and communication services	403 407	393 727	667 136	948 734	1 035 459	1 240 972	1 274 761	1 381 989	1 104 273	127 159 1
Commercial services	276 224	527 456	766 339	1 145 775	1 380 085	1 457 410	1 499 495	2 045 919	1 849 534	1 866 449
Economic framework	213 148	193 052	223 875	304 864	349 517	548 517	604 404	598 312	600 662	611 868
Natural resources	259 803	407 227	528 236	377 891	478 198	521 228	720 746	697 290	725 062	839 825
Division 3: Society	**891 483**	**1 583 390**	**2 274 312**	**2 316 725**	**2 731 152**	**2 827 775**	**3 225 179**	**3 276 198**	**3 247 428**	**3 861 888**
Society unclassified	3 364	93 498	102 936	115 029	150 668	171 520	209 400	0	0	0
Health	44 513	1 044 744	1 504 741	1 522 650	1 725 977	1 790 225	2 013 993	2 247 629	2 089 570	2 301 764
Education and training	201 100	200 500	382 553	382 105	418 971	389 138	465 475	458 060	442 181	554 462
Social development and community services	240 506	244 648	284 082	296 942	435 536	476 892	536 312	570 508	715 677	1 005 662
Division 4: Environment	**410 545**	**555 312**	**575 026**	**604 769**	**711 134**	**854 997**	**1 006 106**	**992 840**	**735 909**	**905 570**
Environment unclassified	6 728	31 166	34 312	38 343	50 223	57 173	69 800	0	0	0
Environmental knowledge	216 283	248 177	257 500	303 892	348 158	375 069	488 204	463 786	310 888	398 977
Environmental aspects of development	97 523	122 517	141 631	118 802	130 144	195 300	176 503	181 907	189 344	216 406
Environmental and other aspects	90 010	153 452	141 583	143 732	182 609	227 455	271 599	347 147	235 677	290 186
Division 5: Advancement of knowledge	**930 870**	**1 172 594**	**1 287 316**	**1 504 349**	**1 968 977**	**2 081 375**	**2 301 517**	**3 068 334**	**3 697 128**	**4 197 547**
Advancement of knowledge unclassified	10 092	93 498	102 936	115 029	150 668	171 520	209 400	0	0	0
Natural sciences, technologies and engineering	793 052	755 448	788 740	925 287	1 372 203	1 456 357	1 604 035	2 036 622	2 672 224	3 025 841
Social sciences and humanities	127 725	323 648	395 640	464 032	446 107	453 498	488 082	1 031 712	1 024 904	1 171 706
TOTAL	**7 488 074***	**10 082 559**	**12 009 981**	**14 149 239**	**16 520 584**	**18 624 015**	**21 041 046**	**20 954 677**	**20 253 805**	**22 209 192**

** The total for 2001/02 includes a figure of R151 343 000, whose category of socio-economic objective was not specified.*

TABLE C.10: R&D EXPENDITURE BY PROVINCE, R'000 (2001/02 TO 2011/12)

YEAR	GERD	EASTERN CAPE	FREE STATE	GAUTENG	KWAZULU-NATAL	LIMPOPO	MPUMALANGA	NORTHERN CAPE	NORTH-WEST	WESTERN CAPE
2001/02	**7 488 076**	247 862	654 550	4 100 072	809 405	118 748	145 014	78 566	321 054	1 012 805
2003/04	**10 082 559**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2004/05	**12 009 982**	481 979	723 225	6 552 884	1 229 397	151 112	299 681	100 241	370 310	2 101 162
2005/06	**14 149 238**	672 008	718 908	7 173 590	1 532 158	197 054	340 773	138 426	323 838	3 052 483
2006/07	**16 520 584**	752 303	944 829	8 447 470	1 809 013	240 952	369 535	180 923	402 461	3 373 098
2007/08	**18 624 014**	826 925	1 098 210	9 620 752	2 081 166	263 784	452 950	169 937	453 574	3 656 717
2008/09	**21 041 046**	889 081	1 562 720	10 981 587	2 210 336	286 157	379 123	174 453	487 376	4 070 214
2009/10	**20 954 677**	1 121 484	1 370 779	10 377 381	2 167 048	340 379	393 822	217 774	540 951	4 425 059
2010/11	**20 253 805**	1 048 959	1 332 224	9 772 806	2 290 711	395 042	397 878	250 320	532 456	4 233 409
2011/12	**22 209 192**	1 278 870	1 718 602	10 391 272	2 515 736	583 857	522 963	341 136	732 363	4 124 394

Note: N/A indicates that data were not collected for that year

C.1.2 Sources of Funds

TABLE C.11: SOURCES OF FUNDING FOR R&D BY SECTOR, R'000 (2001/02 TO 2011/12)

YEAR	GOVERNMENT	BUSINESS	OTHER SOUTH AFRICAN (LOCAL) SOURCES*	FOREIGN SOURCES
2001/02	2 633 224	3 990 505	407 204	457 143
2003/04	3 433 088	5 521 405	32 337	1 095 741
2004/05	4 276 313	5 838 774	62 342	1 832 551
2005/06	5 403 955	6 206 837	620 849	1 917 598
2006/07	6 672 138	7 399 660	701 907	1 746 865
2007/08	8 510 101	7 945 949	180 927	1 987 082
2008/09	9 497 510	8 973 490	175 219	2 394 827
2009/10	9 313 028	8 907 527	195 682	2 538 439
2010/11	9 018 874	8 128 246	661 676	2 445 009
2011/12	9 561 917	8 663 105	653 674	3 330 496

**Includes higher education institutions and not-for-profit organisations*

TABLE C.12: R&D EXPENDITURE BY SOURCES OF FUNDING, AMOUNT AND AS A PERCENTAGE OF TOTAL EXPENDITURE (2011/12)

SOURCE OF FUNDS	TOTAL (ALL SECTORS)		R&D EXPENDITURE BY SOURCES OF FUNDS									
			GOVERNMENT		SCIENCE COUNCILS		HIGHER EDUCATION		BUSINESS		NOT-FOR-PROFIT	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
Own funds	**12 322 566**	**55.5**	**745 777**	**60.4**	**261 533**	**7.0**	**3 356 700**	**50.8**	**7 936 552**	**75.8**	**22 004**	**12.9**
Internal sources	12 322 566	55.5	745 777	60.4	261 533	7.0	3 356 700	50.8	7 936 552	75.8	22 004	12.9
Government	**5 197 907**	**23.4**	**366 530**	**29.7**	**3 049 361**	**81.8**	**1 241 726**	**18.8**	**499 298**	**4.8**	**40 992**	**24.0**
Grants	2 060 818	9.3	290 189	23.5	1 465 813	39.3	N/A	N/A	28 0328	2.7	24 488	14.4
Contracts	1 895 363	8.5	76 341	6.2	1 583 548	42.5	N/A	N/A	218 970	2.1	16 504	9.7
All other	1 241 726	5.6	N/A	N/A	N/A	N/A	1 241 726	18.8	N/A	N/A	N/A	N/A
Business	**726 553**	**3.3**	**1 355**	**0.1**	**67 614**	**1.8**	**505 510**	**7.6**	**119 993**	**1.1**	**32 081**	**18.8**
Local business	726 553	3.3	1 355	0.1	67 614	1.8	505 510	7.6	119 993	1.1	32 081	18.8
Other SA sources	**631 670**	**2.8**	**3 880**	**0.3**	**29 915**	**0.8**	**233 107**	**3.5**	**345 902**	**3.3**	**18 866**	**11.1**
Higher education	31 187	0.1	898	0.1	4 480	0.1	21 548	0.3	1 953	0.0	2 308	1.4
Not-for-profit	406 435	1.8	2 982	0.2	25 428	0.7	22 641	0.3	34 1307	3.3	14 077	8.3
Individual donations	194 048	0.9	0	0.0	7	0.0	188 918	2.9	2 642	0.0	2 481	1.5
Foreign	**3 330 496**	**15.0**	**118 127**	**9.6**	**321 257**	**8.6**	**1 272 173**	**19.2**	**1 562 277**	**14.9**	**56 662**	**33.2**
All sources	3 330 496	15.0	118 127	9.6	321 257	8.6	1 272 173	19.2	1 562 277	14.9	56 662	33.2
TOTAL	**22 209 192**	**100**	**1 235 669**	**100**	**3 729 680**	**100**	**6 609 216**	**100**	**10 464 022**	**100**	**170 605**	**100**

Note: N/A indicates that data were not collected

TABLE C.13: GOVERNMENT-FUNDED R&D BY SECTOR, R'000 (2007/08–2011/12)

YEAR	TOTAL	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2007/08	**8 510 055**	1 091 049	2 297 322	2 761 557	2 326 728	33 399
2008/09	**9 497 510**	1 068 527	2 602 458	3 226 674	2 567 140	32 711
2009/10	**9 313 028**	1 008 475	2 917 683	3 918 620	1 429 766	38 484
2010/11	**9 018 874**	990 290	2 932 489	4 222 092	832 173	41 830
2011/12	**9 561 917**	1 112 307	3 310 894	4 598 426	499 298	40 992

TABLE C.14: BUSINESS-FUNDED R&D BY SECTOR, R'000 (2001/02 TO 2011/12)

YEAR	TOTAL (ALL SECTORS)	BUSINESS-FUNDED R&D BY SECTOR				
		GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2001/02	**3 990 505**	320	241 540	380 075	3 356 495	12 075
2003/04	**5 256 363**	3 758	254 668	478 734	4 499 656	19 547
2004/05	**5 344 512**	2 666	293 030	364 041	4 666 364	18 411
2005/06	**6 206 837**	11 000	220 698	316 740	5 630 983	27 416
2006/07	**7 399 659**	13 067	265 441	682 493	6 414 319	24 339
2007/08	**7 945 949**	5 343	263 098	519 804	7 133 913	23 791
2008/09	**8 973 490**	15 980	137 356	454 184	8 339 379	26 591
2009/10	**8 907 527**	2 326	120 528	609 250	8 142 996	32 427
2010/11	**8 128 246**	2 406	198 206	367 340	7 528 667	31 627
2011/12	**8 663 105**	1 355	67 614	505 510	8 056 545	32 081

TABLE C.15: FOREIGN-FUNDED R&D BY SECTOR, R'000 (2001/02 TO 2011/12)

YEAR	TOTAL (ALL SECTORS)	FOREIGN-FUNDED R&D BY SECTOR				
		GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2001/02	**457 143**	8 890	121 653	173 865	127 775	24 960
2003/04	**1 095 741**	45 065	171 076	224 031	534 636	120 933
2004/05	**1 894 645**	57 765	254 287	303 002	1 208 310	71 281
2005/06	**1 917 598**	58 714	254 183	305 590	1 196 771	102 340
2006/07	**1 746 996**	51 660	320 868	278 708	977 087	118 673
2007/08	**1 987 082**	56 172	298 906	320 286	1 180 193	131 525
2008/09	**2 394 827**	53 348	392 008	410 038	1 396 033	143 400
2009/10	**2 538 439**	54 129	416 571	443 109	1 538 917	85 713
2010/11	**2 445 009**	16 236	460 580	473 145	1 442 334	52 714
2011/12	**3 330 496**	118 127	321 257	1 272 173	1 562 277	56 662

C.1.3 R&D Personnel

TABLE C.16: R&D PERSONNEL, HEADCOUNT AND FULL-TIME EQUIVALENTS (2001/02 TO 2011/12)

YEAR	R&D PERSONNEL			RESEARCHERS			TECHNICIANS	OTHER R&D PERSONNEL
	R&D PERSONNEL (HEAD-COUNT)	R&D PERSONNEL (FTEs)	R&D PERSONNEL (FTE) PER 1 000 IN TOTAL EMPLOYMENT	RESEARCHERS (HEADCOUNT)	RESEARCHERS (FTEs)	RESEARCHERS (FTE) PER 1 000 IN TOTAL EMPLOYMENT	TECHNICIANS (HEADCOUNT)	OTHER R&D PERSONNEL (HEAD-COUNT)
2001/02	32 501	21 195.3	*	19 406	8 706.9	*	5 139	7 956
2003/04	40 605	25 190.0	3.3	22 760	10 127.5	1.6	8 193	9 651
2004/05	56 453	29 696.0	2.6	37 001	17 915.0	1.6	8 641	10 811
2005/06	57 275	28 798.0	2.4	39 266	17 303.0	1.5	8 325	9 684
2006/07	58 706	30 985.4	1.5	39 591	18 573.5	1.5	9 761	9 354
2007/08	59 334	31 354.0	2.4	40 084	19 320.3	1.5	9 476	9 784
2008/09	58 895	30 801.6	2.2	39 955	19 384.3	1.4	9 761	9 179
2009/10	59 494	30 891.3	2.3	40 797	19 793.1	1.5	9 443	9 254
2010/11	55 531	29 486.4	2.2	37 901	18 719.6	1.4	8 559	9 071
2011/12	59 487	30 978.4	2.3	40 653	20 115.1	1.5	9 260	9 574

** Total employment numbers, R&D personnel (FTE) per 1000 in total employment, and researchers (FTE) per 1000 in total employment were not reported in the 2001/02 reference year.*

TABLE C.17: R&D PERSONNEL BY SECTOR, HEADCOUNT (2001/02 TO 2011/12)

YEAR	TOTAL R&D PERSONNEL (ALL SECTORS)	R&D PERSONNEL BY SECTOR (HEADCOUNT)				
		GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2001/02	32 501	2 138	5 874	15 767	8 284	438
2003/04	40 605	2 283	6 522	19 377	11 608	815
2004/05	56 453	2 311	6 170	33 126	14 337	509
2005/06	57 275	2 001	5 679	32 789	16 321	485
2006/07	58 706	2 924	5 798	32 033	17 467	484
2007/08	59 334	2 794	5 988	32 109	17 951	502
2008/09	58 895	2 963	5 609	31 226	18 595	502
2009/10	59 494	2 580	5 926	32 392	18 216	380
2010/11	55 531	2 704	4 923	32 571	14 933	400
2011/12	59 487	3 143	4 494	36 157	15 288	405

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

TABLE C.18: RESEARCHERS BY SECTOR, HEADCOUNT (2001/02 TO 2011/12)

YEAR	TOTAL RESEARCHERS (ALL SECTORS)	RESEARCHERS BY SECTOR (HEADCOUNT)				
		GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2001/02	19 406	560	2 214	12 626	3 753	253
2003/04	22 760	929	2 414	14 054	5 058	305
2004/05	37 001	692	1 846	27 603	6 575	285
2005/06	39 266	874	1 790	28 879	7 480	243
2006/07	39 591	1 111	2 255	27 746	8 227	252
2007/08	40 084	1 138	2 594	27 752	8 336	264
2008/09	39 955	1 169	2 648	27 316	8 560	262
2009/10	40 797	986	2 669	28 552	8 366	224
2010/11	37 901	1 184	1 941	28 154	6 372	250
2011/12	40 653	1 411	1 803	30 993	6 192	254

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

TABLE C.19: R&D PERSONNEL HEADCOUNT BY PERSONNEL CATEGORY, QUALIFICATION RACE AND GENDER (2011/12)

QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN		WHITE	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers*											
Doctoral degree or equivalent	**18 511**	**10 592**	**7 919**	3 732	2 065	567	493	717	725	5 576	4 636
Masters, honours, bachelor or equivalent	**15 123**	**8 422**	**6 701**	2 700	1 874	418	504	676	687	4 628	3 637
Diplomas	**2 994**	**1 678**	**1 316**	506	476	75	97	134	125	964	618
Subtotal	**36 628**	**20 692**	**15 936**	**6 938**	**4 415**	**1 060**	**1 094**	**1 527**	**1 537**	**11 168**	**8 891**
Technicians directly supporting R&D											
Doctoral degree or equivalent	**177**	**110**	**67**	19	10	5	2	5	4	81	51
Masters, honours, bachelor or equivalent	**3 027**	**1 808**	**1 219**	523	446	100	95	203	129	983	549
Diplomas	**6 056**	**4 116**	**1 939**	1 229	840	422	171	264	163	2 201	765
Subtotal	**9 260**	**6 035**	**3 225**	**1 771**	**1 296**	**527**	**268**	**472**	**297**	**3 265**	**1 365**
Other personnel directly supporting R&D											
Doctoral degree or equivalent	**256**	**156**	**100**	30	25	7	11	9	2	110	62
Masters, honours, bachelor or equivalent	**2 064**	**957**	**1 107**	251	301	58	188	186	70	462	548
Diplomas	**7 253**	**3 900**	**3 353**	2 095	1 221	534	530	164	154	1 107	1 449
Subtotal	**9 574**	**5 013**	**4 561**	**2 376**	**1 547**	**599**	**729**	**359**	**225**	**1 679**	**2 059**
Total	**44 788**	**26 113**	**18 675**	**8 503**	**5 688**	**1 816**	**1 745**	**1 976**	**1 579**	**13 818**	**9 663**

** Doctoral degree or equivalent includes South African doctoral students and post-doctoral fellows. Non-SA student data is not collected by race.*

C.2 SECTOR TABLES

C.2.1 Business Sector

TABLE C.20: BUSINESS SECTOR R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Basic research	663 818	759 345	642 302	721 255	800 085	929 134	1 073 117	1 267 759	1 025 389	922 888
Applied research	1 397 968	1 883 082	2 223 955	2 409 266	2 550 483	3 077 341	3 426 651	3 301 773	3 949 410	4 461 770
Experimental research	1 674 818	2 948 898	3 900 103	5 113 256	5 892 597	6 731 981	7 832 244	6 569 705	5 084 210	5 079 364
Total	**4 023 576***	**5 591 325**	**6 766 361**	**8 243 776**	**9 243 165**	**10 738 456**	**12 332 012**	**11 139 237**	**10 059 010**	**10 464 022**

** The R&D survey of 2001/02 reported an unspecified expenditure of R286 972 000 that is included in the total.*

TABLE C.21: PROPORTIONAL BUSINESS SECTOR R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	%	%	%	%	%	%	%	%	%	%
Basic research	17.7	13.6	9.5	8.7	8.7	8.7	8.7	11.4	10.2	8.8
Applied research	37.4	33.7	32.9	29.2	27.6	28.7	27.8	29.6	39.3	42.6
Experimental research	44.8	52.7	57.6	62.0	63.8	62.7	63.5	59.0	50.5	48.5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.22: BUSINESS SECTOR R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1: Defence	**594 773**	**849 574**	**718 491**	**747 523**	**777 139**	**900 909**	**908 781**	**959 761**	**1 103 510**	**813 259**
Defence	594 773	849 574	718 491	747 523	777 139	900 909	908 781	959 761	1 103 510	813 259
Division 2: Economic Development	**2 943 459**	**3 935 136**	**4 895 638**	**6 384 780**	**7 233 003**	**8 399 187**	**9 737 338**	**8 258 491**	**7 012 272**	**7 381 289**
Economic Development unclassified	0	0	0	0	0	0	0	0	0	0
Plant Production And Plant Primary Products	121 239	153 202	209 583	273 503	279 937	279 437	266 259	309 370	288 323	315 806
Animal Production and Animal Primary Products	0	21 967	38 024	61 266	67 619	78 657	74 302	110 295	46 709	46 316
Mineral Resources (Excluding Energy)	777 499	469 983	711 661	829 414	779 765	937 628	839 558	741 401	728 130	733 280
Energy Resources	30 481	277 337	301 603	385 851	470 735	585 453	732 188	290 662	93 532	90 377
Energy Supply	241 164	279 093	292 545	205 657	239 018	252 064	393 798	426 407	470 030	490 490
Manufacturing	818 969	1 023 487	1 115 221	1 603 753	1 846 199	2 117 823	2 562 745	2 037 129	1 747 369	1 863 289
Construction	17 789	385 179	365 271	631 698	756 166	1 017 969	1 295 717	367 510	16 284	46 158
Transport	276 040	351 443	363 545	391 173	446 162	523 022	621 479	843 301	872 149	920 081
Information and Communication Services	325 930	355 231	588 233	818 485	895 714	1 087 198	1 151 637	1 189 650	851 392	978 187
Commercial Services	227 023	486 682	718 856	1 091 434	1 329 972	1 347 470	1 422 123	1 747 450	1 773 253	1 739 933
Economic Framework	3 592	14 803	11 280	13 515	16 243	41 756	160 562	106 693	70 795	57 474
Natural Resources	103 733	116 730	179 816	79 032	105 475	130 711	216 971	88 624	54 306	99 898
Division 3: Society	**40 320**	**502 865**	**911 606**	**798 247**	**839 908**	**915 567**	**1 019 848**	**1 224 481**	**1 041 616**	**1 232 867**
Society unclassified	0	0	0	0	0	0	0	0	0	0
Health	30 996	475 478	873 468	761 222	799 201	857 364	930 645	1 103 816	880 549	1 054 182
Education and Training	4 033	16 672	20 087	11 199	12 913	12 204	27 232	26 444	32 486	32 767
Social Development and Community Services	5 291	10 715	18 050	25 827	27 794	45 999	61 971	94 220	128 581	145 918
Division 4: Environment	**75 574**	**151 043**	**145 034**	**109 803**	**113 821**	**164 552**	**221 747**	**211 208**	**211 025**	**220 698**
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental Knowledge	26 183	43 489	32 776	33 395	39 233	62 551	91 953	53 022	51 845	58 565
Environmental Aspects of Development	16 625	56 246	70 069	28 781	28 327	33 901	31 493	22 456	55 577	42 226
Environmental and Other Aspects	32 767	51 307	42 188	47 626	46 261	68 100	98 301	135 730	103 602	119 907
Division 5: Advancement of Knowledge	**369 451**	**152 708**	**95 593**	**203 423**	**279 295**	**358 242**	**444 298**	**485 296**	**690 587**	**815 909**
Advancement of Knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural Sciences, Technologies and Engineering	369 451	147 486	92 497	200 018	275 446	353 694	439 330	479 999	682 401	813 150
Social Sciences and Humanities	0	5 222	3 096	3 406	3 848	4 548	4 968	5 298	8 186	2 758
Total	**4 023 576**	**5 591 325**	**6 766 361**	**8 243 776**	**9 243 165**	**10 738 457**	**12 332 012**	**11 139 237**	**10 059 010**	**10 464 022**

TABLE C.23: PROPORTIONAL BUSINESS SECTOR R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Defence	**14.8**	**15.2**	**10.6**	**9.1**	**8.4**	**8.4**	**7.4**	**8.6**	**11.0**	**7.8**
Defence	14.8	15.2	10.6	9.1	8.4	8.4	7.4	8.6	11.0	7.8
Division 2: Economic Development	**73.2**	**70.4**	**72.4**	**77.4**	**78.3**	**78.2**	**79.0**	**74.1**	**69.7**	**70.5**
Economic Development unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant Production And Plant Primary Products	3.0	2.7	3.1	3.3	3.0	2.6	2.2	2.8	2.9	3.0
Animal Production and Animal Primary Products	0.0	0.4	0.6	0.7	0.7	0.7	0.6	1.0	0.5	0.4
Mineral Resources (Excluding Energy)	19.3	8.4	10.5	10.1	8.4	8.7	6.8	6.7	7.2	7.0
Energy Resources	0.8	5.0	4.5	4.7	5.1	5.5	5.9	2.6	0.9	0.9
Energy Supply	6.0	5.0	4.3	2.5	2.6	2.3	3.2	3.8	4.7	4.7
Manufacturing	20.4	18.3	16.5	19.5	20.0	19.7	20.8	18.3	17.4	17.8
Construction	0.4	6.9	5.4	7.7	8.2	9.5	10.5	3.3	0.2	0.4
Transport	6.9	6.3	5.4	4.7	4.8	4.9	5.0	7.6	8.7	8.8
Information and Communication Services	8.1	6.4	8.7	9.9	9.7	10.1	9.3	10.7	8.5	9.3
Commercial Services	5.6	8.7	10.6	13.2	14.4	12.5	11.5	15.7	17.6	16.6
Economic Framework	0.1	0.3	0.2	0.2	0.2	0.4	1.3	1.0	0.7	0.5
Natural Resources	2.6	2.1	2.7	1.0	1.1	1.2	1.8	0.8	0.5	1.0
Division 3: Society	**1.0**	**9.0**	**13.5**	**9.7**	**9.1**	**8.5**	**8.3**	**11.0**	**10.4**	**11.8**
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	0.8	8.5	12.9	9.2	8.6	8.0	7.5	9.9	8.8	10.1
Education and Training	0.1	0.3	0.3	0.1	0.1	0.1	0.2	0.2	0.3	0.3
Social Development and Community Services	0.1	0.2	0.3	0.3	0.3	0.4	0.5	0.8	1.3	1.4
Division 4: Environment	**1.9**	**2.7**	**2.1**	**1.3**	**1.2**	**1.5**	**1.8**	**1.9**	**2.1**	**2.1**
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental Knowledge	0.7	0.8	0.5	0.4	0.4	0.6	0.7	0.5	0.5	0.6
Environmental Aspects of Development	0.4	1.0	1.0	0.3	0.3	0.3	0.3	0.2	0.6	0.4
Environmental and Other Aspects	0.8	0.9	0.6	0.6	0.5	0.6	0.8	1.2	1.0	1.1
Division 5: Advancement of Knowledge	**9.2**	**2.7**	**1.4**	**2.5**	**3.0**	**3.3**	**3.6**	**4.4**	**6.9**	**7.8**
Advancement of Knowledge unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Natural Sciences, Technologies and Engineering	9.2	2.6	1.4	2.4	3.0	3.3	3.6	4.3	6.8	7.8
Social Sciences and Humanities	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.24: BUSINESS SECTOR R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Eastern Cape	13 311	N/A	136 027	242 692	247 295	283 488	316 089	320 955	217 880	354 553
Free State	510 891	N/A	520 740	476 346	665 443	786 225	1 213 808	999 554	943 508	1 308 833
Gauteng	2 624 422	N/A	4 121 777	4 643 864	5 263 546	6 142 233	7 131 411	6 120 062	5 439 718	5 558 409
KwaZulu-Natal	309 403	N/A	615 437	843 499	962 308	1 302 260	1 255 509	1 183 636	1 280 014	1 160 507
Limpopo	3 270	N/A	49 948	84 187	72 813	71 687	75 675	49 375	41 850	62 728
Mpumalanga	41 501	N/A	178 452	187 934	172 948	196 368	201 550	161 154	139 771	157 158
North-West	9 529	N/A	184 691	180 227	197 383	193 339	222 630	267 528	256 428	302 164
Northern Cape	187 472	N/A	11 665	14 691	15 834	7 450	7 319	7 988	17 017	45 267
Western Cape	323 778	N/A	947 623	1 570 336	1 645 595	1 755 404	1 908 020	2 028 984	1 722 823	1 514 404
Total	**4 023 576**	**N/A**	**6 766 361**	**8 243 776**	**9 243 165**	**10 738 456**	**12 332 012**	**11 139 237**	**10 059 010**	**10 464 022**

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

TABLE C.25: PROPORTIONAL BUSINESS SECTOR R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Eastern Cape	0.3	N/A	2.0	2.9	2.7	2.6	2.6	2.9	2.2	3.4
Free State	12.7	N/A	7.7	5.8	7.2	7.3	9.8	9.0	9.4	12.5
Gauteng	65.2	N/A	60.9	56.3	56.9	57.2	57.8	54.9	54.1	53.1
KwaZulu-Natal	7.7	N/A	9.1	10.2	10.4	12.1	10.2	10.6	12.7	11.1
Limpopo	0.1	N/A	0.7	1.0	0.8	0.7	0.6	0.4	0.4	0.6
Mpumalanga	1.0	N/A	2.6	2.3	1.9	1.8	1.6	1.4	1.4	1.5
North-West	0.2	N/A	2.7	2.2	2.1	1.8	1.8	2.4	2.5	2.9
Northern Cape	4.7	N/A	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.4
Western Cape	8.0	N/A	14.0	19.0	17.8	16.3	15.5	18.2	17.1	14.5
Total	**100**	**N/A**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

TABLE C.26: BUSINESS SECTOR R&D EXPENDITURE BY SPECIFIC AREAS OF NATIONAL INTEREST OF R&D (2009/10, 2010/11 AND 2011/12)

MULTI-DISCIPLINARY AREA OF R&D	2009/10			2010/11			2011/12		
	R'000	%	NUMBER OF COMPANIES	R'000	%	NUMBER OF COMPANIES	R'000	%	NUMBER OF COMPANIES
Environment/Environment related	N/A		N/A	N/A		N/A	31 349	0.3	25
Open source software	91 818	0.8	20	68 105	0.7	21	85 787	0.8	28
New materials	173 308	1.6	22	227 682	2.3	22	277 152	2.6	24
Tuberculosis (TB), HIV/AIDS, malaria	460 233	4.1	21	631 996	6.3	20	812 580	7.8	20
Total	**11 139 237**	**100***	**N/A**	**10 059 010**	**100***	**N/A**	**10 464 022**	**100***	**N/A**

Note: N/A indicates that data was not collected.
**Note: The selected items of multidisciplinary areas of R&D are not a complete list and therefore do not add to 100%.*

TABLE C.27: BUSINESS SECTOR R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02 R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Division 1: Natural Sciences, Technology and Engineering	**3 974 369**	**5 456 725**	**6 536 764**	**7 919 744**	**8 881 904**	**10 357 433**	**11 902 551**	**10 743 523**	**9 612 221**	**9 992 916**
Mathematical sciences	11 336	43 823	92 844	169 355	159 496	176 077	183 255	183 426	110 543	204 594
Physical sciences	16 099	208 386	211 921	312 246	382 551	507 646	655 898	190 292	32 669	28 489
Chemical sciences	306 074	410 939	469 211	441 138	438 969	580 146	859 041	627 729	687 843	934 005
Earth sciences	43 722	36 788	34 269	52 781	66 244	93 014	95 034	90 098	106 759	92 439
Information, computer and communication technologies	717 747	944 070	1 279 325	1 635 321	1 980 630	2 182 253	2 412 430	2 855 355	2 502 454	2 481 028
Applied sciences and technologies	1 046 037	857 404	856 021	1 384 945	1 551 885	1 581 438	1 671 375	1 271 414	1 132 538	902 425
Engineering sciences	1 367 752	1 980 965	2 101 662	2 219 530	2 439 092	3 237 265	3 908 347	3 311 902	2 768 035	2 751 145
Biological sciences	34 156	52 867	127 322	163 796	160 584	161 058	162 776	194 671	207 456	212 632
Agricultural sciences	112 158	200 856	187 344	257 447	277 889	311 287	293 357	323 603	371 310	471 529
Medical and health sciences	156 868	571 171	997 182	1 073 854	1 225 114	1 268 551	1 509 109	1 567 493	1 622 215	1 843 005
Environmental sciences	31 161	56 473	73 775	52 492	42 315	62 355	57 764	47 692	5 818	2 206
Material sciences	131 260	86 627	96 525	146 886	146 588	184 625	82 192	70 949	59 723	65 092
Marine sciences	0	6 355	9 366	9 951	10 547	11 719	11 975	8 899	4 859	4 324
Division 2: Social Sciences and Humanities	**49 207**	**134 600**	**229 597**	**324 032**	**361 261**	**381 023**	**429 461**	**395 714**	**446 789**	**471 106**
Social sciences	49 207	134 600	229 522	323 673	360 856	380 554	428 969	395 115	446 789	471 106
Humanities	0	0	75	359	405	469	491	599	0	0
Total	**4 023 576**	**5 591 325**	**6 766 361**	**8 243 776**	**9 243 165**	**10 738 456**	**12 332 012**	**11 139 237**	**10 059 010**	**10 464 022**

TABLE C.28: PROPORTIONAL BUSINESS SECTOR R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Natural Sciences, Technology and Engineering	**98.8**	**97.6**	**96.6**	**96.1**	**96.1**	**96.5**	**96.5**	**96.4**	**95.6**	**95.5**
Mathematical sciences	0.3	0.8	1.4	2.1	1.7	1.6	1.5	1.6	1.1	2.0
Physical sciences	0.4	3.7	3.1	3.8	4.1	4.7	5.3	1.7	0.3	0.3
Chemical sciences	7.6	7.3	6.9	5.4	4.7	5.4	7.0	5.6	6.8	8.9
Earth sciences	1.1	0.7	0.5	0.6	0.7	0.9	0.8	0.8	1.1	0.9
Information, computer and communication technologies	17.8	16.9	18.9	19.8	21.4	20.3	19.6	25.6	24.9	23.7
Applied sciences and technologies	26.0	15.3	12.7	16.8	16.8	14.7	13.6	11.4	11.3	8.6
Engineering sciences	34.0	35.4	31.1	26.9	26.4	30.1	31.7	29.7	27.5	26.3
Biological sciences	0.8	0.9	1.9	2.0	1.7	1.5	1.3	1.7	2.1	2.0
Agricultural sciences	2.8	3.6	2.8	3.1	3.0	2.9	2.4	2.9	3.7	4.5
Medical and health sciences	3.9	10.2	14.7	13.0	13.3	11.8	12.2	14.1	16.1	17.6
Environmental sciences	0.8	1.0	1.1	0.6	0.5	0.6	0.5	0.4	0.1	0.0
Material sciences	3.3	1.5	1.4	1.8	1.6	1.7	0.7	0.6	0.6	0.6
Marine sciences	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Division 2: Social Sciences and Humanities	**1.2**	**2.4**	**3.4**	**3.9**	**3.9**	**3.5**	**3.5**	**3.6**	**4.4**	**4.5**
Social sciences	1.2	2.4	3.4	3.9	3.9	3.5	3.5	3.5	4.4	4.5
Humanities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.29: BUSINESS SECTOR R&D EXPENDITURE BY STANDARD INDUSTRIAL CLASSIFICATION CODE (SIC) (2001/02 TO 2011/12)

STANDARD INDUSTRIAL CLASSIFICATION	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Agriculture, Hunting, Forestry and Fishing	**105 977**	**98 659**	**180 008**	**206 449**	**199 959**	**213 808**	**220 757**	**208 447**	**157 916**	**211 312**
Mining and Quarrying	**943 645**	**721 503**	**425 917**	**428 066**	**518 262**	**559 332**	**578 825**	**499 286**	**1 055 963**	**1 352 877**
Manufacturing	**1 754 613**	**2 478 200**	**2 981 267**	**3 367 640**	**3 537 433**	**4 222 127**	**4 787 581**	**4 321 327**	**3 592 204**	**3 551 234**
Manufacture of Food Products, Beverages and Tobacco Products	65 446	128 017	145 848	194 900	183 391	196 238	215 876	162 851	221 370	283 262
Manufacture of Textiles, Clothing and Leather Goods	0	3 376	14 843	23 047	21 899	17 888	13 755	16 946	2 437	0
Manufacture of Wood and Products of Wood and Cork, except furniture; Manufacture of Articles of Straw and Plaiting Materials; Manufacture of Paper and Paper Products; Manufacture of Publishing, Printing and Reproduction of Recorded Material	50 183	91 107	86 214	102 715	110 631	118 535	118 016	111 255	106 448	80 255
Manufacture of Refined Petroleum, Coke and Nuclear Fuel; Manufacture of Chemicals and Chemical Products (incl. Pharmaceuticals); Manufacture of Rubber and Plastic Products	665 441	921 065	1 120 622	1 057 218	1 301 947	1 579 382	2 267 063	1 758 353	1 197 179	1 381 001
Manufacture of Non-Metallic Mineral Products	73 298	108 379	115 461	108 310	127 714	183 758	134 638	120 508	87 037	72 039
Manufacture of Basic Metals, Fabricated Metal Products, Machinery & Equipment; Manufacture of Office, Accounting and Computing Machinery	167 075	342 799	428 409	600 305	386 605	500 715	315 295	330 137	240 408	392 800
Manufacture of Electrical Machinery and Apparatus	40 352	65 838	83 582	157 388	189 554	187 612	166 498	146 169	207 954	310 599
Manufacture of Radio, Television and communication Equipment &Apparatus Manufacture of Medical, Precision and Optical Instruments, Watches & Clocks	245 628	348 015	284 803	378 170	425 585	506 497	511 356	591 774	590 174	639 217
Manufacture of Transport Equipment	447 190	463 272	697 268	726 605	784 209	924 053	984 235	1 022 589	881 958	310 145
Manufacture of Furniture, Recycling; Manufacturing not elsewhere classified	0	6 333	4 218	18 983	5 898	7 449	60 849	60 743	57 240	81 914
Electricity, Gas and Water Supply	**248 963**	**227 956**	**270 538**	**1 067 428**	**1 292 925**	**1 737 511**	**2 306 297**	**955 690**	**536 050**	**494 745**
Construction	**5 547**	**537 300**	**483 519**	**8 815**	**4 559**	**6 043**	**6 105**	**3 490**	**3 213**	**6 495**
Wholesale and Retail	**5 977**	**6 458**	**23 469**	**274 743**	**324 666**	**317 780**	**334 131**	**434 522**	**620 541**	**547 194**
Transport, Storage and Communication	**327 665**	**289 070**	**325 707**	**438 003**	**453 715**	**490 138**	**425 235**	**415 243**	**354 311**	**484 222**
Financial Intermediation, Real Estate and Business Services	**550 539**	**1 095 482**	**1 912 951**	**2 080 840**	**2 477 423**	**2 759 550**	**3 377 896**	**3 777 124**	**3 326 985**	**3 645 625**
Community, Social and Personal Services	**80 651**	**136 697**	**162 986**	**371 792**	**434 223**	**432 167**	**295 185**	**524 108**	**411 826**	**170 498**
Total	**4 023 576**	**5 591 325**	**6 766 361**	**8 243 776**	**9 243 165**	**10 738 456**	**12 332 012**	**11 139 237**	**10 059 010**	**10 464 022**

TABLE C.30: PROPORTIONAL BUSINESS SECTOR R&D EXPENDITURE BY STANDARD INDUSTRIAL CLASSIFICATION CODE (SIC) (2001/02 TO 2011/12)

STANDARD INDUSTRIAL CLASSIFICATION	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	%	%	%	%	%	%	%	%	%	%
Agriculture, Hunting, Forestry and Fishing	**2.6**	**1.8**	**2.7**	**2.5**	**2.2**	**2.0**	**1.8**	**1.9**	**1.6**	**2.0**
Mining and Quarrying	**23.5**	**12.9**	**6.3**	**5.2**	**5.6**	**5.2**	**4.7**	**4.5**	**10.5**	**12.9**
Manufacturing	**43.6**	**44.3**	**44.1**	**40.9**	**38.3**	**39.3**	**38.8**	**38.8**	**35.7**	**33.9**
Manufacture of Food Products, Beverages and Tobacco Products	1.6	2.3	2.2	2.4	2.0	1.8	1.8	1.5	2.2	2.7
Manufacture of Textiles, Clothing and Leather Goods	0.0	0.1	0.2	0.3	0.2	0.2	0.1	0.2	0.0	0.0
Manufacture of Wood and Products of Wood and Cork, except furniture; Manufacture of Articles of Straw and Plaiting Materials; Manufacture of Paper and Paper Products; Manufacture of Publishing, Printing and Reproduction of Recorded Material	1.2	1.6	1.3	1.2	1.2	1.1	1.0	1.0	1.1	0.8
Manufacture of Refined Petroleum, Coke and Nuclear Fuel; Manufacture of Chemicals and Chemical Products (incl. Pharmaceuticals); Manufacture of Rubber and Plastic Products	16.5	16.5	16.6	12.8	14.1	14.7	18.4	15.8	11.9	13.2
Manufacture of Non-Metallic Mineral Products	1.8	1.9	1.7	1.3	1.4	1.7	1.1	1.1	0.9	0.7
Manufacture of Basic Metals, Fabricated Metal Products, Machinery & Equipment; Manufacture of Office, Accounting and Computing Machinery	4.2	6.1	6.3	7.3	4.2	4.7	2.6	3.0	2.4	3.8
Manufacture of Electrical Machinery and Apparatus	1.0	1.2	1.2	1.9	2.1	1.7	1.4	1.3	2.1	3.0
Manufacture of Radio, Television and communication Equipment &Apparatus Manufacture of Medical, Precision and Optical Instruments, Watches & Clocks	6.1	6.2	4.2	4.6	4.6	4.7	4.1	5.3	5.9	6.1
Manufacture of Transport Equipment	11.1	8.3	10.3	8.8	8.5	8.6	8.0	9.2	8.8	3.0
Manufacture of Furniture, Recycling; Manufacturing not elsewhere classified	0.0	0.1	0.1	0.2	0.1	0.1	0.5	0.5	0.6	0.8
Electricity, Gas and Water Supply	**6.2**	**4.1**	**4.0**	**12.9**	**14.0**	**16.2**	**18.7**	**8.6**	**5.3**	**4.7**
Construction	**0.1**	**9.6**	**7.1**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**
Wholesale and Retail	**0.1**	**0.1**	**0.3**	**3.3**	**3.5**	**3.0**	**2.7**	**3.9**	**6.2**	**5.2**
Transport, Storage and Communication	**8.1**	**5.2**	**4.8**	**5.3**	**4.9**	**4.6**	**3.4**	**3.7**	**3.5**	**4.6**
Financial Intermediation, Real Estate and Business Services	**13.7**	**19.6**	**28.3**	**25.2**	**26.8**	**25.7**	**27.4**	**33.9**	**33.1**	**34.8**
Community, Social and Personal Services	**2.0**	**2.4**	**2.4**	**4.5**	**4.7**	**4.0**	**2.4**	**4.7**	**4.1**	**1.6**
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.31: BUSINESS SECTOR R&D PERSONNEL, HEADCOUNT AND FULL-TIME EQUIVALENTS (2009/10, 2010/11 AND 2011/12)

OCCUPATION	HEADCOUNT			FULL-TIME EQIVALENTS	
2009/10	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	8 366	5 830	2 536	6 059.5	72.4
Technicians directly supporting R&D	5 362	3 672	1 690	3 612.6	67.4
Other personnel directly supporting R&D	4 488	2 468	2 020	2 352.6	52.4
Total	**18 216**	**11 970**	**6 246**	**12 024.6**	**66.0**
2010/11	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	6 372	4 370	2 002	4 804.0	75.4
Technicians directly supporting R&D	4 630	3 235	1 395	3 318.7	71.7
Other personnel directly supporting R&D	3 931	2 320	1 611	2 082.3	53.0
Total	**14 933**	**9 925**	**5 008**	**10 205.1**	**68.3**
2011/12	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	6 192	4 288	1 904	4 451.9	71.9
Technicians directly supporting R&D	5 095	3 648	1 447	3 343.5	65.6
Other personnel directly supporting R&D	4 001	2 393	1 608	2 099.9	52.5
Total	**15 288**	**10 329**	**4 959**	**9 894.9**	**64.7**

TABLE C.32: BUSINESS SECTOR R&D PERSONNEL BY RACE, GENDER, PERSONNEL CATEGORY AND QUALIFICATION, HEADCOUNT (2011/12)

QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN		WHITE	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers											
Doctoral degree or equivalent	742	524	219	78	42	12	6	20	20	414	151
Masters, honours, bachelor or equivalent	4 248	2 981	1 267	467	255	80	52	244	123	2190	838
Diplomas	1 202	784	418	85	155	30	28	60	48	610	187
Subtotal	**6 192**	**4 288**	**1 904**	**630**	**452**	**121**	**86**	**323**	**191**	**3214**	**1176**
Technicians directly supporting R&D											
Doctoral degree or equivalent	33	19	14	3	2	0	0	0	0	16	12
Masters, honours, bachelor or equivalent	1 498	992	506	217	144	49	31	137	68	590	263
Diplomas	3 564	2 636	927	646	441	195	84	157	70	1638	332
Subtotal	**5 095**	**3 648**	**1 447**	**866**	**587**	**244**	**115**	**294**	**139**	**2244**	**607**
Other personnel directly supporting R&D											
Doctoral degree or equivalent	49	30	19	5	6	0	0	0	0	25	13
Masters, honours, bachelor or equivalent	1 056	587	469	83	90	15	113	164	31	325	235
Diplomas	2 895	1 776	1 119	748	437	98	102	121	87	809	494
Subtotal	**4 001**	**2 393**	**1 608**	**836**	**533**	**113**	**215**	**285**	**117**	**1159**	**742**
Total	**15 288**	**10 329**	**4 959**	**2332**	**1571**	**478**	**416**	**902**	**447**	**6617**	**2525**

TABLE C.33: NUMBER OF FOREIGN AND LOCAL BUSINESS SECTOR R&D COLLABORATIONS*, AND TOTAL R&D COLLABORATION EXPENDITURE (2011/12)

	WITHIN SOUTH AFRICA	INCLUDING FOREIGN PARTNER(S)
Government research institutes	21	6
Higher education institutions	63	22
Members of own company	21	11
Not-for-profit organisations	2	0
Other companies	51	29
Science councils	31	4
No collaboration	21	20
	R'000 EXCL VAT	**R'000 EXCL VAT**
Total (in-house & outsourced) R&D collaboration expenditure	**1 889 828**	**807 341**

**Number of partnerships, alliances and collaborations.*

Note: the data in this table is not comparable to similar data on R&D collaborations in previous R&D surveys because the data stems from a new question introduced in 2011/12.

C.2.2 Not-For-Profit Sector

TABLE C.34: NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02 R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Basic research	24 441	65 277	58 514	57 877	54 915	65 337	70 725	111 377	59 302	62 134
Applied research	34 484	118 698	100 137	123 609	110 698	119 982	131 259	53 530	87 435	79 105
Experimental research	11 853	25 048	39 617	45 026	46 925	37 883	38 665	23 933	16 092	29 366
Total	**70 778**	**209 023**	**198 268**	**226 514**	**212 538**	**223 202**	**240 649**	**188 840**	**162 830**	**170 605**

TABLE C.35: PROPORTIONAL NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Basic research	34.6	31.2	29.5	25.5	25.8	29.3	29.4	59.0	36.4	36.4
Applied research	48.7	56.8	50.5	54.6	52.1	53.8	54.5	28.3	53.7	46.4
Experimental research	16.7	12.0	20.0	19.9	22.1	17.0	16.1	12.7	9.9	17.2
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.36: NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02 R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Division 1: Defence	**147**	**1 564**	**1 441**	**1 161**	**1 312**	**1 438**	**2 050**	**1 600**	**0**	**0**
Defence	147	1 564	1 441	1 161	1 312	1 438	2 050	1 600	0	0
Division 2: Economic Development	**19 792**	**47 946**	**56 356**	**58 983**	**61 743**	**63 450**	**69 810**	**71 939**	**65 777**	**60 758**
Economic Development unclassified	0	0	0	0	0	0	0	0	0	0
Plant Production And Plant Primary Products	9 866	13 023	942	13 747	13 996	16 030	17 520	18 873	25 441	24 850
Animal Production and Animal Primary Products	0	1 376	13 647	1 577	1 850	918	972	1 632	1 389	828
Mineral Resources (Excluding Energy)	0	0	0	0	0	0	0	0	763	0
Energy Resources	0	920	490	581	656	1 000	1 760	2 604	1 653	969
Energy Supply	0	718	1 164	1 161	1 312	1 438	2 575	3 774	3 307	3 430
Manufacturing	0	0	0	0	0	0	0	0	0	2 197
Construction	0	0	0	0	0	0	0	0	0	0
Transport	0	0	0	0	0	70	74	208	0	137
Information and Communication Services	0	0	0	1 183	1 388	0	0	0	0	1 480
Commercial Services	250	3 729	2 994	2 396	622	782	827	970	0	0
Economic Framework	9 272	22 604	33 695	34 253	37 516	36 588	39 059	39 463	27 068	22 228
Natural Resources	404	5 577	3 425	4 086	4 403	6 624	7 022	4 414	6 157	4 640
Division 3: Society	**43 805**	**144 673**	**125 674**	**147 288**	**127 170**	**129 159**	**141 189**	**93 947**	**82 481**	**75 597**
Society unclassified	0	0	0	0	0	0	0	0	0	0
Health	6 953	76 295	23 471	26 824	28 057	33 549	37 461	16 554	15 050	13 496
Education and Training	14 043	30 217	66 400	72 160	38 907	32 161	32 308	19 986	22 303	23 762
Social Development and Community Services	22 809	38 162	35 803	48 304	60 206	63 449	71 420	57 407	45 128	38 339
Division 4: Environment	**4 018**	**6 418**	**10 632**	**3 870**	**4 493**	**5 885**	**6 937**	**7 052**	**10 051**	**13 356**
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental Knowledge	3 011	3 883	4 641	949	1 090	2 553	3 406	3 577	6 139	7 233
Environmental Aspects of Development	292	1 395	5 704	185	209	559	593	683	504	3 746
Environmental and Other Aspects	714	1 140	286	2 736	3 194	2 773	2 938	2 792	3 408	2 377
Division 5: Advancement of Knowledge	**3 017**	**8 423**	**4 165**	**15 211**	**17 819**	**23 271**	**20 663**	**14 303**	**4 521**	**20 895**
Advancement of Knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural Sciences, Technologies and Engineering	0	5 514	0	789	925	459	486	452	632	13 166
Social Sciences and Humanities	3 017	2 909	4 165	14 422	16 894	22 812	20 177	13 851	3 889	7 729
Total	**70 778**	**209 023**	**198 268**	**226 514**	**212 537**	**223 203**	**240 649**	**188 840**	**162 830**	**170 605**

TABLE C.37: PROPORTIONAL NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Defence	**0.2**	**0.7**	**0.7**	**0.5**	**0.6**	**0.6**	**0.9**	**0.8**	**0.0**	**0.0**
Defence	0.2	0.7	0.7	0.5	0.6	0.6	0.9	0.8	0.0	0.0
Division 2: Economic Development	**28.0**	**22.9**	**28.4**	**26.0**	**29.1**	**28.4**	**29.0**	**38.1**	**40.4**	**35.6**
Economic Development unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant Production And Plant Primary Products	13.9	6.2	0.5	6.1	6.6	7.2	7.3	10.0	15.6	14.6
Animal Production and Animal Primary Products	0.0	0.7	6.9	0.7	0.9	0.4	0.4	0.9	0.9	0.5
Mineral Resources (Excluding Energy)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Energy Resources	0.0	0.4	0.2	0.3	0.3	0.4	0.7	1.4	1.0	0.6
Energy Supply	0.0	0.3	0.6	0.5	0.6	0.6	1.1	2.0	2.0	2.0
Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transport	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Information and Communication Services	0.0	0.0	0.0	0.5	0.7	0.0	0.0	0.0	0.0	0.9
Commercial Services	0.4	1.8	1.5	1.1	0.3	0.4	0.3	0.5	0.0	0.0
Economic Framework	13.1	10.8	17.0	15.1	17.7	16.4	16.2	20.9	16.6	13.0
Natural Resources	0.6	2.7	1.7	1.8	2.1	3.0	2.9	2.3	3.8	2.7
Division 3: Society	**61.9**	**69.2**	**63.4**	**65.0**	**59.8**	**57.9**	**58.7**	**49.7**	**50.7**	**44.3**
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	9.8	36.5	11.8	11.8	13.2	15.0	15.6	8.8	9.2	7.9
Education and Training	19.8	14.5	33.5	31.9	18.3	14.4	13.4	10.6	13.7	13.9
Social Development and Community Services	32.2	18.3	18.1	21.3	28.3	28.4	29.7	30.4	27.7	22.5
Division 4: Environment	**5.7**	**3.1**	**5.4**	**1.7**	**2.1**	**2.6**	**2.9**	**3.7**	**6.2**	**7.8**
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental Knowledge	4.3	1.9	2.3	0.4	0.5	1.1	1.4	1.9	3.8	4.2
Environmental Aspects of Development	0.4	0.7	2.9	0.1	0.1	0.3	0.2	0.4	0.3	2.2
Environmental and Other Aspects	1.0	0.5	0.1	1.2	1.5	1.2	1.2	1.5	2.1	1.4
Division 5: Advancement of Knowledge	**4.3**	**4.0**	**2.1**	**6.7**	**8.4**	**10.4**	**8.6**	**7.6**	**2.8**	**12.2**
Advancement of Knowledge unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Natural Sciences, Technologies and Engineering	0.0	2.6	0.0	0.3	0.4	0.2	0.2	0.2	0.4	7.7
Social Sciences and Humanities	4.3	1.4	2.1	6.4	7.9	10.2	8.4	7.3	2.4	4.5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.38: NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Eastern Cape	6 315	N/A	8 151	6 589	4 850	6 164	6 790	8 136	9 790	9 493
Free State	1 335	N/A	4 301	3 687	1 974	1 255	4 763	4 418	6 385	5 096
Gauteng	28 558	N/A	82 581	104 002	102 141	115 499	126 136	104 420	61 496	69 321
KwaZulu-Natal	11 014	N/A	37 729	35 036	42 902	42 141	40 492	30 548	35 765	33 740
Limpopo	5 364	N/A	4 201	5 329	3 979	4 602	5 138	4 524	4 541	7 449
Mpumalanga	6 554	N/A	9 029	10 238	9 131	9 930	10 332	8 311	13 206	16 027
North-West	1 787	N/A	4 810	3 547	1 974	2 207	2 339	2 382	5 612	6 353
Northern Cape	2 590	N/A	1 298	1 650	1 736	2 038	2 159	4 493	2 030	1 889
Western Cape	7 261	N/A	46 169	56 436	43 852	39 367	42 500	21 609	24 003	21 236
Total	**70 778**	**N/A**	**198 268**	**226 514**	**212 538**	**223 203**	**240 649**	**188 840**	**162 830**	**170 605**

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

TABLE C.39: PROPORTIONAL NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02* %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Eastern Cape	8.9	N/A	4.1	2.9	2.3	2.8	2.8	4.3	6.0	5.6
Free State	1.9	N/A	2.2	1.6	0.9	0.6	2.0	2.3	3.9	3.0
Gauteng	40.3	N/A	41.7	45.9	48.1	51.7	52.4	55.3	37.8	40.6
KwaZulu-Natal	15.6	N/A	19.0	15.5	20.2	18.9	16.8	16.2	22.0	19.8
Limpopo	7.6	N/A	2.1	2.4	1.9	2.1	2.1	2.4	2.8	4.4
Mpumalanga	9.3	N/A	4.6	4.5	4.3	4.4	4.3	4.4	8.1	9.4
North-West	2.5	N/A	2.4	1.6	0.9 0.8	1.0	0.9	2.4	3.4	1.1
Northern Cape	3.7	N/A	0.7	0.7		0.9	1.0	1.3	1.2	3.7
Western Cape	10.3	N/A	23.3	24.9	20.6	17.6	17.7	11.4	14.7	12.4
Total	**100**	**N/A**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

TABLE C.40: NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY SPECIFIC AREAS OF NATIONAL INTEREST OF R&D (2009/10, 2010/11 AND 2011/12)

MULTI-DISCIPLINARY AREA OF R&D	2009/10		2010/11		2011/12	
	R'000	%	R'000	%	R'000	%
Environment/Environment related	N/A	N/A	N/A	N/A	15 133	8.9
Open source software	0	0.0	0	0.0	20	0.0
New materials	542	0.3	830	0.5	395	0.2
Tuberculosis (TB), HIV/AIDS, malaria	7 419	3.9	13 979	8.6	5 034	3.0
Total	**188 840**	**100***	**162 830**	**100***	**170 605**	**100***

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

**Note: The selected items of multidisciplinary areas of R&D are not a complete list and therefore do not add to 100%.*

TABLE C.41: NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 20011/12)

MAIN RESEARCH FIELD	2001/02*	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1: Natural Sciences, Technology and Engineering	**33 036**	**100 388**	**53 198**	**54 740**	**53 937**	**61 494**	**72 018**	**53 112**	**54 776**	**64 042**
Mathematical sciences	0	0	0	0	0	0	1 041	0	0	0
Physical sciences	0	0	0	0	0	0	0	6 422	0	0
Chemical sciences	0	0	0	0	0	0	0	0	0	0
Earth sciences	0	0	1 386	158	185	459	1 012	452	2 585	2 407
Information, computer and communication technologies	2 569	0	924	789	925	1 446	1 555	2 207	0	595
Applied sciences and technologies	0	0	5 250	5 775	1 407	0	0	0	0	1 487
Engineering sciences	0	0	0	0	0	0	0	0	0	0
Biological sciences	0	907	766	1 630	1 874	2 005	2 126	904	1 473	7 978
Agricultural sciences	9 962	13 646	12 705	16 507	17 234	18 324	19 426	20 404	25 679	25 819
Medical and health sciences	12 945	79 775	20 096	23 748	25 237	29 603	36 032	13 999	15 920	17 423
Environmental sciences	7 560	4 940	6 067	3 531	3 097	7 363	8 396	6 014	3 433	7 553
Material sciences	0	0	0	0	0	0	0	0	0	0
Marine sciences	0	1 120	6 005	2 602	3 978	2 294	2 431	2 711	5 687	781
Division 2: Social Sciences and Humanities	**37 740**	**108 635**	**145 070**	**171 774**	**158 601**	**161 708**	**168 631**	**135 728**	**108 054**	**106 563**
Social sciences	37 740	108 155	143 351	170 126	156 574	159 155	165 924	133 340	104 306	104 842
Humanities	0	480	1 719	1 648	2 027	2 553	2 707	2 388	3 749	1 720
Total	**70 778**	**209 023**	**198 268**	**226 514**	**212 538**	**223 202**	**240 649**	**188 840**	**162 830**	**170 605**

** The R&D survey of 2001/02 reported an unspecified expenditure of R1 000 that is included in the total.*

TABLE C.42: PROPORTIONAL NOT-FOR-PROFIT SECTOR R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 20011/12)

MAIN RESEARCH FIELD	2001/02*	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	%	%	%	%	%	%	%	%	%	%
Division 1: Natural Sciences, Technology and Engineering	**46.7**	**48.0**	**26.8**	**24.2**	**25.4**	**27.6**	**29.9**	**28.1**	**33.6**	**37.5**
Mathematical sciences	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
Physical sciences	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0
Chemical sciences	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Earth sciences	0.0	0.0	0.7	0.1	0.1	0.2	0.4	0.2	1.6	1.4
Information, computer and communication technologies	3.6	0.0	0.5	0.3	0.4	0.6	0.6	1.2	0.0	0.3
Applied sciences and technologies	0.0	0.0	2.6	2.5	0.7	0.0	0.0	0.0	0.0	0.9
Engineering sciences	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Biological sciences	0.0	0.4	0.4	0.7	0.9	0.9	0.9	0.5	0.9	4.7
Agricultural sciences	14.1	6.5	6.4	7.3	8.1	8.2	8.1	10.8	15.8	15.1
Medical and health sciences	18.3	38.2	10.1	10.5	11.9	13.3	15.0	7.4	9.8	10.2
Environmental sciences	10.7	2.4	3.1	1.6	1.5	3.3	3.5	3.2	2.1	4.4
Material sciences	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marine sciences	0.0	0.5	3.0	1.1	1.9	1.0	1.0	1.4	3.5	0.5
Division 2: Social Sciences and Humanities	**53.3**	**52.0**	**73.2**	**75.8**	**74.6**	**72.4**	**70.1**	**71.9**	**66.4**	**62.5**
Social sciences	53.3	51.7	72.3	75.1	73.7	71.3	68.9	70.6	64.1	61.5
Humanities	0.0	0.2	0.9	0.7	1.0	1.1	1.1	1.3	2.3	1.0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.43: NOT-FOR-PROFIT SECTOR R&D PERSONNEL, HEADCOUNT AND FULL-TIME EQUIVALENTS (2009/10, 2010/11 AND 2011/12)

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
2009/10	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	224	113	111	187.5	83.7
Technicians directly supporting R&D	76	41	35	63.7	83.8
Other personnel directly supporting R&D	80	16	64	58.6	73.2
Total	**380**	**170**	**210**	**309.7**	**81.5**
2010/11	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	250	103	147	196.2	78.5
Technicians directly supporting R&D	49	39	10	47.6	97.0
Other personnel directly supporting R&D	101	22	79	69.3	68.6
Total	**400**	**164**	**236**	**313.1**	**78.3**
2011/12	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	254	115	139	190.8	75.1
Technicians directly supporting R&D	56	36	20	47.2	84.3
Other personnel directly supporting R&D	95	23	72	74.1	78.0
Total	**405**	**174**	**231**	**312.1**	**77.1**

TABLE C.44: NOT-FOR-PROFIT SECTOR R&D PERSONNEL BY RACE, GENDER, PERSONNEL CATEGORY AND QUALIFICATION, HEADCOUNT (2011/12)

QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN		WHITE	
		MALE	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**
Researchers											
Doctoral degree or equivalent	48	28	20	9	6	0	3	1	0	18	11
Masters, honours, bachelor or equivalent	188	80	108	36	33	3	5	4	10	37	60
Diplomas	18	7	11	4	5	0	2	0	4	3	0
Subtotal	**254**	**115**	**139**	**49**	**44**	**3**	**10**	**5**	**14**	**58**	**71**
Technicians directly supporting R&D											
Doctoral degree or equivalent	0	0	0	0	0	0	0	0	0	0	0
Masters, honours, bachelor or equivalent	15	11	4	5	1	1	1	0	0	5	2
Diplomas	41	25	16	17	9	0	3	1	2	7	2
Subtotal	**56**	**36**	**20**	**22**	**10**	**1**	**4**	**1**	**2**	**12**	**4**
Other personnel directly supporting R&D											
Doctoral degree or equivalent	1	1	0	0	0	0	0	0	0	1	0
Masters, honours, bachelor or equivalent	34	8	26	2	8	0	3	0	3	6	12
Diplomas	60	14	46	11	30	1	2	0	5	2	9
Subtotal	**95**	**23**	**72**	**13**	**38**	**1**	**5**	**0**	**8**	**9**	**21**
Total	**405**	**174**	**231**	**84**	**92**	**5**	**19**	**6**	**24**	**79**	**96**

C.2.3 Government Sector

TABLE C.45: GOVERNMENT SECTOR R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02* R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Basic research	73 008	119 153	107 912	213 351	224 774	322 270	357 786	257 806	257 235	263 380
Applied research	95 196	283 958	319 040	459 042	521 845	599 162	601 688	621 762	600 205	812 067
Experimental research	34 574	62 256	88 379	172 247	274 736	232 967	180 202	187 734	153 900	160 223
Total	**203 110**	**465 367**	**515 331**	**844 640**	**1 021 355**	**1 154 399**	**1 139 676**	**1 067 302**	**1 011 340**	**1 235 669**

** The R&D survey of 2001/02 reported an unspecified expenditure of R332 000 that is included in the total.*

TABLE C.46: PROPORTIONAL GOVERNMENT SECTOR R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Basic research	36.0	25.6	20.9	25.3	22.0	27.9	31.4	24.2	25.4	21.3
Applied research	46.9	61.0	61.9	54.3	51.1	51.9	52.8	58.3	59.3	65.7
Experimental research	17.1	13.4	17.1	20.4	26.9	20.2	15.8	17.6	15.2	13.0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.47: GOVERNMENT SECTOR R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02 R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Division 1: Defence	**38**	**0**	**237**	**0**	**50 000**	**0**	**0**	**0**	**2 303**	**2 736**
Defence	38	0	237	0	50 000	0	0	0	2 303	2 736
Division 2: Economic Development	**112 370**	**274 374**	**245 493**	**322 819**	**350 497**	**429 646**	**373 251**	**438 114**	**500 343**	**469 129**
Economic Development unclassified	0	0	0	0	0	0	0	0	0	0
Plant Production And Plant Primary Products	25 827	44 609	57 072	54 523	45 951	79 290	66 503	63 570	64 400	70 754
Animal Production and Animal Primary Products	44 252	48 052	57 955	61 778	66 655	79 997	78 619	84 842	91 877	86 710
Mineral Resources (Excluding Energy)	0	0	0	0	0	0	0	0	0	0
Energy Resources	0	0	0	0	0	0	0	0	37	0
Energy Supply	1 061	4 755	0	8 095	8 905	14 290	12 387	2 522	6 154	10 552
Manufacturing	0	0	0	75	79	318	320	5 444	15 870	1 005
Construction	1 342	1 501	620	3 386	3 911	3 219	2 484	0	148	9 545
Transport	698	0	3 140	12 833	21 710	15 386	12 073	4 369	9 377	10 964
Information and Communication Services	2 869	5 195	6 068	39 357	32 858	69 318	11 965	13 244	44 257	20 590
Commercial Services	805	1 942	815	4 686	4 908	6 897	2 405	9 957	7 471	4 708
Economic Framework	9 140	54 990	35 748	74 563	76 965	98 537	105 080	161 326	187 931	157 364
Natural Resources	26 375	113 331	84 076	63 524	88 558	62 394	81 415	92 838	72 820	96 938
Division 3: Society	**29 170**	**96 430**	**189 241**	**261 335**	**341 911**	**265 948**	**285 961**	**326 691**	**341 387**	**538 749**
Society unclassified	0	0	0	0	0	0	0	0	0	0
Health	9 987	66 844	76 373	92 858	150 704	69 493	74 784	77 845	106 522	221 435
Education and Training	2 468	11 853	94 694	97 773	112 042	111 407	127 907	158 579	42 234	69 185
Social Development and Community Services	16 716	17 732	18 174	70 705	79 165	85 048	83 270	90 268	192 630	248 129
Division 4: Environment	**16 555**	**62 698**	**48 560**	**99 112**	**105 792**	**103 372**	**99 985**	**72 614**	**85 347**	**130 742**
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental Knowledge	14 305	49 295	37 663	67 106	74 710	71 734	83 429	45 360	40 610	83 089
Environmental Aspects of Development	233	4 679	5 252	8 995	8 112	20 797	12 424	18 153	27 635	38 467
Environmental and Other Aspects	2 017	8 724	5 645	23 011	22 970	10 841	4 132	9 101	17 102	9 186
Division 5: Advancement of Knowledge	**44 977**	**31 865**	**31 800**	**161 373**	**173 155**	**355 434**	**380 480**	**229 883**	**81 960**	**94 314**
Advancement of Knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural Sciences, Technologies and Engineering	41 694	16 619	22 797	120 247	149 847	324 409	333 561	205 995	50 968	61 357
Social Sciences and Humanities	3 283	15 245	9 002	41 127	23 309	31 025	46 919	23 888	30 992	32 956
Total	**203 110**	**465 367**	**515 331**	**844 640**	**1 021 355**	**1 154 400**	**1 139 676**	**1 067 302**	**1 011 340**	**1 235 669**

TABLE C.48: PROPORTIONAL GOVERNMENT SECTOR R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Defence	**0.0**	**0.0**	**0.0**	**0.0**	**4.9**	**0.0**	**0.0**	**0.0**	**0.2**	**0.2**
Defence	0.0	0.0	0.0	0.0	4.9	0.0	0.0	0.0	0.2	0.2
Division 2: Economic Development	**55.3**	**59.0**	**47.6**	**38.2**	**34.3**	**37.2**	**32.8**	**41.0**	**49.5**	**38.0**
Economic Development unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant Production And Plant Primary Products	12.7	9.6	11.1	6.5	4.5	6.9	5.8	6.0	6.4	5.7
Animal Production and Animal Primary Products	21.8	10.3	11.2	7.3	6.5	6.9	6.9	7.9	9.1	7.0
Mineral Resources (Excluding Energy)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy Resources	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy Supply	0.5	1.0	0.0	1.0	0.9	1.2	1.1	0.2	0.6	0.9
Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.6	0.1
Construction	0.7	0.3	0.1	0.4	0.4	0.3	0.2	0.0	0.0	0.8
Transport	0.3	0.0	0.6	1.5	2.1	1.3	1.1	0.4	0.9	0.9
Information and Communication Services	1.4	1.1	1.2	4.7	3.2	6.0	1.0	1.2	4.4	1.7
Commercial Services	0.4	0.4	0.2	0.6	0.5	0.6	0.2	0.9	0.7	0.4
Economic Framework	4.5	11.8	6.9	8.8	7.5	8.5	9.2	15.1	18.6	12.7
Natural Resources	13.0	24.4	16.3	7.5	8.7	5.4	7.1	8.7	7.2	7.8
Division 3: Society	**14.4**	**20.7**	**36.7**	**30.9**	**33.5**	**23.0**	**25.1**	**30.6**	**33.8**	**43.6**
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	4.9	14.4	14.8	11.0	14.8	6.0	6.6	7.3	10.5	17.9
Education and Training	1.2	2.5	18.4	11.6	11.0	9.7	11.2	14.9	4.2	5.6
Social Development and Community Services	8.2	3.8	3.5	8.4	7.8	7.4	7.3	8.5	19.0	20.1
Division 4: Environment	**8.2**	**13.5**	**9.4**	**11.7**	**10.4**	**9.0**	**8.8**	**6.8**	**8.4**	**10.6**
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental Knowledge	7.0	10.6	7.3	7.9	7.3	6.2	7.3	4.2	4.0	6.7
Environmental Aspects of Development	0.1	1.0	1.0	1.1	0.8	1.8	1.1	1.7	2.7	3.1
Environmental and Other Aspects	1.0	1.9	1.1	2.7	2.2	0.9	0.4	0.9	1.7	0.7
Division 5: Advancement of Knowledge	**22.1**	**6.8**	**6.2**	**19.1**	**17.0**	**30.8**	**33.4**	**21.5**	**8.1**	**7.6**
Advancement of Knowledge unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Natural Sciences, Technologies and Engineering	20.5	3.6	4.4	14.2	14.7	28.1	29.3	19.3	5.0	5.0
Social Sciences and Humanities	1.6	3.3	1.7	4.9	2.3	2.7	4.1	2.2	3.1	2.7
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.49: GOVERNMENT SECTOR R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 R'000	2003/04* R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Eastern Cape	9 712	N/A	77 762	84 071	109 779	122 191	107 929	100 100	114 127	127 415
Free State	7 322	N/A	24 962	41 856	69 314	62 116	58 697	46 155	39 998	44 200
Gauteng	71 171	N/A	151 197	291 639	321 176	292 757	264 273	396 124	343 096	447 635
KwaZulu-Natal	55 362	N/A	31 213	72 131	84 192	76 458	115 302	54 914	48 056	126 857
Limpopo	653	N/A	9 568	15 917	31 118	40 217	55 252	60 421	57 797	65 017
Mpumalanga	16 794	N/A	29 240	36 001	50 568	74 690	39 103	68 796	69 980	78 335
North-West	4 813	N/A	13 401	20 857	32 889	42 500	70 741	29 176	43 048	44 618
Northern Cape	4 286	N/A	46 075	42 539	64 733	66 921	52 907	77 978	58 918	63 556
Western Cape	32 998	N/A	131 912	239 630	257 586	376 550	375 473	233 639	236 320	238 035
Total	**203 110**	**N/A**	**515 331**	**844 640**	**1 021 355**	**1 154 399**	**1 139 676**	**1 067 302**	**1 011 340**	**1 235 669**

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

TABLE C.50: PROPORTIONAL GOVERNMENT SECTOR R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 %	2003/04* %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Eastern Cape	4.8	N/A	15.1	10.0	10.7	10.6	9.5	9.4	11.3	10.3
Free State	3.6	N/A	4.8	5.0	6.8	5.4	5.2	4.3	4.0	3.6
Gauteng	35.0	N/A	29.3	34.5	31.4	25.4	23.2	37.1	33.9	36.2
KwaZulu-Natal	27.3	N/A	6.1	8.5	8.2	6.6	10.1	5.1	4.8	10.3
Limpopo	0.3	N/A	1.9	1.9	3.0	3.5	4.8	5.7	5.7	5.3
Mpumalanga	8.3	N/A	5.7	4.3	5.0	6.5	3.4	6.4	6.9	6.3
North-West	2.4	N/A	2.6	2.5	3.2	3.7	6.2	2.7	4.3	3.6
Northern Cape	2.1	N/A	8.9	5.0	6.3	5.8	4.6	7.3	5.8	5.1
Western Cape	16.2	N/A	25.6	28.4	25.2	32.6	32.9	21.9	23.4	19.3
Total	**100**	**N/A**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

TABLE C.51: GOVERNMENT SECTOR R&D EXPENDITURE BY SPECIFIC AREAS OF NATIONAL INTEREST OF R&D (2009/10, 2010/11 AND 2011/12)

MULTI-DISCIPLINARY AREA OF R&D	2009/10		2010/11		2011/12	
	R'000	%	R'000	%	R'000	%
Environment/Environment related	N/A	N/A	N/A	N/A	109774.2	8.9
Open source software	7 238	0.7	7 261	0.7	1 345	0.1
New materials	7 156	0.7	26 166	2.6	4 107	0.3
Tuberculosis (TB), HIV/AIDS, malaria	199 977	18.7	174 382	17.2	167 522	13.6
Total	**1 067 302**	**100***	**1 011 340**	**100***	**1 235 669**	**100***

Note: N/A indicates no data was collected.

**Note: The selected items of multidisciplinary areas of R&D are not a complete list and therefore do not add to 100%.*

TABLE C.52: GOVERNMENT SECTOR R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1: Natural Sciences, Technology and Engineering	**171 603**	**372 373**	**450 456**	**661 594**	**808 404**	**874 425**	**824 394**	**806 995**	**634 237**	**863 949**
Mathematical sciences	830	5 782	17 562	21 496	24 823	20 643	20 704	24 441	22 811	2 349
Physical sciences	9 035	0	8 256	27 205	24 726	45 052	45 804	12 093	0	0
Chemical sciences	187	493	8 709	10 711	16 622	22 672	17 009	21 698	10 653	1 223
Earth sciences	14 236	38 378	32 795	100 743	109 959	161 815	163 156	47 624	42 081	39 303
Information, computer and communication technologies	49	3 494	14 180	42 093	56 323	82 123	22 191	28 176	31 960	15 642
Applied sciences and technologies	950	16 758	4 581	17 328	31 603	15 286	15 852	9 315	4 154	10 183
Engineering sciences	2 145	116	9 663	10 355	26 008	14 164	11 487	14 996	4 165	4 515
Biological sciences	32 689	64 611	53 988	79 402	99 841	113 409	125 152	54 893	85 990	94 662
Agricultural sciences	80 538	141 460	174 756	156 538	170 347	208 662	200 598	274 781	225 441	362 241
Medical and health sciences	9 729	66 893	84 629	137 909	187 741	173 929	180 260	288 488	168 400	270 312
Environmental sciences	4 213	13 037	19 790	39 867	40 851	8 589	11 675	10 722	9 147	34 231
Material sciences	0	0	0	150	158	637	640	0	0	4 107
Marine sciences	17 001	21 352	21 547	17 797	19 402	7 445	9 866	19 768	29 434	25 182
Division 2: Social Sciences and Humanities	**31 507**	**92 994**	**64 875**	**183 047**	**212 951**	**279 974**	**315 282**	**260 308**	**377 103**	**371 720**
Social sciences	27 884	81 866	59 831	139 536	189 155	235 299	268 058	249 155	363 055	358 892
Humanities	3 623	11 128	5 044	43 511	23 796	44 676	47 225	11 152	14 048	12 828
Total	**203 110**	**465 367**	**515 331**	**844 641**	**1 021 355**	**1 154 399**	**1 139 676**	**1 067 302**	**1 011 340**	**1 235 669**

TABLE C.53: PROPORTIONAL GOVERNMENT SECTOR R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Natural Sciences, Technology and Engineering	**84.5**	**80.0**	**87.4**	**78.3**	**79.2**	**75.7**	**72.3**	**75.6**	**62.7**	**69.9**
Mathematical sciences	0.4	1.2	3.4	2.5	2.4	1.8	1.8	2.3	2.3	0.2
Physical sciences	4.4	0.0	1.6	3.2	2.4	3.9	4.0	1.1	0.0	0.0
Chemical sciences	0.1	0.1	1.7	1.3	1.6	2.0	1.5	2.0	1.1	0.1
Earth sciences	7.0	8.2	6.4	11.9	10.8	14.0	14.3	4.5	4.2	3.2
Information, computer and communication technologies	0.0	0.8	2.8	5.0	5.5	7.1	1.9	2.6	3.2	1.3
Applied sciences and technologies	0.5	3.6	0.9	2.1	3.1	1.3	1.4	0.9	0.4	0.8
Engineering sciences	1.1	0.0	1.9	1.2	2.5	1.2	1.0	1.4	0.4	0.4
Biological sciences	16.1	13.9	10.5	9.4	9.8	9.8	11.0	5.1	8.5	7.7
Agricultural sciences	39.7	30.4	33.9	18.5	16.7	18.1	17.6	25.7	22.3	29.3
Medical and health sciences	4.8	14.4	16.4	16.3	18.4	15.1	15.8	27.0	16.7	21.9
Environmental sciences	2.1	2.8	3.8	4.7	4.0	0.7	1.0	1.0	0.9	2.8
Material sciences	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.3
Marine sciences	8.4	4.6	4.2	2.1	1.9	0.6	0.9	1.9	2.9	2.0
Division 2: Social Sciences and Humanities	**15.5**	**20.0**	**12.6**	**21.7**	**20.8**	**24.3**	**27.7**	**24.4**	**37.3**	**30.1**
Social sciences	13.7	17.6	11.6	16.5	18.5	20.4	23.5	23.3	35.9	29.0
Humanities	1.8	2.4	1.0	5.2	2.3	3.9	4.1	1.0	1.4	1.0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.54: GOVERNMENT SECTOR R&D PERSONNEL, HEADCOUNT AND FULL-TIME EQUIVALENTS (2009/10, 2010/11 AND 2011/12)

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
2009/10	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	986	500	486	680.4	69.0
Technicians directly supporting R&D	509	253	256	356.8	70.1
Other personnel directly supporting R&D	1 085	721	364	866.7	79.9
Total	**2 580**	**1 474**	**1 106**	**1 903.9**	**73.8**
2010/11	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	1 184	610	574	874.2	73.8
Technicians directly supporting R&D	421	221	200	352.9	83.8
Other personnel directly supporting R&D	1 099	782	317	951.6	86.6
Total	**2 704**	**1 613**	**1 091**	**2 178.60**	**80.6**
2011/12	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	1 411	700	711	1 009.8	71.6
Technicians directly supporting R&D	432	250	182	330.4	76.5
Other personnel directly supporting R&D	1 300	912	388	1 064.3	81.9
Total	**3 143**	**1 862**	**1 281**	**2 404.5**	**76.5**

TABLE C.55: GOVERNMENT SECTOR R&D PERSONNEL BY RACE, GENDER, PERSONNEL CATEGORY AND QUALIFICATION, HEADCOUNT (2011/12)

QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN		WHITE	
		MALE	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**
Researchers											
Doctoral degree or equivalent	295	157	138	30	21	9	8	9	16	109	93
Masters, honours, bachelor or equivalent	1 041	500	541	279	255	30	47	24	44	167	195
Diplomas	75	43	32	28	20	3	7	0	1	12	4
Subtotal	**1 411**	**700**	**711**	**337**	**296**	**42**	**62**	**33**	**61**	**288**	**292**
Technicians directly supporting R&D											
Doctoral degree or equivalent	19	13	6	4	1	2	1	1	3	6	1
Masters, honours, bachelor or equivalent	197	98	99	57	61	7	10	6	2	28	26
Diplomas	216	139	77	78	35	14	1	2	2	45	39
Subtotal	**432**	**250**	**182**	**139**	**97**	**23**	**12**	**9**	**7**	**79**	**66**
Other personnel directly supporting R&D											
Doctoral degree or equivalent	1	1	0	0	0	0	0	0	0	1	0
Masters, honours, bachelor or equivalent	86	26	60	21	36	1	7	1	2	3	15
Diplomas	1 213	885	328	603	220	250	39	1	4	31	65
Subtotal	**1 300**	**912**	**388**	**624**	**256**	**251**	**46**	**2**	**6**	**35**	**80**
Total	**3 143**	**1 862**	**1 281**	**1 100**	**649**	**316**	**120**	**44**	**74**	**402**	**438**

C.2.4 Science Councils Sector

TABLE C.56: SCIENCE COUNCILS R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02 R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Basic research	359 252	575 616	379 044	522 861	647 191	804 731	776 407	776 505	871 635	900 830
Applied research	609 668	752 489	1 028 770	1 018 979	1 328 996	1 314 770	1 384 860	1 552 560	1 531 563	1 756 157
Experimental research	325 535	417 388	588 236	560 254	768 531	766 593	976 077	1 129 009	1 192 825	10 72 693
Total	**1 294 454**	**1 745 493**	**1 996 050**	**2 102 094**	**2 744 718**	**2 886 094**	**3 137 344**	**3 458 074**	**3 596 023**	**3 729 680**

TABLE C.57: SCIENCE COUNCILS R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Basic research	27.8	33.0	19.0	24.9	23.6	27.9	24.7	22.5	24.2	24.2
Applied research	47.1	43.1	51.5	48.5	48.4	45.6	44.1	44.9	42.6	47.1
Experimental research	25.1	23.9	29.5	26.7	28.0	26.6	31.1	32.6	33.2	28.8
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.58: SCIENCE COUNCILS R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02 R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Division 1: Defence	**85 117**	**153 196**	**160 864**	**155 066**	**260 354**	**228 603**	**280 219**	**311 288**	**228 376**	**243 083**
Defence	85 117	153 196	160 864	155 066	260 354	228 603	280 219	311 288	228 376	243 083
Division 2: Economic Development	**720 217**	**879 229**	**1 057 410**	**1 126 651**	**1 172 607**	**1 560 688**	**1 592 110**	**1 834 253**	**2 111 033**	**2 191 098**
Economic Development unclassified	0	0	0	0	0	0	0	0	0	0
Plant Production And Plant Primary Products	200 398	188 451	198 256	297 626	332 655	433 850	349 907	485 470	478 437	448 531
Animal Production and Animal Primary Products	95 886	141 996	118 171	72 380	115 649	25 124	18 760	27 043	25 193	280 542
Mineral Resources (Excluding Energy)	116 651	150 228	251 953	286 363	62 585	63 469	67 418	387 531	294 203	202 919
Energy Resources	22 606	16 961	16 916	30 997	51 257	38 979	379 859	32 136	90 342	94 385
Energy Supply	0	3 125	542	595	8 033	874	0	0	0	14 715
Manufacturing	60 427	128 057	138 792	110 467	130 396	385 822	225 227	262 443	366 380	351 021
Construction	38 582	36 433	61 761	90 143	149 809	101 232	116 781	129 922	222 124	220 595
Transport	13 086	54 906	41 935	18 401	30 943	33 817	41 260	45 848	0	0
Information and Communication Services	41 407	7 176	22 090	18 271	25 177	17 429	24 146	68 506	115 342	127 021
Commercial Services	14 666	7 234	2 086	0	3 546	8 975	19 536	5 465	14 152	15 522
Economic Framework	51 433	35 116	50 045	66 540	85 194	206 878	106 105	84 205	97 367	72 109
Natural Resources	65 076	109 546	154 861	134 867	177 363	244 239	243 111	305 685	407 492	363 738
Division 3: Society	**156 381**	**205 207**	**324 973**	**278 222**	**359 982**	**368 010**	**418 385**	**453 428**	**388 244**	**430 876**
Society unclassified	0	0	0	0	0	0	0	0	0	0
Health	96 079	134 099	203 178	218 941	240 248	272 905	326 340	348 407	310 760	326 500
Education and Training	35 691	31 227	68 755	51 704	56 054	37 449	50 525	65 761	50 676	68 852
Social Development and Community Services	24 611	39 881	53 040	7 577	63 680	57 656	41 520	39 260	26 807	35 525
Division 4: Environment	**137 361**	**137 520**	**144 737**	**168 682**	**225 563**	**263 325**	**338 290**	**355 484**	**52 334**	**31 241**
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental Knowledge	88 044	83 067	87 752	94 519	120 806	130 041	173 945	190 926	24 043	19 956
Environmental Aspects of Development	29 101	17 175	20 436	43 835	50 877	46 190	59 943	48 262	19 333	8 623
Environmental and Other Aspects	20 215	37 279	36 549	30 328	53 880	87 094	104 402	116 296	8 958	2 662
Division 5: Advancement of Knowledge	**195 379**	**370 340**	**308 067**	**373 473**	**726 212**	**465 468**	**508 339**	**503 621**	**816 035**	**833 382**
Advancement of Knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural Sciences, Technologies and Engineering	171 439	274 691	246 359	306 398	616 487	361 714	407 189	381 098	674 421	694 254
Social Sciences and Humanities	23 940	95 649	61 708	67 076	109 725	103 754	101 150	122 523	141 614	139 127
Total	**1 294 454**	**1 745 493**	**1 996 050**	**2 102 094**	**2 744 718**	**2 886 094**	**3 137 343**	**3 458 074**	**3 596 023**	**3 729 680**

TABLE C.59: SCIENCE COUNCILS R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Defence	**6.6**	**8.8**	**8.1**	**7.4**	**9.5**	**7.9**	**8.9**	**9.0**	**6.4**	**6.5**
Defence	6.6	8.8	8.1	7.4	9.5	7.9	8.9	9.0	6.4	6.5
Division 2: Economic Development	**55.6**	**50.4**	**53.0**	**53.6**	**42.7**	**54.1**	**50.7**	**53.0**	**58.7**	**58.7**
Economic Development unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant Production And Plant Primary Products	15.5	10.8	9.9	14.2	12.1	15.0	11.2	14.0	13.3	12.0
Animal Production and Animal Primary Products	7.4	8.1	5.9	3.4	4.2	0.9	0.6	0.8	0.7	7.5
Mineral Resources (Excluding Energy)	9.0	8.6	12.6	13.6	2.3	2.2	2.1	11.2	8.2	5.4
Energy Resources	1.7	1.0	0.8	1.5	1.9	1.4	12.1	0.9	2.5	2.5
Energy Supply	0.0	0.2	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.4
Manufacturing	4.7	7.3	7.0	5.3	4.8	13.4	7.2	7.6	10.2	9.4
Construction	3.0	2.1	3.1	4.3	5.5	3.5	3.7	3.8	6.2	5.9
Transport	1.0	3.1	2.1	0.9	1.1	1.2	1.3	1.3	0.0	0.0
Information and Communication Services	3.2	0.4	1.1	0.9	0.9	0.6	0.8	2.0	3.2	3.4
Commercial Services	1.1	0.4	0.1	0.0	0.1	0.3	0.6	0.2	0.4	0.4
Economic Framework	4.0	2.0	2.5	3.2	3.1	7.2	3.4	2.4	2.7	1.9
Natural Resources	5.0	6.3	7.8	6.4	6.5	8.5	7.7	8.8	11.3	9.8
Division 3: Society	**12.1**	**11.8**	**16.3**	**13.2**	**13.1**	**12.8**	**13.3**	**13.1**	**10.8**	**11.6**
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	7.4	7.7	10.2	10.4	8.8	9.5	10.4	10.1	8.6	8.8
Education and Training	2.8	1.8	3.4	2.5	2.0	1.3	1.6	1.9	1.4	1.8
Social Development and Community Services	1.9	2.3	2.7	0.4	2.3	2.0	1.3	1.1	0.7	1.0
Division 4: Environment	**10.6**	**7.9**	**7.3**	**8.0**	**8.2**	**9.1**	**10.8**	**10.3**	**1.5**	**0.8**
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental Knowledge	6.8	4.8	4.4	4.5	4.4	4.5	5.5	5.5	0.7	0.5
Environmental Aspects of Development	2.2	1.0	1.0	2.1	1.9	1.6	1.9	1.4	0.5	0.2
Environmental and Other Aspects	1.6	2.1	1.8	1.4	2.0	3.0	3.3	3.4	0.2	0.1
Division 5: Advancement of Knowledge	**15.1**	**21.2**	**15.4**	**17.8**	**26.5**	**16.1**	**16.2**	**14.6**	**22.7**	**22.3**
Advancement of Knowledge unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Natural Sciences, Technologies and Engineering	13.2	15.7	12.3	14.6	22.5	12.5	13.0	11.0	18.8	18.6
Social Sciences and Humanities	1.8	5.5	3.1	3.2	4.0	3.6	3.2	3.5	3.9	3.7
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.60: SCIENCE COUNCILS R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 R'000	2003/04* R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Eastern Cape	56 379	N/A	75 170	123 956	131 126	138 342	171 669	155 501	150 665	178 594
Free State	36 700	N/A	33 725	50 197	52 773	67 901	58 561	74 355	60 443	37 138
Gauteng	757 831	N/A	1 312 041	1 103 284	1 546 032	1 809 272	1 991 853	2 219 609	2 327 712	2 287 762
KwaZulu-Natal	123 037	N/A	171 424	201 811	267 620	201 009	231 033	235 432	249 137	292 246
Limpopo	29 826	N/A	23 887	48 058	69 808	67 562	63 455	78 662	66 250	99 104
Mpumalanga	65 704	N/A	35 580	48 051	69 859	66 333	55 547	66 881	55 690	100 476
North-West	28 580	N/A	43 581	45 751	72 968	49 390	41 541	51 295	42 854	104 139
Northern Cape	49 780	N/A	20 051	64 284	55 676	45 250	43 624	35 253	64 774	81 998
Western Cape	146 617	N/A	280 591	416 702	478 856	441 036	480 059	541 086	578 497	548 223
Total	**1 294 454**	**N/A**	**1 996 050**	**2 102 094**	**2 744 718**	**2 886 094**	**3 137 343**	**3 458 074**	**3 596 023**	**3 729 680**

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

TABLE C.61: PROPORTIONAL SCIENCE COUNCILS R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 %	2003/04* %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Eastern Cape	4.4	N/A	3.8	5.9	4.8	4.8	5.5	4.5	4.2	4.8
Free State	2.8	N/A	1.7	2.4	1.9	2.4	1.9	2.2	1.7	1.0
Gauteng	58.5	N/A	65.7	52.5	56.3	62.7	63.5	64.2	64.7	61.3
KwaZulu-Natal	9.5	N/A	8.6	9.6	9.8	7.0	7.4	6.8	6.9	7.8
Limpopo	2.3	N/A	1.2	2.3	2.5	2.3	2.0	2.3	1.8	2.7
Mpumalanga	5.1	N/A	1.8	2.3	2.5	2.3	1.8	1.9	1.5	2.7
North-West	2.2	N/A	2.2	2.2	2.7	1.7	1.3	1.5	1.2	2.8
Northern Cape	3.8	N/A	1.0	3.1	2.0	1.6	1.4	1.0	1.8	2.2
Western Cape	11.3	N/A	14.1	19.8	17.4	15.3	15.3	15.6	16.1	14.7
Total	**100**	**N/A**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

TABLE C.62: SCIENCE COUNCILS SECTOR R&D EXPENDITURE BY SPECIFIC AREAS OF NATIONAL INTEREST OF R&D (2009/10, 2010/11 AND 2011/12)

MULTI-DISCIPLINARY AREA OF R&D	2009/10		2010/11		2011/12	
	R'000	%	R'000	%	R'000	%
Environment/Environment related	N/A	N/A	N/A	N/A	770 339	20.6
Open source software	15 013	0.4	7 228	0.2	15 982	0.4
New materials	94 304	2.7	201 071	5.6	197 430	5.3
Tuberculosis (TB), HIV/AIDS, malaria	333 841	9.7	386 948	10.8	399 070	10.7
Total	**3 458 074**	**100***	**3 596 023**	**100***	**3 729 680**	**100***

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

**Note: The selected items of multidisciplinary areas of R&D are not a complete list and therefore do not add to 100%.*

TABLE C.63: SCIENCE COUNCILS R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1: Natural Sciences, Technology and Engineering	**1 207 686**	**1 538 663**	**1 829 632**	**1 922 728**	**2 530 246**	**2 623 455**	**2 916 350**	**3 258 392**	**3 414 985**	**3 517 520**
Mathematical sciences	2 286	15 492	13 629	20 564	27 129	35 551	40 632	37 678	113 396	117 637
Physical sciences	21 971	87 967	58 292	114 723	126 542	93 583	115 737	87 221	97 922	120 267
Chemical sciences	37 250	50 159	28 710	21 494	33 774	37 430	44 271	49 462	8 074	20 972
Earth sciences	107 674	84 880	96 474	96 410	130 879	147 427	167 463	179 999	94 642	100 921
Information, computer and communication technologies	107 084	55 045	141 363	82 238	133 328	212 796	201 731	265 191	161 282	168 115
Applied sciences and technologies	78 686	101 620	63 696	78 065	126 107	138 849	139 267	153 830	924 104	954 616
Engineering sciences	204 532	321 668	450 079	451 924	642 923	643 349	863 084	947 315	365 980	278 125
Biological sciences	99 941	226 256	208 812	265 202	306 056	175 592	171 810	200 625	437 938	425 036
Agricultural sciences	309 057	287 632	393 682	387 569	521 454	566 561	442 060	647 750	479 449	582 438
Medical and health sciences	179 218	206 749	237 103	270 090	340 764	358 726	447 479	440 895	428 642	443 156
Environmental sciences	25 869	34 615	61 022	56 259	72 191	85 414	101 920	112 327	273 283	284 116
Material sciences	12 524	47 011	65 398	69 742	51 020	108 068	155 529	106 411	23 199	15 462
Marine sciences	21 594	19 570	11 372	8 448	18 078	20 108	25 368	29 689	7 073	6 656
Division 2: Social Sciences and Humanities	**86 768**	**206 830**	**166 418**	**179 366**	**214 472**	**262 639**	**220 993**	**199 682**	**181 038**	**212 160**
Social sciences	82 197	198 138	148 758	165 557	194 040	238 019	194 646	182 431	164 954	190 845
Humanities	4 571	8 692	17 660	13 809	20 432	24 620	26 347	17 250	16 084	21 315
Total	**1 294 454**	**1 745 493**	**1 996 050**	**2 102 094**	**2 744 718**	**2 886 094**	**3 137 343**	**3 458 074**	**3 596 023**	**3 729 680**

TABLE C.64: PROPORTIONAL SCIENCE COUNCILS R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Natural Sciences, Technology and Engineering	**93.3**	**88.2**	**91.7**	**91.5**	**92.2**	**90.9**	**93.0**	**94.2**	**95.0**	**94.3**
Mathematical sciences	0.2	0.9	0.7	1.0	1.0	1.2	1.3	1.1	3.2	3.2
Physical sciences	1.7	5.0	2.9	5.5	4.6	3.2	3.7	2.5	2.7	3.2
Chemical sciences	2.9	2.9	1.4	1.0	1.2	1.3	1.4	1.4	0.2	0.6
Earth sciences	8.3	4.9	4.8	4.6	4.8	5.1	5.3	5.2	2.6	2.7
Information, computer and communication technologies	8.3	3.2	7.1	3.9	4.9	7.4	6.4	7.7	4.5	4.5
Applied sciences and technologies	6.1	5.8	3.2	3.7	4.6	4.8	4.4	4.4	25.7	25.6
Engineering sciences	15.8	18.4	22.5	21.5	23.4	22.3	27.5	27.4	10.2	7.5
Biological sciences	7.7	13.0	10.5	12.6	11.2	6.1	5.5	5.8	12.2	11.4
Agricultural sciences	23.9	16.5	19.7	18.4	19.0	19.6	14.1	18.7	13.3	15.6
Medical and health sciences	13.8	11.8	11.9	12.8	12.4	12.4	14.3	12.7	11.9	11.9
Environmental sciences	2.0	2.0	3.1	2.7	2.6	3.0	3.2	3.2	7.6	7.6
Material sciences	1.0	2.7	3.3	3.3	1.9	3.7	5.0	3.1	0.6	0.4
Marine sciences	1.7	1.1	0.6	0.4	0.7	0.7	0.8	0.9	0.2	0.2
Division 2: Social Sciences and Humanities	**6.7**	**11.8**	**8.3**	**8.5**	**7.8**	**9.1**	**7.0**	**5.8**	**5.0**	**5.7**
Social sciences	6.3	11.4	7.5	7.9	7.1	8.2	6.2	5.3	4.6	5.1
Humanities	0.4	0.5	0.9	0.7	0.7	0.9	0.8	0.5	0.4	0.6
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.65: SCIENCE COUNCILS SECTOR R&D PERSONNEL, HEADCOUNT AND FULL-TIME EQUIVALENTS (2009/10, 2010/11 AND 2011/12)

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
2009/10	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	2 669	1 637	1 032	2 251.5	84.4
Technicians directly supporting R&D	1 381	698	683	1 179.4	85.4
Other personnel directly supporting R&D	1 876	1 029	847	1 351.8	72.1
Total	**5 926**	**3 364**	**2 562**	**4 782.7**	**80.7**
2010/11	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	1 941	1 110	831	1 777.3	91.6
Technicians directly supporting R&D	1 336	691	645	1 155.5	86.5
Other personnel directly supporting R&D	1 646	836	810	1 379.6	83.8
Total	**4 923**	**2 637**	**2 286**	**4 312.4**	**87.6**
2011/12	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers	1 803	1 023	780	1 634.9	90.7
Technicians directly supporting R&D	1 333	774	559	1 172.4	88.0
Other personnel directly supporting R&D	1 358	778	580	996.1	73.4
Total	**4 494**	**2 575**	**1 919**	**3 803.5**	**84.6**

TABLE C.66: SCIENCE COUNCILS SECTOR R&D PERSONNEL BY RACE, GENDER, PERSONNEL CATEGORY AND QUALIFICATION, HEADCOUNT (2011/12)

QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN		WHITE	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers											
Doctoral degree or equivalent	744	474	150	165	63	13	22	30	35	266	270
Masters, honours, bachelor or equivalent	1 030	536	193	201	192	24	28	42	81	269	494
Diplomas	29	13	7	4	6	0	1	2	2	7	16
Subtotal	1 803	1 023	350	370	261	37	51	74	118	542	780
Technicians directly supporting R&D											
Doctoral degree or equivalent	17	13	3	0	1	0	0	0	0	13	4
Masters, honours, bachelor or equivalent	638	362	79	116	146	14	12	33	39	199	276
Diplomas	678	399	57	207	182	48	19	13	21	131	279
Subtotal	1 333	774	139	323	329	62	31	46	60	343	559
Other personnel directly supporting R&D											
Doctoral degree or equivalent	30	23	4	6	1	3	2	2	0	12	7
Masters, honours, bachelor or equivalent	310	146	49	73	78	19	20	12	17	42	164
Diplomas	1 018	609	113	502	213	48	71	14	12	45	409
Subtotal	**1 358**	**778**	**166**	**581**	**292**	**70**	**93**	**28**	**29**	**99**	**580**
Total	**4 494**	**2 575**	**655**	**1 274**	**882**	**169**	**175**	**148**	**207**	**984**	**1 919**

TABLE C.67: SCIENCE COUNCILS SECTOR OVERVIEW (2011/12)

SCIENCE COUNCILS	R&D EXPENDITURE R'000	RESEARCHERS (FTE)	BASIC RESEARCH R'000	CAPITAL EXPENDITURE R'000
African Institute of South Africa	34 537	20.0	34 537	274
Agricultural Research Council	677 842	317.0	88 119	72 044
Council for Scientific and Industrial Research	1 816 735	584.0	181 674	153 893
Council for Geoscience	86 232	100.0	67 261	7 949
Human Science Research Council	236 830	79.2	59 208	6 651
Medical Research Council	411 441	293.0	246 865	15 269
Mintek	233 656	142.8	58 414	20 828
National Research Foundation	232 407	98.9	164 753	46 162
Total	**3 729 680**	**1 634.9**	**900 830**	**323 070**

C.2.5 Higher Education Sector

TABLE C.68: HIGHER EDUCATION SECTOR R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02*	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Basic research	862 067	915 972	1 049 330	1 134 411	1 348 299	1 709 334	1 965 121	2 459 733	2 634 722	3 290 328
Applied research	706 108	827 209	979 626	1 045 483	1 282 627	1 262 425	1 468 624	1 729 496	1 890 185	2 279 175
Experimental research	234 529	328 170	505 014	552 321	667 882	650 102	757 621	911 994	899 695	1 039 712
Total	**1 896 156**	**2 071 351**	**2 533 971**	**2 732 215**	**3 298 808**	**3 621 861**	**4 191 366**	**5 101 224**	**5 424 602**	**6 609 216**

** The R&D survey of 2001/02 reported an unspecified expenditure of R93 452 000 that is included in the total.*

TABLE C.69: PROPORTIONAL HIGHER EDUCATION SECTOR R&D EXPENDITURE BY TYPE OF RESEARCH (2001/02 TO 2011/12)

TYPE OF RESEARCH	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	%	%	%	%	%	%	%	%	%	%
Basic research	47.8	44.2	41.4	41.5	40.9	47.2	46.9	48.2	48.6	49.8
Applied research	39.2	39.9	38.7	38.3	38.9	34.9	35.0	33.9	34.8	34.5
Experimental research	13.0	15.8	19.9	20.2	20.2	17.9	18.1	17.9	16.6	15.7
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.70: HIGHER EDUCATION SECTOR R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02* R'000	2003/04 R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Division 1: Defence	**2 993**	**1 679**	**2 069**	**2 423**	**2 711**	**4 328**	**5 150**	**3 620**	**7 271**	**10 211**
Defence	2 993	1 679	2 069	2 423	2 711	4 328	5 150	3 620	7 271	10 211
Division 2: Economic Development	**624 929**	**628 565**	**735 329**	**923 990**	**1 199 956**	**1 271 620**	**1 539 534**	**1 738 239**	**1 542 453**	**2 072 624**
Economic Development unclassified	13 456	93 498	102 936	115 029	150 668	171 520	209 400	0	0	0
Plant Production And Plant Primary Products	46 184	69 061	60 922	91 790	119 949	123 126	153 054	178 033	188 513	277 764
Animal Production and Animal Primary Products	44 351	58 674	72 192	75 076	85 256	95 219	117 255	130 828	128 705	151 334
Mineral Resources (Excluding Energy)	39 531	67 831	15 898	48 914	89 559	74 725	88 576	83 294	99 966	129 185
Energy Resources	13 695	17 402	16 709	21 461	51 923	84 459	71 648	81 689	88 657	87 659
Energy Supply	26 096	30 186	31 871	58 314	90 365	96 209	106 457	107 759	144 462	157 304
Manufacturing	131 902	78 679	102 001	145 485	210 910	172 947	210 009	297 303	245 037	272 287
Construction	29 659	19 548	26 956	20 407	27 521	28 313	46 175	23 858	73 340	116 141
Transport	9 449	12 109	14 347	16 440	16 447	22 770	29 517	30 456	24 045	53 043
Information and Communication Services	33 201	26 125	50 745	71 439	80 322	67 026	87 013	110 589	93 281	144 313
Commercial Services	33 480	27 868	41 588	47 260	41 037	93 285	54 604	282 078	54 659	106 287
Economic Framework	139 711	65 539	93 107	115 993	133 600	164 759	193 599	206 625	217 501	302 693
Natural Resources	64 215	62 045	106 057	96 382	102 399	77 260	172 228	205 728	184 287	274 612
Division 3: Society	**621 807**	**634 216**	**722 819**	**831 632**	**1 062 182**	**1 149 091**	**1 359 797**	**1 177 651**	**1 393 700**	**1 583 800**
Society unclassified	3 364	93 498	102 936	115 029	150 668	171 520	209 400	0	0	0
Health	302 498	292 029	328 251	422 804	507 767	556 914	644 763	701 007	776 688	686 152
Education and Training	144 865	110 531	132 616	149 270	199 056	195 917	227 502	187 291	294 482	359 897
Social Development and Community Services	171 079	138 158	159 016	144 529	204 691	224 740	278 132	289 353	322 530	537 752
Division 4: Environment	**177 037**	**197 632**	**226 063**	**223 302**	**261 464**	**317 863**	**339 148**	**346 483**	**377 151**	**509 533**
Environment unclassified	6 728	31 166	34 312	38 343	50 223	57 173	69 800	0	0	0
Environmental Knowledge	84 740	68 443	94 667	107 922	112 319	108 189	135 472	170 901	188 250	230 135
Environmental Aspects of Development	51 272	43 021	40 122	37 006	42 619	93 853	72 050	92 353	86 295	123 344
Environmental and Other Aspects	34 297	55 002	56 963	40 030	56 303	58 648	61 826	83 229	102 606	156 054
Division 5: Advancement of Knowledge	**318 046**	**609 259**	**847 691**	**750 868**	**772 495**	**878 959**	**947 737**	**1 835 231**	**2 104 026**	**2 433 048**
Advancement of Knowledge unclassified	10 092	93 498	102 936	115 029	150 668	171 520	209 400	0	0	0
Natural Sciences, Technologies and Engineering	210 468	311 137	427 087	297 837	329 497	416 081	423 469	969 079	1 263 802	1 443 913
Social Sciences and Humanities	97 485	204 623	317 668	338 002	292 330	291 359	314 868	866 152	840 223	989 135
Total	**1 896 156**	**2 071 351**	**2 533 971**	**2 732 215**	**3 298 808**	**3 621 862**	**4 191 366**	**5 101 224**	**5 424 602**	**6 609 216**

** The R&D survey of 2001/02 reported an unspecified expenditure of R151 343 000 that is included in the total.*

TABLE C.71: PROPORTIONAL HIGHER EDUCATION SECTOR R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2001/02 TO 2011/12)

SOCIO-ECONOMIC OBJECTIVE	2001/02* %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Defence	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**
Defence	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Division 2: Economic Development	**33.0**	**30.3**	**29.0**	**33.8**	**36.4**	**35.1**	**36.7**	**34.1**	**28.4**	**31.4**
Economic Development unclassified	0.7	4.5	4.1	4.2	4.6	4.7	5.0	0.0	0.0	0.0
Plant Production And Plant Primary Products	2.4	3.3	2.4	3.4	3.6	3.4	3.7	3.5	3.5	4.2
Animal Production and Animal Primary Products	2.3	2.8	2.8	2.7	2.6	2.6	2.8	2.6	2.4	2.3
Mineral Resources (Excluding Energy)	2.1	3.3	0.6	1.8	2.7	2.1	2.1	1.6	1.8	2.0
Energy Resources	0.7	0.8	0.7	0.8	1.6	2.3	1.7	1.6	1.6	1.3
Energy Supply	1.4	1.5	1.3	2.1	2.7	2.7	2.5	2.1	2.7	2.4
Manufacturing	7.0	3.8	4.0	5.3	6.4	4.8	5.0	5.8	4.5	4.1
Construction	1.6	0.9	1.1	0.7	0.8	0.8	1.1	0.5	1.4	1.8
Transport	0.5	0.6	0.6	0.6	0.5	0.6	0.7	0.6	0.4	0.8
Information and Communication Services	1.8	1.3	2.0	2.6	2.4	1.9	2.1	2.2	1.7	2.2
Commercial Services	1.8	1.3	1.6	1.7	1.2	2.6	1.3	5.5	1.0	1.6
Economic Framework	7.4	3.2	3.7	4.2	4.0	4.5	4.6	4.1	4.0	4.6
Natural Resources	3.4	3.0	4.2	3.5	3.1	2.1	4.1	4.0	3.4	4.2
Division 3: Society	**32.8**	**30.6**	**28.5**	**30.4**	**32.2**	**31.7**	**32.4**	**23.1**	**25.7**	**24.0**
Society unclassified	0.2	4.5	4.1	4.2	4.6	4.7	5.0	0.0	0.0	0.0
Health	16.0	14.1	13.0	15.5	15.4	15.4	15.4	13.7	14.3	10.4
Education and Training	7.6	5.3	5.2	5.5	6.0	5.4	5.4	3.7	5.4	5.4
Social Development and Community Services	9.0	6.7	6.3	5.3	6.2	6.2	6.6	5.7	5.9	8.1
Division 4: Environment	**9.3**	**9.5**	**8.9**	**8.2**	**7.9**	**8.8**	**8.1**	**6.8**	**7.0**	**7.7**
Environment unclassified	0.4	1.5	1.4	1.4	1.5	1.6	1.7	0.0	0.0	0.0
Environmental Knowledge	4.5	3.3	3.7	3.9	3.4	3.0	3.2	3.4	3.5	3.5
Environmental Aspects of Development	2.7	2.1	1.6	1.4	1.3	2.6	1.7	1.8	1.6	1.9
Environmental and Other Aspects	1.8	2.7	2.2	1.5	1.7	1.6	1.5	1.6	1.9	2.4
Division 5: Advancement of Knowledge	**16.8**	**29.4**	**33.5**	**27.5**	**23.4**	**24.3**	**22.6**	**36.0**	**38.8**	**36.8**
Advancement of Knowledge unclassified	0.5	4.5	4.1	4.2	4.6	4.7	5.0	0.0	0.0	0.0
Natural Sciences, Technologies and Engineering	11.1	15.0	16.9	10.9	10.0	11.5	10.1	19.0	23.3	21.8
Social Sciences and Humanities	5.1	9.9	12.5	12.4	8.9	8.0	7.5	17.0	15.5	15.0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

** The R&D survey of 2001/02 reported an unspecified expenditure of R151 343 000 that is included in the total.*

TABLE C.72: HIGHER EDUCATION SECTOR R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 R'000	2003/04* R'000	2004/05 R'000	2005/06 R'000	2006/07 R'000	2007/08 R'000	2008/09 R'000	2009/10 R'000	2010/11 R'000	2011/12 R'000
Eastern Cape	162 145	N/A	184 868	214 701	259 254	276 740	286 605	536 792	556 496	608 815
Free State	98 302	N/A	139 497	146 823	155 326	180 713	226 892	246 298	281 889	323 335
Gauteng	618 090	N/A	885 288	1 030 801	1 214 575	1 260 991	1 467 914	1 537 166	1 600 783	2 028 145
KwaZulu-Natal	310 589	N/A	373 595	379 681	451 992	459 299	567 999	662 518	677 740	902 386
Limpopo	79 635	N/A	63 508	43 565	63 233	79 716	86 635	147 397	224 603	349 559
Mpumalanga	14 461	N/A	47 379	58 548	67 029	105 629	72 590	88 680	119 231	170 966
North-West	98 402	N/A	123 817	73 456	97 246	166 137	150 125	190 570	184 514	275 088
Northern Cape	12 381	N/A	21 152	15 263	42 944	48 277	68 443	92 062	107 581	148 425
Western Cape	502 151	N/A	694 867	769 377	947 209	1 044 360	1 264 162	1 599 741	1 671 766	1 802 496
Total	**1 896 156**	**N/A**	**2 533 971**	**2 732 215**	**3 298 808**	**3 621 862**	**4 191 366**	**5 101 224**	**5 424 602**	**6 609 216**

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

TABLE C.73: PROPORTIONAL HIGHER EDUCATION SECTOR R&D EXPENDITURE BY PROVINCE (2001/02 TO 2011/12)

PROVINCE	2001/02 %	2003/04* %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Eastern Cape	8.6	N/A	7.3	7.9	7.9	7.6	6.8	10.5	10.3	9.2
Free State	5.2	N/A	5.5	5.4	4.7	5	5.4	4.8	5.2	4.9
Gauteng	32.6	N/A	34.9	37.7	36.8	34.8	35	30.1	29.5	30.7
KwaZulu-Natal	16.4	N/A	14.7	13.9	13.7	12.7	13.6	13	12.5	13.7
Limpopo	4.2	N/A	2.5	1.6	1.9	2.2	2.1	2.9	4.1	5.3
Mpumalanga	0.8	N/A	1.9	2.1	2	2.9	1.7	1.7	2.2	2.6
North-West	5.2	N/A	4.9	2.7	2.9	4.6	3.6	3.7	3.4	4.2
Northern Cape	0.7	N/A	0.8	0.6	1.3	1.3	1.6	1.8	2.0	2.2
Western Cape	26.5	N/A	27.4	28.2	28.7	28.8	30.2	31.4	30.8	27.3
Total	**100**	**N/A**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

TABLE C.74: HIGHER EDUCATION SECTOR R&D EXPENDITURE BY SPECIFIC AREAS OF NATIONAL INTEREST OF R&D (2009/10, 2010/11 AND 2011/12)

MULTI-DISCIPLINARY AREA OF R&D	2009/10		2010/11		2011/12	
	R'000	%	R'000	%	R'000	%
Environment/Environment related	N/A	N/A	N/A	N/A	770 339	11.7
Open source software	58 643	1.1	75 195	1.4	15 982	0.2
New materials	283 711	5.2	266 419	4.9	197 430	3.0
Tuberculosis (TB), HIV/AIDS, malaria	815 431	15.0	845 216	15.6	399 070	6.0
Total R&D	**5 101 224**	**100***	**5 424 602**	**100***	**6 609 216**	**100***

Note: N/A indicates that data was not collected.
** Note: The selected items of multidisciplinary areas of R&D are not a complete list and therefore do not add to 100%.*

TABLE C.75: HIGHER EDUCATION SECTOR R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1: Natural Sciences, Technology and Engineering	**1 219 842**	**1,424,560**	**1,646,731**	**1,846,022**	**2,294,479**	**2,389,525**	**2,703,975**	**3,374,024**	**3,558,265**	**4,486,057**
Mathematical sciences	80 220	127,344	81,251	79,707	104,323	109,354	151,880	168,689	283,942	311,572
Physical sciences	49 029	52,552	100,761	97,252	121,559	146,726	135,002	352,628	175,110	189,341
Chemical sciences	57 566	71,479	101,808	117,914	106,214	143,897	136,528	161,856	158,775	317,389
Earth sciences	50 043	94,833	101,262	115,680	119,682	121,419	136,955	84,777	157,781	174,141
Information, computer and communication technologies	76 618	58,014	98,240	105,873	143,037	119,600	125,413	121,750	112,985	186,870
Applied sciences and technologies	62 063	54,238	43,653	55,779	101,400	96,972	78,904	306,195	90,761	245,611
Engineering sciences	151 147	198,163	307,141	268,250	349,889	294,630	352,114	305,953	461,980	741,462
Biological sciences	142 127	159,708	192,658	195,380	230,480	271,216	282,280	349,343	593,219	610,408
Agricultural sciences	96 950	97,996	97,248	143,104	151,950	159,793	192,265	179,309	205,311	268,834
Medical and health sciences	377 567	433,504	440,249	582,798	710,386	785,630	966,365	1,195,597	1,226,127	1,245,284
Environmental sciences	48 165	37,358	40,388	42,719	58,256	58,793	68,869	52,431	60,458	111,612
Material sciences	17 846	31,685	29,918	29,348	86,764	72,484	68,467	76,732	26,629	81,749
Marine sciences	10 501	7,685	12,154	12,220	10,539	9,013	8,933	18,764	5,186	1,783
Division 2: Social Sciences and Humanities	**585 260**	**646,791**	**887,240**	**886,193**	**1,004,329**	**1,232,337**	**1,487,391**	**1,727,200**	**1,866,337**	**2,123,159**
Social sciences	439 492	445,031	577,653	594,579	658,419	796,281	967,204	1,273,479	1,433,610	1,664,653
Humanities	145 768	201,761	309,587	291,615	345,910	436,056	520,187	453,721	432,727	458,505
Total	**1 805 102**	**2,071,351**	**2,533,971**	**2,732,215**	**3,298,808**	**3,621,862**	**4,191,366**	**5,101,224**	**5,424,602**	**6,609,216**

TABLE C.76: PROPORTIONAL HIGHER EDUCATION SECTOR R&D EXPENDITURE BY RESEARCH FIELD (2001/02 TO 2011/12)

MAIN RESEARCH FIELD	2001/02 %	2003/04 %	2004/05 %	2005/06 %	2006/07 %	2007/08 %	2008/09 %	2009/10 %	2010/11 %	2011/12 %
Division 1: Natural Sciences, Technology and Engineering	**64.3**	**68.8**	**65.0**	**67.6**	**69.6**	**66.0**	**64.5**	**66.1**	**65.6**	**67.9**
Mathematical sciences	4.2	6.1	3.2	2.9	3.2	3.0	3.6	3.3	5.2	4.7
Physical sciences	2.6	2.5	4.0	3.6	3.7	4.1	3.2	6.9	3.2	2.9
Chemical sciences	3.0	3.5	4.0	4.3	3.2	4.0	3.3	3.2	2.9	4.8
Earth sciences	2.6	4.6	4.0	4.2	3.6	3.4	3.3	1.7	2.9	2.6
Information, computer and communication technologies	4.0	2.8	3.9	3.9	4.3	3.3	3.0	2.4	2.1	2.8
Applied sciences and technologies	3.3	2.6	1.7	2.0	3.1	2.7	1.9	6.0	1.7	3.7
Engineering sciences	8.0	9.6	12.1	9.8	10.6	8.1	8.4	6.0	8.5	11.2
Biological sciences	7.5	7.7	7.6	7.2	7.0	7.5	6.7	6.8	10.9	9.2
Agricultural sciences	5.1	4.7	3.8	5.2	4.6	4.4	4.6	3.5	3.8	4.1
Medical and health sciences	19.9	20.9	17.4	21.3	21.5	21.7	23.1	23.4	22.6	18.8
Environmental sciences	2.5	1.8	1.6	1.6	1.8	1.6	1.6	1.0	1.1	1.7
Material sciences	0.9	1.5	1.2	1.1	2.6	2.0	1.6	1.5	0.5	1.2
Marine sciences	0.6	0.4	0.5	0.4	0.3	0.2	0.2	0.4	0.1	0.0
Division 2: Social Sciences and Humanities	**30.9**	**31.2**	**35.0**	**32.4**	**30.4**	**34.0**	**35.5**	**33.9**	**34.4**	**32.1**
Social sciences	23.2	21.5	22.8	21.8	20.0	22.0	23.1	25.0	26.4	25.2
Humanities	7.7	9.7	12.2	10.7	10.5	12.0	12.4	8.9	8.0	6.9
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

TABLE C.77: HIGHER EDUCATION SECTOR R&D PERSONNEL, HEADCOUNT AND FULL-TIME EQUIVALENTS (2009/10, 2010/11 AND 2011/12)

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
2009/10	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers*	17 010	9 534	7 476	3 761.8	22.1
Technicians directly supporting R&D	2 115	1 243	872	579.8	27.4
Other personnel directly supporting R&D	1 725	626	1 099	676.4	39.2
Total	**20 850**	**11 403**	**9 447**	**5 018.0**	**24.1**
2010/11	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers*	15 553	8 630	6 923	3 613.7	23.2
Technicians directly supporting R&D	2 123	1 233	890	534.9	25.2
Other personnel directly supporting R&D	2 294	760	1 534	874.5	38.1
Total	**19 970**	**10 623**	**9 347**	**5 023.0**	**25.2**
2011/12	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Researchers*	16 294	8 939	7 355	4 355.3	26.7
Technicians directly supporting R&D	2 344	1 327	1 017	673.4	28.7
Other personnel directly supporting R&D	2 820	907	1 913	1 062.5	37.7
Total	**21 458**	**11 173**	**10 285**	**6 091.2**	**28.4**

** Excludes postgraduate students.*

TABLE C.78: HIGHER EDUCATION SECTOR R&D POSTGRADUATE STUDENTS BY GENDER AND QUALIFICATION, HEADCOUNT AND FULL-TIME EQUIVALENTS (2009/10, 2010/11 AND 2011/12)

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
2009/10	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Post-doctoral fellows	781	447	334	696.7	89.2
Doctoral students	10 761	6 108	4 653	6 155.8	57.2
Masters students	26 956	13 614	13 342	11 105.2	41.2
Total	**38 498**	**20 169**	**18 329**	**17 957.6**	**46.6**
2010/11	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Post-doctoral fellows	961	570	391	866.6	90.2
Doctoral students	11 640	6 714	4 926	6 587.6	56.6
Masters students	28 373	14 165	14 208	12 505.1	44.1
Total	**40 974**	**21 449**	**19 525**	**19 959.3**	**48.7**
2011/12	**TOTAL**	**MALE**	**FEMALE**	**FTEs**	**FTEs AS % OF HEADCOUNT**
Post-doctoral fellows	1 180	667	513	982.0	83.2
Doctoral students	13 519	7 737	5 782	7 490.2	55.4
Masters students	35 637	18 354	17 283	14 912.4	41.8
Total	**50 336**	**26 758**	**23 578**	**23 384.7**	**46.5**

TABLE C.79: HIGHER EDUCATION SECTOR R&D PERSONNEL BY RACE, GENDER, PERSONNEL CATEGORY AND QUALIFICATION, HEADCOUNT (2011/12)

QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN		WHITE	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers											
Doctoral degree or equivalent	6 008	3 783	2 225	868	364	164	108	276	174	2 475	1 579
Masters, honours, bachelor or equivalent	8 616	4 325	4 291	1 717	1 139	281	372	362	429	1 965	2 351
Diplomas	1 670	831	839	385	290	42	59	72	70	332	420
Subtotal	**16 294**	**8 939**	**7 355**	**2 970**	**1793**	**487**	**539**	**710**	**673**	**4 772**	**4 350**
Technicians directly supporting R&D											
Doctoral degree or equivalent	108	65	43	12	6	3	1	4	1	46	35
Masters, honours, bachelor or equivalent	679	345	334	128	94	29	41	27	20	161	179
Diplomas	1 557	917	640	281	173	165	64	91	68	380	335
Subtotal	**2 344**	**1 327**	**1 017**	**421**	**273**	**197**	**106**	**122**	**89**	**587**	**549**
Other personnel directly supporting R&D											
Doctoral degree or equivalent	175	101	74	19	18	4	9	7	2	71	45
Masters, honours, bachelor or equivalent	578	190	388	72	89	23	45	9	17	86	237
Diplomas	2 067	616	1 451	231	321	137	316	28	46	220	768
Subtotal	**2 820**	**907**	**1 913**	**322**	**428**	**164**	**370**	**44**	**65**	**377**	**1 050**
Total	**21 458**	**11 173**	**10 285**	**3 713**	**2 494**	**848**	**1 015**	**876**	**827**	**5 736**	**5 949**

TABLE C.80: HIGHER EDUCATION SECTOR OVERVIEW (2011/12)

	R&D EXPENDITURE R'000	RESEARCHER (HEADCOUNT)	RESEARCHER (FTE)	POSTGRAD (HEADCOUNT)	POSTGRAD (FTE)
Private Universities	**23 980**	**80**	**29.0**	**2**	**1.0**
Universities	**6 108 890**	**13 121**	**3842.0**	**13 662**	**7989.0**
Nelson Mandela Metropolitan University	239 433	444	77.3	464	236.9
North West University	358 107	1173	388.4	1047	547.4
Rhodes University	191 865	365	124.9	452	452.0
University of Cape Town	1 000 055	1097	371.0	1 448	950.0
University of Fort Hare	30 898	291	58.2	263	157.8
University of Johannesburg	250 111	790	196.3	738	738.0
University of KwaZulu-Natal	681 606	1085	447.7	1 394	516.4
University of Limpopo	241 563	305	50.8	195	26.1
University of Pretoria	591 381	1754	345.9	1 767	721.3
University of South Africa	517 523	1849	924.5	1 269	891.9
University of Stellenbosch	678 154	1066	335.3	1 381	767.2
University of the Free State	208 457	188	57.1	604	268.1
University of the Western Cape	137 659	866	173.2	655	344.3
University of the Witwatersrand	949 102	1578	237.0	1 801	1260.0
University of Zululand	32 976	270	54.0	184	111.2
Universities of (Science) and Technology	**476 346**	**3 093**	**485.0**	**1 035**	**483.0**
Cape Peninsula University of Technology	100 229	429	86.9	189	189.0
Central University of Technology, Free State	34 949	212	51.6	65	48.2
Durban Institute of Technology	57 971	338	45.4	82	57.4
Mangosuthu Technikon	10 781	86	17.2		
Tshwane University of Technology	175 583	836	125.4	428	79.5
Walter Sisulu University of Technology and Science	46 517	607	91.4	30	18.0
University of Venda for Science and Technology	17 294	325	32.5	118	70.8
Vaal University of Technology	33 022	260	34.6	123	20.2
TOTAL	**6 609 216**	**16 294**	**4 355.0**	**14 699**	**8 472.0**

D. TECHNICAL NOTES

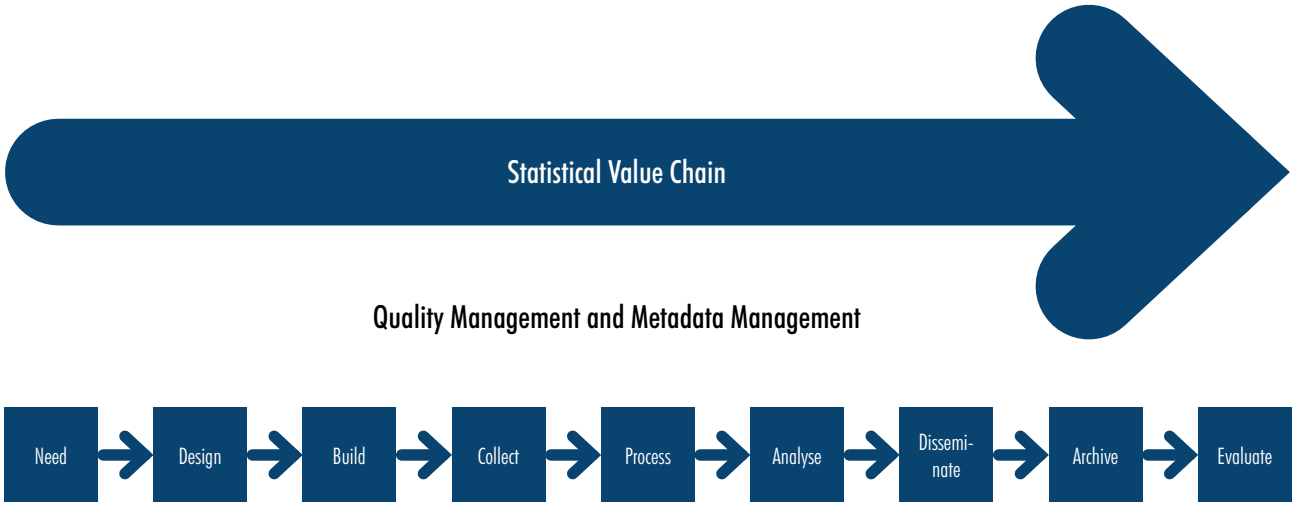
D.1 SURVEY PLANNING AND DESIGN

The South African National Survey of Research and Experimental Development is commissioned by the Department of Science and Technology (DST) and forms part of the tools for monitoring and evaluating the performance of the national innovation system. The survey collects data in accordance with the guidelines recommended by the OECD in the Frascati Manual (OECD, 2002).

The survey produced statistics on expenditure and human resources devoted to R&D in South Africa in the specified annual reference period of 2011/12. These data are used to compile national and international indicators on R&D for South Africa. Standard output tables for the production of indicators were agreed in advance of the survey between the HSRC-CeSTII and DST. Additionally, data items on public and private inputs into R&D investment were identified for inclusion in the 2011/12 survey questionnaire compared with the 2010/11 survey.

HSRC-CeSTII conducted the survey according to a project plan aligned with the phases of the Statistical Value Chain (SVC) illustrated in Figure D.1 and described in the South African Statistical Quality Assessment Framework (SASQAF) (Stats SA, 2010).

FIGURE D.1: STATISTICAL VALUE CHAIN USED IN QUALITY AND METADATA MANAGEMENT



D.2 METHOD OF SURVEYING

A set of three separate questionnaires was used for the survey. One questionnaire was designed for the business sector, another for the higher education sector, and a third one for government departments, research institutes, science councils and not-for-profit organisations.

Table D.1 describes each of the sectors and provides their respective reference period.

TABLE D.1: DESCRIPTION OF SECTORS, RESPECTIVE REFERENCE PERIODS AND SAMPLING METHODS

SECTOR	DESCRIPTION	REFERENCE PERIOD	METHOD OF SAMPLING
Business	Large, medium and small enterprises; state-owned enterprises.	Financial year ending 28 February 2012 (or the closest complete financial year).	A purposive sampling design was used for the survey of the business sector, and the frame was constructed from the business register developed and maintained by HSRC-CeSTII, since 2002. All known or likely R&D performers were targeted.
Not-for-profit	Non-governmental and other organisations formally registered as NPOs.	Financial year ending 31 March 2012 (or the closest complete financial year).	Non-governmental and other organisations formally registered as NPOs were surveyed through purposive sampling.
Government	National and provincial departments, local government, museums, research institutes and research councils with an R&D component.	Financial (fiscal) year ending 31 March 2012.	Government departments were surveyed using a census approach. All national government departments, associated research institutions and museums performing R&D at national, provincial and local levels were included in the government sector.
Science councils	The nine science councils established through Acts of Parliament.	Financial (fiscal) year ending 31 March 2012.	Nine science councils were surveyed as a census.
Higher education	All public higher education institutions as well as private higher education institutions that performed R&D. Teaching hospitals were also included in this sector.	Calendar year ending 31 December 2011.	Higher education institutions, namely universities, universities of science and technology, institutes of education and private higher education institutions were included in the higher education sector frame. Public higher education institutions were surveyed as a census. Private higher education institutions were surveyed through purposive sampling

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

D.3 FIELDWORK

The R&D data were collected by means of questionnaires that were sent to the units in each sector by surface and/or electronic mail. All five of the sectors were surveyed between 4 October 2012 and 30 May 2013.

The questionnaire response rate as a percentage was calculated using the following formula:

$$\text{Response rate} = 100 \times \frac{\text{Response}}{(\text{Response} + \text{Non-response}) - (\text{Out-of-scope})}$$

Non-response[2] was defined as failure to obtain a measurement on one or more variables for one or more units selected for the survey. These include out-of-scope units.

Out-of-scope units were defined as units that should not be included in the sampling frame because they did not belong to the target population in the reference period. Entities that returned a questionnaire stating nil in-house R&D expenditure were counted as out-of-scope for the 2011/12 R&D survey.

In-scope units[3] were defined as units performing in-house R&D or with likely in-house R&D activity; units that indicated that no R&D had been performed during the 2011/12 period were classified as out-of-scope.

2 *Adapted from (Sarndal, Swensson and Wretman 1992).*

3 *This is the HSRC -CeSTII operational definition.*

Questionnaire responses were defined as units that were not classified as non-response.

A unit was considered as a response if it completed and returned a questionnaire with non-zero in-house R&D expenditure, or if the unit's in-house R&D expenditure figure was reported by the respondent without a completed questionnaire, or if in-house R&D expenditure was confirmed by the respondent after being imputed based on secondary data. The data sources used for imputation included previous R&D survey responses as well as other private and public data sources such as HEMIS and SPII.

D.4 IMPUTATION

The survey employed varying degrees of imputation, ranging from using a total R&D expenditure figure reported by the respondent (by e-mail or telephone), followed by imputing the remaining data items from available sector R&D profiles, to generating an R&D profile for a unit based on its known historical R&D profile adjusted by the GDP inflation factor, or using publicly available data on a unit's R&D. The imputation models were unchanged from those used in the 2010/11 survey. Details of the imputation methods are available on request. Financial data on R&D were adjusted by a GDP inflation factor[4].

Survey coverage rate was defined as the proportion of known R&D-performing units used to estimate survey variables as a fraction of eligible units. It was calculated using the following formula:

$$\text{Survey coverage rate} = \frac{\text{Response} + \text{Imputations}}{(\text{Response} + \text{Non-response}) - (\text{Out-of-scope})}$$

Table D.2 presents survey imputation by age of data used.

TABLE D.2: NUMBER OF UNITS AND AGE OF DATA USED IN THE IMPUTATION MODELS BY SECTOR

AGE OF DATA	BUSINESS	NPO	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION
Imputed from current reference period	18	0	0	0	0
Imputed from previous year	0	0	1	0	0
Imputed, more than one year old	0	0	0	0	0
Commuted from previous year	69	2	5	0	3
Commuted, more than one year old	18	0	1	0	0
Total	**105**	**2**	**7**	**0**	**3**

Only units with evidence of on-going R&D activity qualified for imputation. Individual fieldwork lists were interrogated, and non-responders were identified towards the end of the survey period. These were isolated for possible imputation. All commuted data were sent to companies for review, agreement or adjustment where necessary. Where it was not possible to obtain company sign-off, individual fieldworkers were responsible for providing evidence of on-going R&D activity to qualify units for imputation.

Completed respondent questionnaires were checked and signed off by the responsible fieldworker. Apparent anomalies were clarified by contacting respondents by e-mail or telephone, where necessary. Similarly, all imputed data items were confirmed and signed off by the responsible fieldworker.

4 *A GDP inflation factor of 9.706% was used for NPO, government and higher education sectors, while a GDP inflation factor of 9.708% was used for business sector imputations.*

D.5 QUALITY INDICATORS OF SURVEY COVERAGE

TABLE D.3: QUALITY INDICATORS OF SURVEY COVERAGE BY SECTOR

SECTOR	NUMBER OF UNITS INVESTIGATED	NUMBER OF UNITS SELECTED	QUESTIONNAIRES SENT OUT	NUMBER OF QUESTIONNAIRES RETURNED	NONRESPONSE	OUT-OF-SCOPE	RESPONSES	QUESTIONNAIRE RESPONSE RATE	IMPUTATIONS	UNIT IMPUTATION RATE	SURVEY COVERAGE RATE	WEIGHTED RESPONSE RATE
Business	1 185	632	566	364	291	89	275	57.7%	105	22.0%	79.7%	72.8%
Not-for-profit	17 410	116	116	73	81	41	35	46.7%	2	2.7%	49.3%	94.1%
Government	222	167	167	69	98	41	69	54.8%	7	5.6%	60.3%	96.6%
Science councils	13	13	13	13	0	0	13	100.0%	0	0.0%	100.0%	100.0%
Higher education	37	37	37	28	13	1	24	66.7%	3	8.3%	75.0%	98.6%
Total	**18 854**	**965**	**899**	**547**	**483**	**172**	**416**	**57.2%**	**117**	**16.1%**	**73.3%**	**86.5%**

A summary set of quality indicators for the collection and imputation phases of the survey processes in Table D.3 records an overall questionnaire response rate of 57.2%. The survey coverage rate was 73.3%, which was calculated from the number of unit imputations added to the number of unit responses as a percentage of eligible units. The weighted response rate of 86.5% gives an estimate of the size of national R&D expenditure captured from responses alone; that is excluding imputed units.

The business sector list of companies used to source potential R&D performers was streamlined from 3 515 units to 976 units by removing companies that primarily were closed down, expired, non-R&D performing or not contactable from that list and archiving them in long-term secure storage. These were archived using database classifications that listed the companies as those that had non-active R&D status, were untraceable, advised no R&D activities in the long-term, were misclassified under business sector, were duplicates, were unlikely to be R&D active, were adjudged as unlikely R&D performers based on auxiliary company information (e.g. company name), or were previously marked as possible or not known R&D performers but confirmed as non-R&D performers. An additional 209 companies were added to this streamlined list of 976 units resulting in 1 185 units that were selected for investigation to comprise a frame for the business sector.

The science councils sector was surveyed as a census. Eight R&D active science councils responded to the survey questionnaire, one science council was not classified as a R&D performer. One of these eight science councils was surveyed at the level of its constituent units. This resulted in a total of 13 reporting units surveyed in the science councils sector.

The 86 units arising from the 2010/11 survey investigated in the NPO sector were augmented by 17 324 units. This singularly large number of units investigated was due to the filtering of a full list of 75 323 NPO units that had become available prior to the start of the collection period. Further investigation of the full list of 75 323 is on-going.

The government sector investigated a list of 222 units by adding to the confirmed R&D performers of 80 units from the 2010/11 survey comprising all national, provincial, municipalities, museums and research institutions.

The number of higher education institutions investigated for the 2011/12 survey was increased to 37, which included 13 additional private universities. This improved coverage of the private higher education sector increased the eligible units for the higher education sector to 27 units, which was up by three units from the 24 units collected in the 2010/11 survey. Nine of the private universities were non-responsive and were not confirmed as R&D performers.

D.6 DATA PROCESSING AND ANALYSIS

Once the individual responses to the questionnaires, including summation and percentage calculations, had been checked by the relevant fieldworker, the data were manually entered on the Survey Management and Results System (SMRS). Data entries were then checked against the questionnaire/fieldwork notes used in the original capture of data on the SMRS as a second quality-control measure in the data-capturing process. Following data capture, an extensive series of automated discrepancy-checking calculations were applied to the data. Where anomalies were found, the responsible sector leader(s) of the survey corrected the data to the required standard in consultation with the relevant respondent(s).

Standard data tables were then drawn from the data in the form of outputs agreed upon by HSRC-CeSTII and the DST. Time-series data were added from previous surveys.

Final data quality-control measures required that the formatted tables be analysed by HSRC-CeSTII researchers by cross-checking sectoral data items with corresponding aggregate data items or historic data. Where variability in data across the time series was observed, factors contributing to such variability were identified and checked by examining the unit-level data on the database to ensure that no anomalies had been missed in processing. Furthermore, statistical extrapolation was applied to the aggregate tables with respect to missing human resource data on the demographics and qualifications of R&D personnel to ensure the consistency of data across the 2010/11 survey report between more detailed and less detailed tables.

D.7 DISSEMINATION OF SURVEY RESULTS

The 2011/12 R&D survey reports will be disseminated to all respondents as well as to users of the R&D statistics.

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

D.8 STORAGE AND ARCHIVING OF SURVEY RESULTS

The data have been archived according to established HSRC-CeSTII procedures. Hard copies of the data from the two most recent surveys are kept in safe storage at HSRC-CeSTII, while the data from older surveys are kept in safe storage off site. All data are stored electronically on secure servers, and daily back-ups of databases are generated. In addition, as part of the HSRC's institutional objectives, the HSRC's Data Curation Unit, in consultation with HSRC-CeSTII, has completed the curation of data from the 2001/02 and 2003/04 to 2007/08 R&D surveys. Data from the remaining surveys will be curated.

E. REFERENCES

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F. ANNEXURE

USER SATISFACTION SURVEY: R&D STATISTICAL REPORT

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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