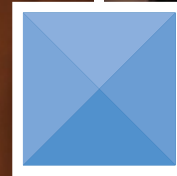
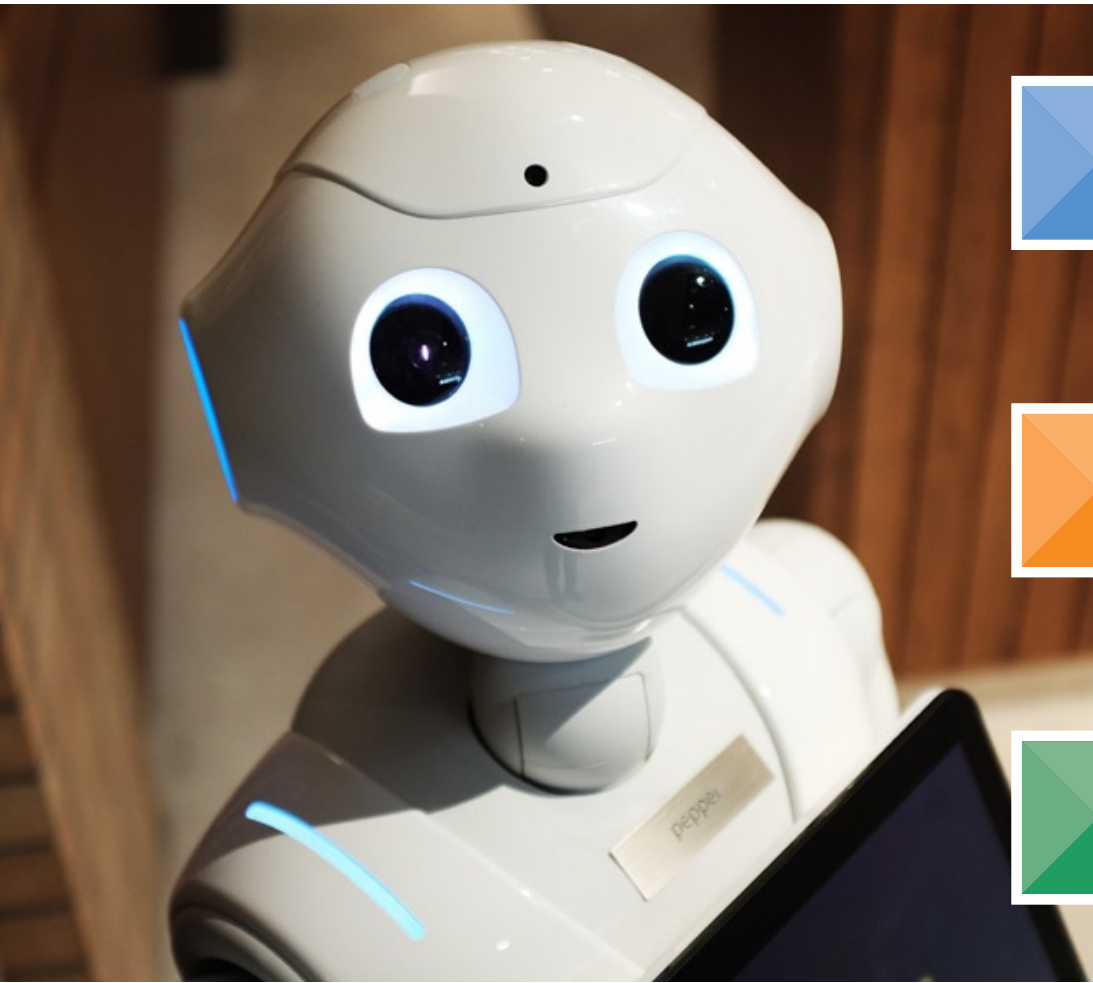


# SOUTH AFRICAN NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT



# STATISTICAL REPORT 2019/20



science & innovation

Department:  
Science and Innovation  
REPUBLIC OF SOUTH AFRICA



HSRC  
Human Sciences  
Research Council



stats sa

Department:  
Statistics South Africa  
REPUBLIC OF SOUTH AFRICA

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

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# DISSEMINATION

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## User feedback

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

## Revisions

The Department of Science and Innovation (DSI), 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 DSI and HSRC websites. The current survey and R&D intensity series was revised to take into account the revision of the GDP series (Stats SA, 2021). The R&D expenditure in real terms was also rebased to 2015 constant prices.



South Africa's R&D statistics are key to monitoring the R&D investment and human resource profile of the country and to inform Science, Technology and Innovation (STI) policy implementation by the government. These statistics are also of use as a source of evidence to the private sector, the international community, media, and researchers.

The National Survey of Research and Experimental Development (R&D Survey), which forms a part of the National Statistics System, is published annually by the Department of Science and Innovation (DSI) in partnership with Statistics South Africa, and is in alignment with the Statistics Act (No. 6 of 1999).

The R&D Survey is conducted by the Human Sciences Research Council's Centre for Science, Technology and Innovation Indicators (CeSTII), following the international guidelines published by the Organization for Economic Cooperation and Development (OECD), known as the Frascati Manual. The resulting statistics provide important evidence on the size, growth and composition of R&D expenditure and human resources devoted to R&D.

The R&D Survey project plan is cast according to the phases of the Statistical Value Chain (SVC) promoted by the requirements of the South African Statistical Quality Assessment Framework (SASQAF). The SASQAF is the instrument used for assessing the quality of statistical reports for accreditation as official statistics. Each year the R&D Survey is subjected to a stringent quality process, which is undertaken by a clearance committee comprising of experts from various sectors. This report is the tenth in the series of R&D Survey statistical reports since the inception of a clearance process before the release of the annual data. To validate the quality of the survey, independent data verification by a technical committee was done in support of the clearance committee recommendations.

The clearance process revealed that the 2019/20 R&D Survey was conducted following good practice and was found to meet most of the quality requirements of the R&D Survey assessment tool. Overall the R&D survey process has shown increasing improvements over the past years.

As with the 2018/19 survey, the impact of Covid-19 lockdowns and restrictions has continued to affect fieldwork operations. Several strategies such as more focus on the top 200 R&D performing business companies, were put in place to mitigate against the likelihood of a lower response rate.

Based on the R&D Survey Clearance Committee recommendations, I endorse the 2019/20 R&D Survey, with the caveat that time series analysis of the data using the 2019/20 R&D Survey estimates need to be done with caution and encourage its use by stakeholders.

**Risenga Maluleke**  
STATISTICIAN-GENERAL  
REPUBLIC OF SOUTH AFRICA  
14 December 2021



# ACKNOWLEDGEMENTS

The South African National Survey of Research and Experimental Development is conducted annually by HSRC-CeSTII on behalf of the DSI.

The project team extends its appreciation to Dr Phil Mjwara, Director-General of the DSI, Mr Risenga Maluleke, Statistician-General, and Prof. Likness Simbayi, Acting CEO of the HSRC, for their support of the R&D survey.

The support and contributions of Dr Glenda Kruss, Executive Director of CeSTII, Mr Imraan Patel, Ms Tshidi Lekala, Ms Kgomotso Matjila and Mr Thabo Manyaka of the DSI are much appreciated.

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

The HSRC-CeSTII project team for the 2019/20 South African National Survey of Research and Experimental Development comprised: Lindiwe Binda, Mario Clayford, Atoko Kasongo, Lwando Kondlo, Precious Mudavanhu, Jerry Mathekga, Neo Molotja, Audrey Mahlaela, Sintu Mavi, Nokhetho Mhlanga, Nazeem Mustapha, Gerard Ralphs, Theodore Sass, Natasha Saunders, Kgabo Ramoroka, Viwe Sigenu, Moses Sithole, Anele Slater, Natalie Vlotman, Darryn Whisgary, and Luthando Zondi.

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We are most grateful for and acknowledge the cooperation of the respondents to the questionnaire.

<b>AIDS</b>	Acquired immune deficiency syndrome
<b>BERD</b>	Business expenditure on R&D
<b>CeSTII</b>	Centre for Science, Technology and Innovation Indicators
<b>DSI</b>	Department of Science and Innovation
<b>FTE</b>	Full-time equivalent
<b>GDP</b>	Gross domestic product
<b>GERD</b>	Gross domestic expenditure on R&D
<b>GOVERD</b>	Government intramural expenditure on R&D
<b>HEMIS</b>	Higher Education Management Information System
<b>HERD</b>	Expenditure on R&D in the higher education sector
<b>HIV</b>	Human immunodeficiency virus
<b>HSRC</b>	Human Sciences Research Council
<b>ICT</b>	Information and communication technologies
<b>NESTI</b>	National Experts on Science and Technology Indicators
<b>NPO</b>	Not-for-profit organisation
<b>NSI</b>	National System of Innovation
<b>NSO</b>	National Statistical Organisation
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>R&amp;D</b>	Research and experimental development
<b>RDSMS</b>	Research and Development Survey Management System
<b>SA</b>	South Africa
<b>SASQAF</b>	South African Statistical Quality Assessment Framework
<b>SOE</b>	State-owned enterprise
<b>SEO</b>	Socio-economic objective
<b>SMU</b>	Sefako Makgatho Health Sciences University
<b>SIC</b>	Standard Industrial Classification
<b>SNA</b>	System of National Accounts
<b>SPII</b>	Support Programme for Industrial Innovation
<b>Stats SA</b>	Statistics South Africa
<b>SVC</b>	Statistical value chain
<b>TB</b>	Tuberculosis
<b>VAT</b>	Value added tax

# DEFINITIONS AND DESCRIPTIONS

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

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

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

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

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

**Constant 2015 Rands** is the value of goods and services of a given year using the prices of a determined base reference year, which is 2010 in this case. These values were obtained by deflating with the GDP deflator using data published in the Statistics South Africa GDP survey P0441, 4<sup>th</sup> Quarter 2019 (Stats SA, 2021a).

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

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

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

**Gross domestic product (GDP)** is the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports. This statistic is obtained from the Statistics South Africa GDP survey P0441, 4<sup>th</sup> Quarter 2019 (Stats SA, 2021a).

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

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

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

**Master's students** refer to students doing a full research master's as well as those doing coursework plus thesis with a research component.

**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 motorcar industries. New materials include multi-functional materials, advanced materials, nano-materials, nano-composites and nanotechnology.

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

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

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

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

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

**R&D personnel** refers to all persons (irrespective of nationality) employed directly on R&D, as well as those providing direct services such as R&D managers, administrators, and clerical staff. These include emeritus professors, honorary fellows and research fellows.<sup>1</sup>

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

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

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

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

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

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

**Total employment** is the total employed labour force in the South African economy. This statistic is obtained from Stats SA Labour Force Survey series P0211 (Stats SA, 2020b) where employed persons were defined as those aged 15–64 years who, during the reference week, did any work for at least one hour, or had a job or business but were not at work (temporarily absent).

<sup>1</sup> Prior to 2016/17, R&D personnel were comprised of only South African researchers, technicians and other R&D personnel. Also, emeritus professors, honorary fellows and research fellows were not explicitly included in the estimates of R&D personnel.

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This Statistical Report presents data tables from the 2019/20 South African National Survey of Research and Experimental Development (R&D Survey). The report provides key findings of the survey with commentary, standard summary tables of the overall findings from 2019/20 and time series from previous instances of the survey. The Statistical Report is published annually, along with the Main Report, and provides selected analysis of the survey data.

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

- **The business enterprise sector**, comprising large, medium and small enterprises, including state-owned enterprises.
- **The government sector**, comprising national, provincial and local government with an R&D component; government research institutions and museums.
- **The higher education sector**, comprising all public and private higher education institutions with an R&D component.
- **The not-for-profit sector**, comprising non-governmental and other organisations formally registered as not-for-profit institutions.
- **The science council sector**, comprising the seven science councils established through Acts of Parliament.

This approach is followed to maintain consistency with the institutional sector categorisation recommended by the Organisation for Economic Co-operation and Development (OECD) in *The Measurement of Scientific and Technological Activities: Proposed Standard Practice for Surveys on Research and Experimental Development*, known as the Frascati Manual (OECD 2002, 2015). The split of government into two sectors – a government sector and a science council sector – is an adjustment for the South African situation.

This report presents R&D statistics in tables according to the following categories:

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

GDP values were obtained from the Stats SA GDP statistical release P0441 (Stats SA, 2021a) and the total employment level was taken from the Stats SA Quarterly Labour Force Survey statistical release P0211 (Stats SA, 2021b).

All financial quantities presented in this report are in current values, unless otherwise indicated. Constant 2015 Rand values were calculated using the GDP deflator.

The headline indicator of GERD/GDP has been recalculated to adjust for ongoing revisions in the Stats SA GDP<sup>2</sup> series.

The classification of main institutional sectors recommended in the System of National Accounts (EC, IMF, OECD, UN and World Bank 2009) is indicated in terms of those used in the Frascati Manual (OECD 2002, 2015). This is only used indicatively in this report to assist users of data for R&D capitalisation purposes. Full implementation of the main institutional sectors will be done once the changes published in the 7<sup>th</sup> edition of the Frascati Manual have been finalised.

Since the 2014/15 R&D Survey tables have been included to assess the R&D activities of SOEs. This aims to address the user need for this type of data.

From the 2016/17 R&D Survey onwards, the master's students category was split into two types: students doing a research master's degree and students doing a master's degree with coursework and a dissertation component. Furthermore, non-SA R&D staff were included in headcount estimates from 2016/17.

Section B provides the main findings of the survey, including commentary on key developments. Section C contains a detailed set of tables describing the survey results for 2019/20 and the preceding nine years. The description of the survey methodology is contained in section D, and the business sector questionnaire for the 2019/20 R&D Survey is reproduced in section F.

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<sup>2</sup> The R&D Survey has historically used the GDP series calculated according to the production method.

# B. KEY FINDINGS FOR 2019/20

## Gross domestic expenditure on R&D (GERD) declined in both nominal and real terms

Gross domestic expenditure on research and development (GERD) for 2019/20 was R34.485 billion. GERD in constant 2015 prices fell from R31.367 billion in 2018/19 to R28.140 billion, which represents a year-on-year change of -10.3% in 2019/20.

GERD as a percentage of gross domestic product (GDP) at current prices was 0.62% in 2019/20, which is seven basis points lower than the 0.69% recorded in 2018/19.

In accordance with the revision policy of the R&D survey, the R&D intensity series was revised to take into account the revision of the GDP series (Stats SA, 2021). The R&D expenditure in real terms was also rebased to 2015 constant prices.

Table B.1 shows the key R&D indicators for the 2017/18, 2018/19 and 2019/20 reference periods.

**Table B.1: Summary of key statistics and indicators (2017/18 to 2019/20)**

KEY INDICATOR	2017/18	2018/19	2019/20
<b>Expenditure on R&amp;D</b>			
Gross domestic expenditure on R&D (GERD) (Rm)	38 725	36 784	34 485
Business enterprise expenditure on R&D (BERD) (Rm)	15 859	14 448	10 704
Not-for-profit (NPO) expenditure on R&D (Rm)	1 216	1 486	1 510
Government expenditure on R&D (GOVERD) (Rm)	2 326	2 223	1 894
Science council (SCI) expenditure on R&D (Rm)	6 313	5 444	6 198
Higher education (HE) expenditure on R&D (HERD) (Rm)	13 010	13 183	14 179
Gross domestic expenditure on R&D in constant 2015 prices (Rm)	34 328	31 367	28 140
<b>Funding sources</b>			
Government-funded* R&D (Rm)	18 082	17 475	19 417
Business-funded R&D (Rm)	16 067	14 534	9 359
Foreign funding of R&D (Rm)	3 937	3 999	4 662
Foreign funding of BERD (Rm)	475	400	1 169
Foreign funding of NPO R&D (Rm)	866	899	941
Foreign funding of GOVERD (Rm)	472	297	134
Foreign funding of SCI R&D (Rm)	618	550	440
Foreign funding of HERD (Rm)	1 506	1 852	1 979
<b>R&amp;D personnel</b>			
Total R&D personnel (FTE**)	44 259.3	43 774.3	41 856.5
Total researchers# (FTE**)	29 515.2	29 110.8	28 358.6
Total researchers# (headcount)	61 840	62 166	62 002
Female researchers# (headcounts)	27 774	28 401	26 015
<b>Indicators computed from R&amp;D Survey</b>			
GERD as a percentage of GDP (%)	0.76	0.69	0.62
Civil GERD as a percentage of GDP (%)	0.81	0.77	0.72
Basic research (Rm)	10 224	10 364	11 043
Total R&D personnel (FTE**) per 1 000 in total employment	2.7	2.7	2.8
Total researchers# (FTE**) per 1 000 in total employment	1.8	1.8	1.9
Female researcher# headcount as a percentage of total researcher headcount (%)	44.9	45.7	42.0
<b>Indicators obtained from external data sources</b>			
Gross domestic product (GDP) level at current prices (Rm)	5 078 190	5 357 640	5 605 034
GDP (%)	1.2	1.5	0.1
SA employment ('000)	16 378	16 420	15 024

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

\*\*FTE: Full-time equivalent.

#Includes doctoral students and post-doctoral fellows. Also includes emeritus professors, research fellows and honorary research fellows (2016/17 onwards). These categories do not incur salary, but there are time and costs (included in "Other current costs") associated with them.

Note: Headcounts include non-SA R&D personnel in 2016/17. Non-South African personnel are classified as those personnel that are not citizens of South Africa but are undertaking research in South Africa for a period exceeding six months.

## Notable developments reflected in key indicators

### General economic decline

Annually, GDP decreased by 1.4 of a percentage point to 0.1% in 2019, after taking into account the revisions due to benchmarking and rebasing of the GDP series to 2015. Furthermore, employment levels decreased by 1,4 million "... largely due to losses in the number of people employed in the Finance (256 000), Community and social services (241 000), Manufacturing (230 000), Trade (186 000) and Construction (184 000) industries" (Stats SA, 2021).

### Sharp declines in the business sector

The business sector continued the downward trend in R&D expenditure evident since 2014/15, with a decrease by a relatively large amount of R3.744 billion in nominal terms (Table B.1), after the R1.411 billion decrease seen in 2018/19. The business sector also shed 4 128 R&D personnel, of which 2 301 were researchers, and 1 530 were other R&D personnel (Table C.52). The science council sector and higher education sector were insulated from the overall economic stagnation in the economy and were the only sectors that registered a nominal increase in R&D expenditure in 2019/20. The not-for-profit sector was unchanged from 2018/19 in nominal terms (Table B.1). The higher education sector increased R&D personnel by 2 369 headcounts. However, the science council sector lost 444 R&D personnel. Government departments, which include research centres, increased the level of R&D personnel employed by 247 in 2019/20 (Table C.30).

### Researcher FTEs as a proportion of employed persons relatively unchanged at 1.9 per 1000 employed

R&D personnel (inclusive of doctoral students and postdoctoral fellows at universities) decreased by 1 917.8 FTEs to 41 856.5 in 2019/20 (Table C.28). Researcher FTEs (including post-doctoral fellows and doctoral students) decreased by 752.6 FTEs from 29 110.9 to 28 358.3, and technician FTEs decreased by 189.1 to 6 879.9 in 2019/20 (Table C.28). The number of FTE researchers per 1 000 in total employment was 1.9 in 2019/20, up by just 0.1 of a percentage point (Table C.28). The relatively unchanged value of the latter indicator reflect that the decline in R&D employment occurred in tandem with the general decline in the economy. The proportion of female researchers decreased by 3.7 percentage points to 42.0% in 2019/20 (Table B.1).

### The government sector buttressed overall losses in R&D funding

The main sources of funding for R&D in South Africa are the government and business sectors. Whereas government (including science councils and university own funds) increased funding overall in 2019/20 by R1.942 billion, business decreased funding of R&D by R5.175 billion (Table C.19). Notable is that funding from abroad, which increased funding by R664 million overall, mostly to the business sector with increased funding of R768 million, at the expense of the government sector and science councils with decreased overall funding of R274 million (Table C.26).

### Financial sector and mining sector record large decreases in R&D expenditure

Within the business sector, the two industries with the largest R&D expenditure have been the financial intermediation, real estate and business services sector and the manufacturing sector (Table C.50). The financial sector decreased R&D expenditure by R2.370 billion in 2018/19 to R4.032 billion, and the mining sector decreased R&D expenditure from R1.748 billion to R686 million. Manufacturing increased slightly by R290 million to R3.457 billion in 2019/20.

The contribution of SOEs to R&D activity in the business sector increased by 1.9 percentage points to 19.2% in 2019/20, even though the R&D expenditure that SOEs contributed to the business sector decreased by R439 million (Table C.56).

### R&D continues to trend towards applied research

Applied research accounted for the majority of R&D activity at 46.6% in 2019/20. This has been the case for at least the last ten years, but basic research increased proportionally in 2019/20 to constitute 32.0% of R&D activity (Table C.6).

### The proportion of R&D performed in Gauteng continues decreasing

While most R&D activity is still performed in Gauteng, its proportion of R&D decreased substantially by R1.381 billion in 2019/20. The next two largest contributors, the Western Cape and KwaZulu-Natal provinces decreased by R53 million and R445 million, respectively.

## The social sciences and medical and health sciences continue to dominate research areas

The 2019/20 results show that the majority of R&D activity is now taking place in the medical and health sciences (21.5%) followed by the social sciences (16.9%) (Table C.14). The engineering sciences, at 13.4%, is the field of research with the third-highest R&D expenditure in South Africa.

## R&D in most priority policy areas increased

Increased funding support from government appears to have protected R&D in areas of policy priority from the overall economic decline. These include increases in biotechnology of R597 million and nanotechnology of R31 million in 2019/20 (Table C. 9). Similarly, research in environment-related areas showed gains of R235 million, open-source software research increased by R164 million, research in new materials increased expenditure by R229 million, and space science research increased R&D expenditure by R95 million. However, research money spent on communicable and non-communicable diseases (TB, HIV/AIDS and malaria) decreased by R421 million (Table C.11).



**Notes:**

- Totals in the tables may not add up to the sum of their constituent items due to rounding effects.
- Data from 2001/02 onwards may be downloaded from
  - <http://www.hsrc.ac.za/en/departments/cestii/sa-national-survey-of-research-and-experimental-development>

**C.1. General survey results****C.1.1. Expenditure on research and experimental development****Table C.1: R&D expenditure by sector (2010/11 to 2019/20)**

YEAR	GERD	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	R'000	R'000	R'000	R'000	R'000	R'000
2010/11	20 253 805	1 011 340	3 596 023	5 424 602	10 059 010	162 830
2011/12	22 209 192	1 235 669	3 729 680	6 609 216	10 464 022	170 605
2012/13	23 871 219	1 437 509	4 025 998	7 333 153	10 570 726	503 833
2013/14	25 660 573	1 697 151	4 304 556	7 292 853	11 782 848	583 165
2014/15	29 344 977	1 893 010	5 004 669	8 377 575	13 290 951	778 772
2015/16	32 336 679	2 013 021	5 740 897	9 876 623	13 814 995	891 142
2016/17	35 692 973	2 098 646	6 136 183	11 659 258	14 781 270	1 017 616
2017/18	38 724 590	2 325 875	6 313 344	13 009 876	15 859 185	1 216 310
2018/19	36 783 968	2 223 426	5 443 885	13 183 119	14 447 833	1 485 704
2019/20	34 484 862	1 893 543	6 198 363	14 178 960	10 704 481	1 509 515

The NPO sector in 2012/13 improved coverage by R281 509 contributing 1.2% of GERD. In 2015/16 the NPO sector improved coverage by R185 302 contributing 0.6% of GERD.

**Table C.2: R&D expenditure by sector, constant 2015 Rand values (2010/11 to 2019/20)**

YEAR	GERD	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	R'000	R'000	R'000	R'000	R'000	R'000
2010/11	26 339 919	1 315 240	4 676 600	7 054 653	13 081 666	211 759
2011/12	27 367 010	1 522 638	4 595 853	8 144 127	12 894 165	210 226
2012/13	28 098 548	1 692 076	4 738 958	8 631 773	12 442 685	593 056
2013/14	28 537 040	1 887 396	4 787 083	8 110 358	13 103 667	648 536
2014/15	30 972 311	1 997 987	5 282 204	8 842 156	14 028 004	821 959
2015/16	32 336 679	2 013 021	5 740 897	9 876 623	13 814 995	891 142
2016/17	33 372 836	1 962 229	5 737 315	10 901 375	13 820 449	951 469
2017/18	34 328 482	2 061 836	5 596 638	11 532 964	14 058 812	1 078 231
2018/19	31 367 131	1 896 003	4 642 214	11 241 762	12 320 234	1 266 918
2019/20	28 140 430	1 545 174	5 058 005	11 570 353	8 735 099	1 231 799

The NPO sector in 2012/13 improved coverage by R281 509 contributing 1.2% of GERD. In 2015/16 the NPO sector improved coverage by R185 302 contributing 0.6% of GERD.

**Table C.3: R&D percentage expenditure composition by sector (2010/11 to 2019/20)**

YEAR	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	%	%	%	%	%
2010/11	5.0	17.8	26.8	49.7	0.8
2011/12	5.6	16.8	29.8	47.1	0.8
2012/13	6.0	16.9	30.7	44.3	2.1
2013/14	6.6	16.8	28.4	45.9	2.3
2014/15	6.5	17.1	28.5	45.3	2.7
2015/16	6.2	17.8	30.5	42.7	2.8
2016/17	5.9	17.2	32.7	41.4	2.9
2017/18	6.0	16.3	33.6	41.0	3.1
2018/19	6.0	14.8	35.8	39.3	4.0
2019/20	5.5	18.0	41.1	31.0	4.4

**Table C.4: R&D expenditure as a percentage of GDP by sector (2010/11 to 2019/20)**

YEAR	GERD/GDP	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	%	%	%	%	%	%
2010/11	0.66	0.03	0.12	0.18	0.33	0.01
2011/12	0.67	0.04	0.11	0.20	0.31	0.01
2012/13	0.67	0.04	0.11	0.21	0.30	0.01
2013/14	0.66	0.04	0.11	0.19	0.30	0.02
2014/15	0.71	0.05	0.12	0.20	0.32	0.02
2015/16	0.73	0.05	0.13	0.22	0.31	0.02
2016/17	0.75	0.04	0.13	0.24	0.31	0.02
2017/18	0.76	0.05	0.12	0.26	0.31	0.02
2018/19	0.69	0.04	0.10	0.25	0.27	0.03
2019/20	0.62	0.03	0.11	0.25	0.19	0.03

The NPO sector in 2012/13 experienced improved coverage contributing 0.01 percentage points to NPO expenditure as a percentage of GDP. In 2015/16 the NPO sector improved coverage by R185 302 contributing a little less than 1 basis point to NPO expenditure as a percentage of GDP.

**Table C.5: R&D expenditure by type of research (2010/11 to 2019/20)**

YEAR	GERD	BASIC RESEARCH	APPLIED RESEARCH	EXPERIMENTAL DEVELOPMENT
	R'000	R'000	R'000	R'000
2010/11	20 253 804	4 848 283	8 058 799	7 346 722
2011/12	22 209 192	5 439 561	9 388 273	7 381 358
2012/13	23 871 219	6 030 827	11 064 247	6 776 146
2013/14	25 660 573	6 102 085	12 132 211	7 426 277
2014/15	29 344 977	7 133 213	14 331 016	7 880 748
2015/16	32 336 679	8 209 662	15 349 070	8 777 948
2016/17	35 692 973	9 542 644	17 061 167	9 089 162
2017/18	38 724 590	10 223 956	20 623 856	7 876 778
2018/19	36 783 968	10 364 091	19 316 433	7 103 444
2019/20	34 484 862	11 043 171	16 074 948	7 366 744

**Table C.6: Proportional R&D expenditure by type of research (2010/11 to 2019/20)**

YEAR	BASIC RESEARCH		APPLIED RESEARCH		EXPERIMENTAL DEVELOPMENT	
	%		%		%	
2010/11		23.9		39.8		36.3
2011/12		24.5		42.3		33.2
2012/13		25.3		46.3		28.4
2013/14		23.8		47.3		28.9
2014/15		24.3		48.8		26.9
2015/16		25.4		47.5		27.1
2016/17		26.7		47.8		25.5
2017/18		26.4		53.3		20.3
2018/19		28.2		52.5		19.3
2019/20		32.0		46.6		21.4

**Table C.7: R&D expenditure by accounting category (2010/11 to 2019/20)**

YEAR	CAPITAL EXPENDITURE ON R&D						CURRENT EXPENDITURE ON R&D				
	GERD	LAND: BUILDINGS AND OTHER STRUCTURES	VEHICLES, PLANT, MACHINERY, EQUIPMENT	#CAPITALISED COMPUTER SOFTWARE	TOTAL: VEHICLES, PLANT, MACHINERY, EQUIPMENT AND SOFTWARE	SUBTOTAL: CAPITAL EXPENDITURE	LABOUR COSTS	TOTAL COST OF R&D POST-GRADUATE STUDENTS	OTHER CURRENT EXPENDITURE*	SUBTOTAL: CURRENT EXPENDITURE	
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	
2010/11	20 253 805	472 205	1 714 845	0	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	0	2 215 416	2 669 737	9 534 138	1 074 207	8 931 110	19 539 455	
2012/13	23 871 219	495 842	1 747 183	0	1 747 183	2 243 025	11 922 169	1 186 653	8 519 372	21 628 194	
2013/14	25 660 573	529 575	1 857 913	0	1 857 913	2 387 488	13 304 413	1 224 611	8 744 061	23 273 085	
2014/15	29 344 977	805 961	2 311 181	0	2 311 181	3 117 142	14 443 903	1 579 088	10 204 844	26 227 835	
2015/16	32 336 679	711 631	3 008 992	0	3 008 992	3 720 622	14 781 549	1 926 301	11 908 207	28 616 057	
2016/17	35 692 973	1 274 737	2 822 229	0	2 822 229	4 096 967	16 505 080	1 928 108	13 162 819	31 596 007	
2017/18	38 724 590	1 715 060	2 385 032	0	2 385 032	4 100 092	18 757 628	1 889 065	13 977 805	34 624 498	
2018/19	36 783 968	879 489	2 393 110	0	2 393 110	3 272 599	18 112 670	1 938 984	13 459 715	33 511 369	
2019/20	34 484 862	843 941	1 733 054	135 027	1 868 080	2 712 021	15 984 538	1 969 872	13 818 431	31 772 841	

\*Includes specific categories of R&D personnel costs for 2017/18 to 2019/20.

#Capitalised computer software collected from 2019/20.

**Table C.8: Proportional R&D expenditure by accounting category (2010/11 to 2019/20)**

YEAR	CAPITAL EXPENDITURE ON R&D					CURRENT EXPENDITURE ON R&D				
	LAND: BUILDINGS AND OTHER STRUCTURES	VEHICLES, PLANT, MACHINERY, EQUIPMENT	#CAPITALISED COMPUTER SOFTWARE	TOTAL: VEHICLES, PLANT, MACHINERY, EQUIPMENT AND SOFTWARE	SUBTOTAL: CAPITAL EXPENDITURE	LABOUR COSTS	TOTAL COST OF R&D POST-GRADUATE STUDENTS	OTHER CURRENT EXPENDITURE*	SUBTOTAL: CURRENT EXPENDITURE	
	%	%	%	%	%	%	%	%	%	
2010/11	2.3	8.5	0.0	8.5	10.8	41.2	3.7	44.2	89.2	
2011/12	2.0	10.0	0.0	10.0	12.0	42.9	4.8	40.2	88.0	
2012/13	2.1	7.3	0.0	7.3	9.4	49.9	5.0	35.7	90.6	
2013/14	2.1	7.2	0.0	7.2	9.3	51.8	4.8	34.1	90.7	
2014/15	2.7	7.9	0.0	7.9	10.6	49.2	5.4	34.8	89.4	
2015/16	2.2	9.3	0.0	9.3	11.5	45.7	6.0	36.8	88.5	
2016/17	3.6	7.9	0.0	7.9	11.5	46.2	5.4	36.9	88.5	
2017/18	4.4	6.2	0.0	6.2	10.6	48.4	4.9	36.1	89.4	
2018/19	2.4	6.5	0.0	6.5	8.9	49.2	5.3	36.6	91.1	
2019/20	2.4	5.0	0.4	5.4	7.9	46.4	5.7	40.1	92.1	

\*Includes specific categories of R&D personnel costs for 2017/18 to 2019/20.

#Capitalised computer software collected from 2019/20.

**Table C.9: Expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

YEAR	GERD	BIOTECHNOLOGY	NANOTECHNOLOGY
	R'000	R'000	R'000
2010/11	20 253 805	1 142 337	414 529
2011/12	22 209 192	1 065 286	596 072
2012/13	23 871 219	1 179 478	662 634
2013/14	25 660 573	1 266 325	664 139
2014/15	29 344 977	1 576 727	818 919
2015/16	32 336 679	1 843 363	871 426
2016/17	35 692 973	1 788 728	853 121
2017/18	38 724 590	1 797 013	718 527
2018/19	36 783 968	1 862 865	824 420
2019/20	34 484 862	2 459 421	855 790

**Table C.10: Proportional expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

YEAR	BIOTECHNOLOGY	NANOTECHNOLOGY
	%	%
2010/11	5.6	2.0
2011/12	4.8	2.7
2012/13	4.9	2.8
2013/14	4.9	2.6
2014/15	5.4	2.8
2015/16	5.7	2.7
2016/17	5.0	2.4
2017/18	4.6	1.9
2018/19	5.1	2.2
2019/20	7.1	2.5

**Table C.11: R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

YEAR	GERD	OPEN-SOURCE SOFTWARE	TUBERCULOSIS (TB), HIV/AIDS, MALARIA	ENVIRONMENT / ENVIRONMENT RELATED	NEW MATERIALS	SPACE SCIENCE
	R'000	R'000	R'000	R'000	R'000	R'000
2010/11	20 253 805	157 790	2 052 521	N/A	722 167	N/A
2011/12	22 209 192	181 320	2 006 625	1 215 855	783 232	N/A
2012/13	23 871 219	211 264	2 478 422	1 051 035	1 327 832	N/A
2013/14	25 660 573	339 065	2 867 954	1 088 094	794 016	N/A
2014/15	29 344 977	818 735	3 008 176	1 996 195	1 053 783	N/A
2015/16	32 336 679	1 145 590	3 462 704	2 056 659	1 146 470	N/A
2016/17	35 692 973	826 648	3 947 430	2 452 367	1 008 578	633 930
2017/18	38 724 590	1 233 636	4 621 859	2 815 269	850 606	300 763
2018/19	36 783 968	465 624	5 105 952	3 083 232	965 820	888 214
2019/20	34 484 862	629 995	4 684 747	3 317 882	1 195 028	982 824

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.12: Proportional R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

YEAR	OPEN-SOURCE SOFTWARE	TUBERCULOSIS (TB), HIV/AIDS, MALARIA	ENVIRONMENT / ENVIRONMENT RELATED	NEW MATERIALS	SPACE SCIENCE
	%	%	%	%	%
2010/11	0.8	10.1	N/A	3.6	N/A
2011/12	0.8	9.0	5.5	3.5	N/A
2012/13	0.9	10.4	4.4	5.6	N/A
2013/14	1.3	11.2	4.2	3.1	N/A
2014/15	2.8	10.3	6.8	3.6	N/A
2015/16	3.5	10.7	6.4	3.5	N/A
2016/17	2.3	11.1	6.9	2.8	1.8
2017/18	3.2	11.9	7.3	2.2	0.8
2018/19	1.3	13.9	8.4	2.6	2.4
2019/20	1.8	13.6	9.6	3.5	2.9

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.13: R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	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	17 274 483	18 924 485	19 384 947	20 587 093	23 687 304	25 562 694	27 253 955	28 666 760	27 582 242	27 590 791
Mathematical sciences	530 693	636 153	634 658	627 017	636 084	646 870	713 360	879 045	934 136	969 234
Physical sciences	305 701	338 098	370 616	379 813	582 267	769 739	876 009	1 070 851	930 033	973 726
Chemical sciences	865 345	1 273 588	1 460 180	1 305 139	1 299 969	1 491 410	1 761 693	1 668 359	1 685 031	1 460 763
Earth sciences	403 848	409 212	499 210	498 427	690 040	635 291	780 402	766 556	826 869	1 020 560
Information, computer and communication technologies	2 808 681	2 852 251	2 000 453	1 994 502	2 946 625	3 877 852	4 494 987	4 006 992	3 636 363	3 560 762
Applied sciences and technologies	2 151 557	2 114 322	2 252 175	2 164 025	1 555 897	1 525 646	1 585 106	1 628 489	1 537 213	1 362 852
Engineering sciences	3 600 159	3 775 247	3 903 931	4 315 051	5 485 812	5 444 740	4 611 038	5 068 338	4 735 131	4 627 317
Biological sciences	1 326 076	1 350 716	1 555 035	1 578 516	1 398 611	1 452 763	1 416 454	1 562 103	1 579 782	1 685 936
Agricultural sciences	1 307 191	1 710 860	1 810 114	2 196 122	2 656 038	2 573 509	2 741 962	2 999 821	3 051 678	3 119 335
Medical and health sciences	3 461 304	3 819 180	4 107 641	4 668 417	5 459 721	6 389 455	6 868 131	7 540 190	7 793 148	7 407 626
Environmental sciences	352 139	439 719	587 113	611 007	533 065	375 455	992 281	1 125 709	435 578	602 065
Material sciences	109 551	166 411	155 379	192 199	368 315	299 069	287 507	206 687	190 551	545 685
Marine sciences	52 238	38 726	48 442	56 857	74 858	80 897	125 024	143 621	246 728	254 931
Division 2: Social sciences and humanities	2 979 322	3 284 707	4 486 272	5 073 480	5 657 674	6 773 985	8 439 018	10 057 830	9 201 726	6 894 071
Social sciences	2 512 714	2 790 339	3 999 853	4 489 054	5 000 339	6 043 806	7 495 167	9 168 767	8 238 808	5 836 521
Humanities	466 608	494 368	486 420	584 426	657 335	730 179	943 851	889 064	962 918	1 057 550
<b>Total</b>	<b>20 253 805</b>	<b>22 209 192</b>	<b>23 871 219</b>	<b>25 660 573</b>	<b>29 344 977</b>	<b>32 336 679</b>	<b>35 692 973</b>	<b>38 724 590</b>	<b>36 783 968</b>	<b>34 484 862</b>

**Table C.14: Proportional R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Division 1: Natural sciences, technology and engineering	85.3	85.2	81.2	80.2	80.7	79.1	76.4	74.0	75.0	80.0
Mathematical sciences	2.6	2.9	2.7	2.4	2.2	2.0	2.0	2.3	2.5	2.8
Physical sciences	1.5	1.5	1.6	1.5	2.0	2.4	2.5	2.8	2.5	2.8
Chemical sciences	4.3	5.7	6.1	5.1	4.4	4.6	4.9	4.3	4.6	4.2
Earth sciences	2.0	1.8	2.1	1.9	2.4	2.0	2.2	2.0	2.2	3.0
Information, computer and communication technologies	13.9	12.8	8.4	7.8	10.0	12.0	12.6	10.3	9.9	10.3
Applied sciences and technologies	10.6	9.5	9.4	8.4	5.3	4.7	4.4	4.2	4.2	4.0
Engineering sciences	17.8	17.0	16.4	16.8	18.7	16.8	12.9	13.1	12.9	13.4
Biological sciences	6.5	6.1	6.5	6.2	4.8	4.5	4.0	4.0	4.3	4.9
Agricultural sciences	6.5	7.7	7.6	8.6	9.1	8.0	7.7	7.7	8.3	9.0
Medical and health sciences	17.1	17.2	17.2	18.2	18.6	19.8	19.2	19.5	21.2	21.5
Environmental sciences	1.7	2.0	2.5	2.4	1.8	1.2	2.8	2.9	1.2	1.7
Material sciences	0.5	0.7	0.7	0.7	1.3	0.9	0.8	0.5	0.5	1.6
Marine sciences	0.3	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.7	0.7
Division 2: Social sciences and humanities	14.7	14.8	18.8	19.8	19.3	20.9	23.6	26.0	25.0	20.0
Social sciences	12.4	12.6	16.8	17.5	17.0	18.7	21.0	23.7	22.4	16.9
Humanities	2.3	2.2	2.0	2.3	2.2	2.3	2.6	2.3	2.6	3.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.15: R&D expenditure by socio-economic objectives (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVES	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1: Defence	1 341 460	1 069 289	1 351 337	1 386 428	1 826 784	1 814 789	1 629 650	2 124 098	1 571 796	1 747 323
Defence	1 341 460	1 069 289	1 351 337	1 386 428	1 826 784	1 814 789	1 629 650	2 124 098	1 571 796	1 747 323
Division 2: Economic development	11 231 879	12 174 897	12 223 017	14 166 615	15 359 534	16 644 668	18 357 187	19 528 226	17 902 898	14 919 363
Economic development unclassified	0	0	0	0	0	0	0	0	0	0
Plant production and plant primary products	1 045 114	1 137 706	1 218 852	1 739 038	1 364 018	1 426 609	1 920 246	1 701 055	1 746 483	1 879 578

SOCIO-ECONOMIC OBJECTIVES	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Animal production and animal primary products	293 873	565 729	598 602	803 403	694 423	655 059	746 579	794 314	748 145	764 501
Mineral resources (excluding energy)	1 123 063	1 065 384	1 143 762	1 351 239	1 779 068	1 759 268	1 328 413	1 256 826	1 321 249	1 259 257
Energy resources	274 220	273 390	294 820	288 314	197 072	178 434	556 147	546 831	605 311	265 828
Energy supply	623 953	676 491	509 128	590 980	778 805	636 596	730 849	853 099	927 403	1 008 795
Manufacturing	2 374 657	2 489 799	2 394 239	2 608 207	2 619 974	2 665 871	2 543 694	2 628 725	2 495 718	2 440 795
Construction	311 897	392 440	426 960	450 907	270 226	229 284	300 582	318 837	363 788	282 651
Transport	905 571	984 225	992 504	1 115 027	998 136	1 115 349	1 195 426	1 247 963	1 099 974	712 749
Information and communication services	1 104 273	1 271 591	1 159 823	1 124 614	1 661 660	2 347 021	2 694 355	2 129 740	1 768 149	1 559 066
Commercial services	1 849 534	1 866 449	1 895 734	2 443 529	2 701 523	2 789 611	3 134 235	4 448 419	3 492 749	1 269 391
Economic framework	600 662	611 868	715 759	689 386	1 331 844	1 797 751	1 997 933	2 343 788	2 147 239	2 248 020
Natural resources	725 062	839 825	872 835	961 971	962 787	1 043 816	1 208 728	1 258 630	1 186 690	1 228 735
<b>Division 3: Society</b>	<b>3 247 428</b>	<b>3 861 889</b>	<b>4 473 657</b>	<b>4 585 825</b>	<b>5 885 267</b>	<b>6 815 987</b>	<b>7 558 386</b>	<b>8 517 207</b>	<b>8 323 617</b>	<b>8 721 748</b>
Society unclassified	0	0	0	0	0	0	0	0	0	0
Health	2 089 570	2 301 764	2 942 262	2 859 623	3 638 036	4 154 557	4 733 478	5 118 330	5 675 740	5 128 170
Education and training	442 181	554 463	672 473	882 976	1 346 974	1 603 117	1 307 791	1 398 846	1 344 005	1 594 278
Social development and community services	715 677	1 005 662	858 922	843 226	900 257	1 058 313	1 517 117	2 000 031	1 303 872	1 999 300
<b>Division 4: Environment</b>	<b>735 909</b>	<b>905 570</b>	<b>979 981</b>	<b>861 976</b>	<b>1 414 524</b>	<b>1 475 053</b>	<b>2 015 344</b>	<b>2 092 706</b>	<b>2 166 332</b>	<b>1 953 590</b>
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental knowledge	310 888	398 977	443 987	388 688	828 768	853 071	969 476	1 016 592	964 261	1 029 870
Environmental aspects of development	189 344	216 406	258 144	226 299	288 823	304 008	361 391	357 509	455 915	425 587
Environmental and other aspects	235 677	290 187	277 849	246 989	296 934	317 975	684 478	718 604	746 156	498 133
<b>Division 5: Advancement of knowledge</b>	<b>3 697 128</b>	<b>4 197 547</b>	<b>4 843 227</b>	<b>4 659 729</b>	<b>4 858 868</b>	<b>5 586 182</b>	<b>6 132 406</b>	<b>6 462 352</b>	<b>6 819 325</b>	<b>7 142 838</b>
Advancement of knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural sciences, technologies and engineering	2 672 224	3 025 841	3 497 129	3 407 325	3 445 842	3 891 834	4 424 024	4 771 950	5 022 207	5 258 091
Social sciences and humanities	1 024 904	1 171 706	1 346 098	1 252 404	1 413 026	1 694 348	1 708 382	1 690 403	1 797 118	1 884 747
<b>Total</b>	<b>20 253 805</b>	<b>22 209 192</b>	<b>23 871 219</b>	<b>25 660 573</b>	<b>29 344 977</b>	<b>32 336 679</b>	<b>35 692 973</b>	<b>38 724 590</b>	<b>36 783 968</b>	<b>34 484 862</b>

**Table C.16: Proportional R&D expenditure by socio-economic objectives (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVES	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Division 1:</b>										
Defence	6.6	4.8	5.7	5.4	6.2	5.6	4.6	5.5	4.3	5.1
Defence	6.6	4.8	5.7	5.4	6.2	5.6	4.6	5.5	4.3	5.1
<b>Division 2:</b>										
Economic development	55.5	54.8	51.2	55.2	52.3	51.5	51.4	50.4	48.7	43.3
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	5.2	5.1	5.1	6.8	4.6	4.4	5.4	4.4	4.7	5.5
Animal production and animal primary products	1.5	2.5	2.5	3.1	2.4	2.0	2.1	2.1	2.0	2.2
Mineral resources (excluding energy)	5.5	4.8	4.8	5.3	6.1	5.4	3.7	3.2	3.6	3.7
Energy resources	1.4	1.2	1.2	1.1	0.7	0.6	1.6	1.4	1.6	0.8
Energy supply	3.1	3.0	2.1	2.3	2.7	2.0	2.0	2.2	2.5	2.9
Manufacturing	11.7	11.2	10.0	10.2	8.9	8.2	7.1	6.8	6.8	7.1
Construction	1.5	1.8	1.8	1.8	0.9	0.7	0.8	0.8	1.0	0.8
Transport	4.5	4.4	4.2	4.3	3.4	3.4	3.3	3.2	3.0	2.1
Information and communication services	5.5	5.7	4.9	4.4	5.7	7.3	7.5	5.5	4.8	4.5
Commercial services	9.1	8.4	7.9	9.5	9.2	8.6	8.8	11.5	9.5	3.7
Economic framework	3.0	2.8	3.0	2.7	4.5	5.6	5.6	6.1	5.8	6.5
Natural resources	3.6	3.8	3.7	3.7	3.3	3.2	3.4	3.3	3.2	3.6
<b>Division 3:</b>										
Society	16.0	17.4	18.7	17.9	20.1	21.1	21.2	22.0	22.6	25.3
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	10.3	10.4	12.3	11.1	12.4	12.8	13.3	13.2	15.4	14.9
Education and training	2.2	2.5	2.8	3.4	4.6	5.0	3.7	3.6	3.7	4.6
Social development and community services	3.5	4.5	3.6	3.3	3.1	3.3	4.3	5.2	3.5	5.8
<b>Division 4:</b>										
Environment	3.6	4.1	4.1	3.4	4.8	4.6	5.6	5.4	5.9	5.7
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental knowledge	1.5	1.8	1.9	1.5	2.8	2.6	2.7	2.6	2.6	3.0
Environmental aspects of development	0.9	1.0	1.1	0.9	1.0	0.9	1.0	0.9	1.2	1.2



SOCIO-ECONOMIC OBJECTIVES	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environmental and other aspects	1.2	1.3	1.2	1.0	1.0	1.0	1.9	1.9	2.0	1.4
Division 5: Advancement of knowledge	18.3	18.9	20.3	18.2	16.6	17.3	17.2	16.7	18.5	20.7
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	13.6	14.6	13.3	11.7	12.0	12.4	12.3	13.7	15.2
Social sciences and humanities	5.1	5.3	5.6	4.9	4.8	5.2	4.8	4.4	4.9	5.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.17: R&D expenditure by province (2010/11 to 2019/20)**

YEAR	GERD	EASTERN CAPE	FREE STATE	GAUTENG	KWAZULU-NATAL	LIMPOPO	MPUMA-LANGA	NORTHERN CAPE	NORTH-WEST	WESTERN CAPE
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
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
2012/13	23 871 219	1 463 589	1 714 473	10 602 434	3 013 372	619 437	612 031	400 974	890 364	4 554 545
2013/14	25 660 573	1 478 850	1 943 131	11 975 916	2 752 543	444 015	615 773	473 722	1 027 448	4 949 174
2014/15	29 344 977	1 734 411	1 456 461	13 686 734	3 187 481	628 607	859 201	575 584	1 402 742	5 813 758
2015/16	32 336 679	2 142 919	1 778 469	14 666 111	3 335 141	627 125	791 248	660 963	1 209 434	7 125 269
2016/17	35 692 973	2 206 473	1 834 572	16 421 582	3 639 100	728 874	699 720	532 530	1 298 778	8 331 345
2017/18	38 724 590	2 300 631	2 149 267	17 319 635	4 172 713	854 885	715 616	576 963	1 306 478	9 328 402
2018/19	36 783 968	2 211 524	1 976 953	15 767 101	4 074 154	806 624	853 859	905 844	1 682 406	8 505 504
2019/20	34 484 862	2 091 071	1 711 039	14 385 849	3 629 403	772 074	841 877	900 545	1 700 184	8 452 820

**Table C.18: Proportional R&D expenditure by province (2010/11 to 2019/20)**

YEAR	EASTERN CAPE	FREE STATE	GAUTENG	KWAZULU-NATAL	LIMPOPO	MPUMA-LANGA	NORTHERN CAPE	NORTH-WEST	WESTERN CAPE
	%	%	%	%	%	%	%	%	%
2010/11	5.2	6.6	48.3	11.3	2.0	2.0	1.2	2.6	20.9
2011/12	5.8	7.7	46.8	11.3	2.6	2.4	1.5	3.3	18.6
2012/13	6.1	7.2	44.4	12.6	2.6	2.6	1.7	3.7	19.1
2013/14	5.8	7.6	46.7	10.7	1.7	2.4	1.8	4.0	19.3
2014/15	5.9	5.0	46.6	10.9	2.1	2.9	2.0	4.8	19.8
2015/16	6.6	5.5	45.4	10.3	1.9	2.4	2.0	3.7	22.0
2016/17	6.2	5.1	46.0	10.2	2.0	2.0	1.5	3.6	23.3
2017/18	5.9	5.6	44.7	10.8	2.2	1.8	1.5	3.4	24.1
2018/19	6.0	5.4	42.9	11.1	2.2	2.3	2.5	4.6	23.1
2019/20	6.1	5.0	41.7	10.5	2.2	2.4	2.6	4.9	24.5

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

**Table C.19: Funding for R&D by source (2010/11 to 2019/20)**

YEAR	TOTAL FUNDS	GOVERNMENT*	BUSINESS	OTHER SOUTH AFRICAN SOURCES**	FOREIGN SOURCES
	R'000	R'000	R'000	R'000	R'000
2010/11	20 253 805	9 018 874	8 128 246	661 676	2 445 009
2011/12	22 209 192	9 561 917	8 663 105	653 674	3 330 496
2012/13	23 871 219	10 831 893	9 152 042	770 300	3 116 984
2013/14	25 660 573	11 007 083	10 615 902	722 361	3 315 227
2014/15	29 344 977	12 873 458	11 981 974	923 530	3 566 015
2015/16	32 336 679	14 425 992	12 578 499	1 122 328	4 209 861
2016/17	35 692 973	16 427 596	14 045 892	1 047 980	4 171 507
2017/18	38 724 590	18 082 182	16 066 846	638 858	3 936 705
2018/19	36 783 968	17 475 173	14 534 123	775 938	3 998 734
2019/20	34 484 862	19 416 933	9 358 770	1 046 861	4 662 299

\*Includes science council and university own funds.

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

**Table C.20: Proportional funding for R&D by source (2010/11 to 2019/20)**

YEAR	GOVERNMENT*	BUSINESS	OTHER SOUTH AFRICAN SOURCES**	FOREIGN SOURCES
	%	%	%	%
2010/11	44.5	40.1	3.3	12.1
2011/12	43.1	39.0	2.9	15.0
2012/13	45.4	38.3	3.2	13.1
2013/14	42.9	41.4	2.8	12.9
2014/15	43.9	40.8	3.1	12.2
2015/16	44.6	38.9	3.5	13.0
2016/17	46.0	39.4	2.9	11.7
2017/18	46.7	41.5	1.6	10.2
2018/19	47.5	39.5	2.1	10.9
2019/20	56.3	27.1	3.0	13.5

\*Includes science council and university own funds.

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

**Table C.21: Sources of R&D funding by sector, amount and as a percentage of total funds (2019/20)**

SOURCE OF FUNDS	TOTAL		GOVERNMENT		SCIENCE COUNCILS		HIGHER EDUCATION		BUSINESS		NOT-FOR-PROFIT	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
Own funds	18 222 458	52.8	1 341 465	70.8	259 487	4.2	7 949 876	56.1	8 438 700	78.8	232 930	15.4
Internal sources	18 222 458	52.8	1 341 465	70.8	259 487	4.2	7 949 876	56.1	8 438 700	78.8	232 930	15.4
Government	9 866 105	28.6	341 019	18.0	5 233 865	84.4	3 430 499	24.2	648 604	6.1	212 118	14.1
Grants	3 752 950	10.9	332 418	17.6	2 984 692	48.2	N/A	N/A	338 815	3.2	97 025	6.4
Contracts	2 682 656	7.8	8 601	0.5	2 249 173	36.3	N/A	N/A	309 789	2.9	115 093	7.6
All other	3 430 499	9.9	N/A	N/A	N/A	N/A	3 430 499	24.2	N/A	N/A	N/A	N/A
Business	920 070	2.7	42 664	2.3	191 520	3.1	519 848	3.7	103 073	1.0	62 965	4.2
Local business	920 070	2.7	42 664	2.3	191 520	3.1	519 848	3.7	103 073	1.0	62 965	4.2
Other SA sources	813 931	2.4	34 563	1.8	73 717	1.2	299 365	2.1	345 445	3.2	60 842	4.0
Higher education	165 012	0.5	4 311	0.2	19 012	0.3	110 456	0.8	0	0.0	31 233	2.1
Not-for-profit	560 525	1.6	21 900	1.2	54 705	0.9	116 830	0.8	344 619	3.2	22 471	1.5
Individual donations	88 394	0.3	8 352	0.4	0	0.0	72 079	0.5	826	0.0	7 138	0.5
Foreign	4 662 299	13.5	133 832	7.1	439 774	7.1	1 979 372	14.0	1 168 659	10.9	940 661	62.3
*All sources	4 662 299	13.5	133 832	7.1	439 774	7.1	1 979 372	14.0	1 168 659	10.9	940 661	62.3
<b>Total</b>	<b>34 484 862</b>	<b>100.0</b>	<b>1 893 543</b>	<b>100.0</b>	<b>6 198 363</b>	<b>100.0</b>	<b>14 178 960</b>	<b>100.0</b>	<b>10 704 481</b>	<b>100.0</b>	<b>1 509 515</b>	<b>100.0</b>

N/A indicates that data were not collected.

\*Refers to all funds for R&D from outside South Africa

**Table C.22: \*Government-funded R&D by sector (2010/11 to 2019/20)**

YEAR	TOTAL	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	R'000	R'000	R'000	R'000	R'000	R'000
2010/11	9 018 874	990 290	2 932 489	4 222 092	832 173	41 830
2011/12	9 561 917	1 112 307	3 310 894	4 598 426	499 298	40 992
2012/13	10 831 893	1 269 337	3 368 555	5 395 871	683 669	114 461
2013/14	11 007 083	1 436 141	3 412 790	5 369 334	685 670	103 148
2014/15	12 873 458	1 711 809	4 319 393	6 020 572	690 396	131 288
2015/16	14 425 992	1 425 598	4 922 223	7 393 857	522 631	161 682
2016/17	16 427 596	1 530 964	5 076 805	9 222 246	453 958	143 623
2017/18	18 082 182	1 769 929	5 311 190	10 486 989	371 165	142 908
2018/19	17 475 173	1 898 230	4 644 414	10 501 066	214 541	216 922
2019/20	19 416 933	1 682 484	5 493 352	11 380 375	648 604	212 118

\*Includes science council and university own funds.

**Table C.23: \*Proportional government-funded R&D by sector (2010/11 to 2019/20)**

YEAR	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	%	%	%	%	%
2010/11	11.0	32.5	46.8	9.2	0.5
2011/12	11.6	34.6	48.1	5.2	0.4
2012/13	11.7	31.1	49.8	6.3	1.1
2013/14	13.0	31.0	48.8	6.2	0.9
2014/15	13.3	33.6	46.8	5.4	1.0
2015/16	9.9	34.1	51.3	3.6	1.1
2016/17	9.3	30.9	56.1	2.8	0.9
2017/18	9.8	29.4	58.0	2.1	0.8
2018/19	10.9	26.6	60.1	1.2	1.2
2019/20	8.7	28.3	58.6	3.3	1.1

\*Includes science council and university own funds.

**Table C.24: Business-funded R&D by sector (2010/11 to 2019/20)**

YEAR	TOTAL	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	R'000	R'000	R'000	R'000	R'000	R'000
2010/11	8 128 246	2 406	198 206	367 340	7 528 667	31 627
2011/12	8 663 105	1 355	67 614	505 510	8 056 545	32 081
2012/13	9 152 042	11 552	135 729	577 527	8 402 340	24 894
2013/14	10 615 902	1 759	419 469	588 598	9 552 717	53 359
2014/15	11 981 974	290	222 892	885 280	10 810 428	63 084
2015/16	12 578 499	41 109	326 648	770 448	11 384 710	55 585
2016/17	14 045 892	1 261	483 166	906 651	12 586 109	68 705
2017/18	16 066 846	519	354 820	679 563	14 963 198	68 747
2018/19	14 534 123	4 614	206 648	463 413	13 787 512	71 937
2019/20	9 358 770	42 664	191 520	519 848	8 541 773	62 965

**Table C.25: Proportional business-funded R&D by sector (2010/11 to 2019/20)**

YEAR	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	%	%	%	%	%
2010/11	0.0	2.4	4.5	92.6	0.4
2011/12	0.0	0.8	5.8	93.0	0.4
2012/13	0.1	1.5	6.3	91.8	0.3
2013/14	0.0	4.0	5.5	90.0	0.5
2014/15	0.0	1.9	7.4	90.2	0.5
2015/16	0.3	2.6	6.1	90.5	0.4
2016/17	0.0	3.4	6.5	89.6	0.5
2017/18	0.0	2.2	4.2	93.1	0.4
2018/19	0.0	1.4	3.2	94.9	0.5
2019/20	0.5	2.0	5.6	91.3	0.7

**Table C.26: Foreign-funded R&D by sector (2010/11 to 2019/20)**

YEAR	TOTAL	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	R'000	R'000	R'000	R'000	R'000	R'000
2010/11	2 445 009	16 236	460 580	473 145	1 442 334	52 714
2011/12	3 330 496	118 127	321 257	1 272 173	1 562 277	56 662
2012/13	3 116 984	143 994	510 846	1 010 244	1 189 865	262 035
2013/14	3 315 227	258 531	454 527	1 042 627	1 226 966	332 576
2014/15	3 566 015	179 473	431 215	1 079 732	1 418 823	456 772
2015/16	4 209 861	499 966	469 507	1 206 192	1 532 766	501 430
2016/17	4 171 507	512 090	537 503	1 143 451	1 338 662	639 801
2017/18	3 936 705	471 786	617 838	1 506 077	474 762	866 241
2018/19	3 998 734	296 918	550 456	1 851 900	400 462	898 998
2019/20	4 662 299	133 832	439 774	1 979 372	1 168 659	940 661

**Table C.27: Proportional foreign-funded R&D by sector (2010/11 to 2019/20)**

YEAR	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
	%	%	%	%	%
2010/11	0.7	18.8	19.4	59.0	2.2
2011/12	3.5	9.6	38.2	46.9	1.7
2012/13	4.6	16.4	32.4	38.2	8.4
2013/14	7.8	13.7	31.4	37.0	10.0
2014/15	5.0	12.1	30.3	39.8	12.8
2015/16	11.9	11.2	28.7	36.4	11.9
2016/17	12.3	12.9	27.4	32.1	15.3
2017/18	12.0	15.7	38.3	12.1	22.0
2018/19	7.4	13.8	46.3	10.0	22.5
2019/20	2.9	9.4	42.5	25.1	20.2

### C.1.3. R&D personnel

**Table C.28: R&D personnel in headcounts and full-time equivalents by occupation (2010/11 to 2019/20)**

YEAR	R&D PERSONNEL			RESEARCHERS			TECHNICIANS		OTHER R&D PERSONNEL	
	(HEAD-COUNTS*)	(FTEs)	(FTEs) PER 1000 IN TOTAL EMPLOYMENT	(HEAD-COUNTS*)	(FTEs)	(FTEs) PER 1000 IN TOTAL EMPLOYMENT	(HEAD-COUNTS)	(FTEs)	(HEAD-COUNTS)	(FTEs)
2010/11	55 531	29 486.4	2.2	37 901	18 719.6	1.4	8 559	5 409.6	9 071	5 357.3
2011/12	59 487	30 978.4	2.3	40 653	20 115.1	1.5	9 260	5 566.9	9 574	5 296.5
2012/13	64 917	35 050.3	2.4	42 828	21 382.4	1.5	10 790	6 582.3	11 299	7 085.5
2013/14	68 838	37 956.5	2.5	45 935	23 346.0	1.6	10 800	6 905.5	12 103	7 705.0
2014/15	72 400	38 465.0	2.5	48 479	23 571.9	1.5	12 183	7 731.3	11 738	7 161.9
2015/16	74 931	41 054.5	2.6	51 877	26 159.4	1.7	11 518	7 688.3	11 536	7 206.9
2016/17	80 029	42 533.0	2.6	56 761	27 656.2	1.7	11 346	7 563.1	11 922	7 313.6
2017/18	84 262	44 259.3	2.7	61 840	29 515.2	1.8	11 219	7 383.3	11 203	7 360.8
2018/19	84 036	43 774.3	2.7	62 166	29 110.8	1.8	10 545	7 069.0	11 325	7 594.5
2019/20	82 068	41 856.5	2.8	62 002	28 358.3	1.9	10 080	6 879.9	9 986	6 618.0

\*Includes doctoral students and post-doctoral fellows. Also includes specific categories of R&D personnel (from 2016/17).

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.29: R&D personnel in headcounts (\*including and \*\*excluding doctoral and post-doctoral students) and full-time equivalents by occupation and gender (2017/18 to 2019/20)**

YEAR	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS
<b>2017/18</b>							
Researchers*	61 840	34 066	27 774	29 515.2	16 404.3	13 111.0	47.7
Technicians directly supporting R&D	11 219	6 673	4 546	7 383.3	4 289.6	3 093.7	65.8
Other personnel directly supporting R&D	11 203	5 580	5 623	7 360.8	3 870.4	3 490.5	65.7
<b>Total</b>	<b>84 262</b>	<b>46 319</b>	<b>37 943</b>	<b>44 259.3</b>	<b>24 564.2</b>	<b>19 695.1</b>	<b>52.5</b>
Researchers**	36 233	19 800	16 433	14 559.6	8 008.6	6 551.0	40.2
Technicians directly supporting R&D	11 219	6 673	4 546	7 383.3	4 289.6	3 093.7	65.8
Other personnel directly supporting R&D	11 203	5 580	5 623	7 360.8	3 870.4	3 490.5	65.7
<b>Total</b>	<b>58 655</b>	<b>32 053</b>	<b>26 602</b>	<b>29 303.6</b>	<b>16 168.5</b>	<b>13 135.1</b>	<b>50.0</b>
<b>2018/19</b>							
Researchers*	62 166	33 765	28 401	29 110.8	16 005.1	13 105.8	46.8
Technicians directly supporting R&D	10 545	6 270	4 275	7 069.0	4 036.1	3 032.9	67.0
Other personnel directly supporting R&D	11 325	5 473	5 852	7 594.5	3 660.9	3 933.6	67.1
<b>Total</b>	<b>84 036</b>	<b>45 508</b>	<b>38 528</b>	<b>43 774.3</b>	<b>23 702.0</b>	<b>20 072.3</b>	<b>52.1</b>
Researchers**	35 597	19 116	16 481	13 527.4	7 273.6	6 253.7	38.0
Technicians directly supporting R&D	10 545	6 270	4 275	7 069.0	4 036.1	3 032.9	67.0
Other personnel directly supporting R&D	11 325	5 473	5 852	7 594.5	3 660.9	3 933.6	67.1
<b>Total</b>	<b>57 467</b>	<b>30 859</b>	<b>26 608</b>	<b>28 190.8</b>	<b>14 970.6</b>	<b>13 220.2</b>	<b>49.1</b>
<b>2019/20</b>							
Researchers*	62 002	33 379	28 623	28 358.6	15 469.8	12 888.5	45.7
Technicians directly supporting R&D	10 080	5 710	4 370	6 879.9	3 641.2	3 238.7	68.3
Other personnel directly supporting R&D	9 986	4 152	5 834	6 618.0	2 779.5	3 838.5	66.3
<b>Total</b>	<b>82 068</b>	<b>43 241</b>	<b>38 827</b>	<b>41 856.5</b>	<b>21 890.6</b>	<b>19 965.7</b>	<b>51.0</b>
Researchers**	34 358	18 547	15 811	12 370.9	6 712.9	5 658.0	36.0
Technicians directly supporting R&D	10 080	5 710	4 370	6 879.9	3 641.2	3 238.7	68.3
Other personnel directly supporting R&D	9 986	4 152	5 834	6 618.0	2 779.5	3 838.5	66.3
<b>Total</b>	<b>54 424</b>	<b>28 409</b>	<b>26 015</b>	<b>25 868.8</b>	<b>13 133.7</b>	<b>12 735.1</b>	<b>47.5</b>

\*Includes doctoral students and post-doctoral fellows. Also includes specific categories of R&D personnel (from 2016/17).

\*\*Excluding doctoral and post-doctoral students. Also includes specific categories of R&D personnel (from 2016/17).

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.30: R&D personnel in headcounts by sector (2010/11 to 2019/20)**

YEAR	TOTAL R&D PERSONNEL (HEADCOUNTS*)	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2010/11	55 531	2 704	4 923	32 571	14 933	400
2011/12	59 487	3 143	4 494	36 157	15 288	405
2012/13	64 917	3 252	5 399	38 205	17 155	906
2013/14	68 838	2 874	5 884	41 464	17 599	1 017
2014/15	72 400	2 893	4 836	44 457	18 743	1 471
2015/16	74 931	2 997	5 162	48 034	17 245	1 493
2016/17	80 029	3 076	4 955	52 384	17 998	1 616
2017/18	84 262	3 027	4 866	57 074	17 554	1 741
2018/19	84 036	2 910	4 514	57 799	16 876	1 937
2019/20	82 068	3 157	4 070	60 168	12 748	1 925

\*Includes doctoral students and post-doctoral fellows. Also includes specific categories of R&D personnel (from 2016/17).

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.31: R&D personnel full-time equivalents by sector (2010/11 to 2019/20)**

YEAR	TOTAL R&D PERSONNEL* (FTEs)	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2010/11	29 486.4	2 178.6	4 312.4	12 477.3	10 205.1	313.1
2011/12	30 978.4	2 404.5	3 803.5	14 563.4	9 894.9	312.1
2012/13	35 050.3	2 597.0	4 748.5	15 614.4	11 322.3	768.0
2013/14	37 956.5	2 245.5	5 164.5	17 777.7	11 877.4	891.4
2014/15	38 465.0	2 181.5	4 180.4	17 944.4	12 927.5	1 231.2
2015/16	41 054.5	2 056.2	4 361.2	20 812.0	12 457.8	1 367.3
2016/17	42 533.0	2 031.6	4 421.4	22 061.4	12 549.2	1 469.5
2017/18	44 259.3	2 000.4	4 294.9	23 415.1	12 952.9	1 596.0
2018/19	43 774.3	1 999.0	3 941.8	24 456.8	11 691.0	1 685.8
2019/20	41 856.5	2 173.1	3 562.8	25 109.7	9 300.8	1 710.1

\*Includes doctoral students and post-doctoral fellows. Also includes specific categories of R&D personnel (2016/17 only).

Note: Headcounts include non-SA R&D personnel (2016/17 only). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.32: Researcher headcounts by sector (2010/11 to 2019/20)**

YEAR	TOTAL RESEARCHERS (HEADCOUNTS*)	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION	BUSINESS	NOT-FOR-PROFIT
2010/11	37 901	1 184	1 941	28 154	6 372	250
2011/12	40 653	1 411	1 803	30 993	6 192	254
2012/13	42 828	1 409	1 879	32 955	6 191	394
2013/14	45 935	1 229	1 956	36 133	6 182	435
2014/15	48 479	1 343	1 988	38 381	6 261	506
2015/16	51 877	1 573	2 072	41 639	6 128	465
2016/17	56 761	1 677	2 189	46 028	6 463	404
2017/18	61 840	1 671	2 053	50 549	7 142	425
2018/19	62 166	1 662	1 951	51 187	6 942	424
2019/20	62 002	1 742	1 858	53 371	4 641	390

\*Includes doctoral students and post-doctoral fellows. Also includes specific categories of R&D personnel (from 2016/17).

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.33: Researcher headcounts by gender (2010/11 to 2019/20)**

YEAR	TOTAL RESEARCHERS* (HEADCOUNTS)	MALE	FEMALE
2010/11	25 300	14 823	10 477
2011/12	25 954	15 065	10 889
2012/13	27 314	15 378	11 936
2013/14	28 014	15 520	12 494
2014/15	28 723	15 824	12 899
2015/16	29 455	16 150	13 305
2016/17	33 035	17 957	15 078
2017/18	36 233	19 800	16 433
2018/19	35 597	19 116	16 481
2019/20	34 358	18 547	15 811

\*Excludes doctoral students and post-doctoral fellows. Researchers includes specific categories of R&D personnel (from 2016/17).

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.34: Researcher headcounts by race (2010/11 to 2019/20)**

YEAR	TOTAL RESEARCHERS* (HEADCOUNTS)	AFRICAN	COLOURED	INDIAN/ASIAN	WHITE	NON-SA
2010/11	25 300	6 756	1 316	2 438	14 789	N/A
2011/12	25 954	7 201	1 438	2 202	15 113	N/A
2012/13	27 314	8 101	1 591	2 514	15 108	N/A
2013/14	28 014	8 024	1 685	2 530	15 775	N/A
2014/15	28 723	8 468	1 815	2 522	15 919	N/A
2015/16	29 454	9 548	1 881	2 629	15 396	N/A
2016/17	33 035	9 968	1 957	2 921	15 151	3 038
2017/18	36 233	10 815	2 209	3 352	15 795	4 062
2018/19	35 597	10 572	2 099	3 370	14 890	4 667
2019/20	34 358	10 724	1 968	3 191	14 224	4 251

\*Excludes doctoral students and post-doctoral fellows. Researchers includes specific categories of R&D personnel (from 2016/17). Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA. N/A: data was not collected for these years.

**Table C.35: R&D personnel (\*including doctoral and post-doctoral students) in headcounts**

OCCUPATION AND QUALIFICATION	TOTAL R&D PERSONNEL (HEADCOUNTS)	SUBTOTAL		AFRICAN		COLOURED		INDIAN/ASIAN		WHITE		NON-SA	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers*	62 002	33 379	28 623	9 980	9 083	1 472	1 668	1 961	2 598	9 959	9 698	10 007	5 576
Doctoral degree or equivalent	42 354	23 196	19 158	6 197	5 325	947	1 019	1 071	1 535	5 764	6 183	9 217	5 096
Master's, honours, bachelor or equivalent	16 558	8 630	7 928	3 211	3 097	448	540	781	911	3 529	2 995	661	385
Diplomas	3 090	1 553	1 537	572	661	77	109	109	152	666	520	129	95
Technicians directly supporting R&D	10 080	5 710	4 370	2 392	2 519	680	449	380	325	2 089	950	169	127
Doctoral degree or equivalent	310	153	157	29	23	9	6	6	16	79	79	30	33
Master's, honours, bachelor or equivalent	3 837	2 062	1 775	809	865	179	202	171	192	828	481	75	35
Diplomas	5 933	3 495	2 438	1 554	1 631	492	241	203	117	1 182	390	64	59
Other personnel directly supporting R&D	9 986	4 152	5 834	2 240	2 880	538	1 017	171	250	900	1 434	303	253
Doctoral degree or equivalent	340	151	189	45	44	11	24	9	14	61	85	25	22
Master's, honours, bachelor or equivalent	2 908	1 073	1 835	452	777	105	228	69	116	328	608	119	106
Diplomas	6 738	2 928	3 810	1 743	2 059	422	765	93	120	511	741	159	125
<b>Total</b>	<b>82 068</b>	<b>43 241</b>	<b>38 827</b>	<b>14 612</b>	<b>14 482</b>	<b>2 690</b>	<b>3 134</b>	<b>2 512</b>	<b>3 173</b>	<b>12 948</b>	<b>12 082</b>	<b>10 479</b>	<b>5 956</b>

\*Researchers includes specific categories of R&D personnel (from 2016/17). To enable comparison, the table below excludes doctoral students and post-doctoral fellows from the Researchers indicator, as well as provides a total for this modified Researchers value, including Technicians directly supporting R&D (unchanged) and Other personnel directly supporting R&D (unchanged). Note: Non-SA student data are not collected by population group. Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA. \*\*Total may vary due to extrapolations.

OCCUPATION AND QUALIFICATION	TOTAL R&D PERSONNEL (HEADCOUNTS)	SUBTOTAL		AFRICAN		COLOURED		INDIAN/ASIAN		WHITE		NON-SA	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers*	34 358	18 547	15 811	5 656	5 068	925	1 043	1 467	1 724	7 541	6 683	2 958	1 293
Doctoral degree or equivalent	14 710	8 364	6 346	1 873	1 310	400	394	577	661	3 346	3 168	2 168	813
Master's, honours, bachelor or equivalent	16 558	8 630	7 928	3 211	3 097	448	540	781	911	3 529	2 995	661	385
Diplomas	3 090	1 553	1 537	572	661	77	109	109	152	666	520	129	95
Technicians directly supporting R&D	10 080	5 710	4 370	2 392	2 519	680	449	380	325	2 089	950	169	127
Other personnel directly supporting R&D	9 986	4 152	5 834	2 240	2 880	538	1 017	171	250	900	1 434	303	253
<b>Total</b>	<b>54 424</b>	<b>28 409</b>	<b>26 015</b>	<b>10 288</b>	<b>10 467</b>	<b>2 143</b>	<b>2 509</b>	<b>2 018</b>	<b>2 299</b>	<b>10 530</b>	<b>9 067</b>	<b>3 430</b>	<b>1 673</b>



## C.2. Sector tables

### C.2.1. Business sector

**Table C.36: Business sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11 R'000	2011/12 R'000	2012/13 R'000	2013/14 R'000	2014/15 R'000	2015/16 R'000	2016/17 R'000	2017/18 R'000	2018/19 R'000	2019/20 R'000
Basic research	1 025 389	922 888	802 753	968 504	845 527	906 730	909 278	1 021 152	948 319	758 971
Applied research	3 949 410	4 461 770	5 569 024	6 087 791	7 541 596	7 492 229	8 389 888	10 551 512	9 819 344	6 218 563
Experimental development research	5 084 210	5 079 364	4 198 949	4 726 553	4 903 827	5 416 037	5 482 104	4 286 521	3 680 170	3 726 947
<b>Total</b>	<b>10 059 010</b>	<b>10 464 022</b>	<b>10 570 726</b>	<b>11 782 848</b>	<b>13 290 951</b>	<b>13 814 995</b>	<b>14 781 270</b>	<b>15 859 185</b>	<b>14 447 833</b>	<b>10 704 481</b>

**Table C.37: Proportional business sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11 %	2011/12 %	2012/13 %	2013/14 %	2014/15 %	2015/16 %	2016/17 %	2017/18 %	2018/19 %	2019/20 %
Basic research	10.2	8.8	7.6	8.2	6.4	6.6	6.2	6.4	6.6	7.1
Applied research	39.3	42.6	52.7	51.7	56.7	54.2	56.8	66.5	68.0	58.1
Experimental development research	50.5	48.5	39.7	40.1	36.9	39.2	37.1	27.0	25.5	34.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.38: Business sector R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11 R'000	2011/12 R'000	2012/13 R'000	2013/14 R'000	2014/15 R'000	2015/16 R'000	2016/17 R'000	2017/18 R'000	2018/19 R'000	2019/20 R'000
Capital expenditure	1 306 444	1 650 541	1 072 556	1 132 520	1 397 243	1 289 228	1 727 929	1 421 699	1 545 944	984 728
Land: buildings & other structures	202 835	217 126	140 053	159 162	117 656	186 396	288 957	270 191	370 231	343 953
TOTAL: Vehicles, plant, machinery, equipment and software	1 103 609	1 433 415	932 503	973 358	1 279 587	1 102 833	1 438 972	1 151 508	1 175 713	640 776
Vehicles, plant, machinery, equipment	1 103 609	1 433 415	932 503	973 358	1 279 587	1 102 833	1 438 972	1 151 508	1 175 713	584 324
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	56 452
Current expenditure	8 752 566	8 813 481	9 498 170	10 650 328	11 893 708	12 525 767	13 053 341	14 437 485	12 901 890	9 719 752
Labour costs	4 467 214	4 723 488	5 821 884	6 768 527	7 659 365	7 821 865	8 486 640	9 747 037	8 612 310	5 992 573
Other current expenditure	4 285 352	4 089 993	3 676 286	3 881 801	4 234 343	4 703 901	4 566 701	4 690 449	4 289 579	3 727 179
<b>Total</b>	<b>10 059 010</b>	<b>10 464 022</b>	<b>10 570 726</b>	<b>11 782 848</b>	<b>13 290 951</b>	<b>13 814 995</b>	<b>14 781 270</b>	<b>15 859 185</b>	<b>14 447 833</b>	<b>10 704 481</b>

\*Capitalised computer software collected from 2019/20.

**Table C.39: Proportional business sector R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Capital expenditure	13.0	15.8	10.1	9.6	10.5	9.3	11.7	9.0	10.7	9.2
Land: buildings & other structures	2.0	2.1	1.3	1.4	0.9	1.3	2.0	1.7	2.6	3.2
TOTAL: Vehicles, plant, machinery, equipment and software	11.0	13.7	8.8	8.3	9.6	8.0	9.7	7.3	8.1	6.0
Vehicles, plant, machinery, equipment	11.0	13.7	8.8	8.3	9.6	8.0	9.7	7.3	8.1	5.5
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.5
Current expenditure	87.0	84.2	89.9	90.4	89.5	90.7	88.3	91.0	89.3	90.8
Labour costs	44.4	45.1	55.1	57.4	57.6	56.6	57.4	61.5	59.6	56.0
Other current expenditure	42.6	39.1	34.8	32.9	31.9	34.0	30.9	29.6	29.7	34.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\*Capitalised computer software collected from 2019/20.

**Table C.40: Business sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Biotechnology	341 695	422 121	499 589	556 275	578 747	729 299	685 170	721 698	702 168	992 682
Nanotechnology	102 670	171 808	225 557	170 479	217 216	134 063	268 320	113 260	155 956	77 163
<b>Total</b>	<b>444 366</b>	<b>593 929</b>	<b>725 145</b>	<b>726 754</b>	<b>795 963</b>	<b>863 362</b>	<b>953 490</b>	<b>834 958</b>	<b>858 124</b>	<b>1 069 845</b>
Business expenditure on R&D	10 059 010	10 464 022	10 570 726	11 782 848	13 290 951	13 814 995	14 781 270	15 859 185	14 447 833	10 704 481

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

**Table C.41: Proportional business sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Biotechnology	3.4	4.0	4.7	4.7	4.4	5.3	4.6	4.6	4.9	9.3
Nanotechnology	1.0	1.6	2.1	1.4	1.6	1.0	1.8	0.7	1.1	0.7
<b>Total</b>	<b>4.4</b>	<b>5.7</b>	<b>6.9</b>	<b>6.2</b>	<b>6.0</b>	<b>6.2</b>	<b>6.5</b>	<b>5.3</b>	<b>5.9</b>	<b>10.0</b>

**Table C.42: Business sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11 R'000	2011/12 R'000	2012/13 R'000	2013/14 R'000	2014/15 R'000	2015/16 R'000	2016/17 R'000	2017/18 R'000	2018/19 R'000	2019/20 R'000
Environment related	N/A	31 349	183 921	228 905	176 463	173 356	280 651	377 030	472 759	532 424
Open-source software	68 105	85 787	87 200	233 576	241 710	326 856	207 849	193 239	154 894	176 450
New materials	227 682	277 152	225 897	151 890	245 752	224 433	179 108	186 858	268 298	447 596
Tuberculosis, HIV/AIDS, malaria	631 996	812 580	929 121	992 538	1 082 646	1 176 149	1 153 668	1 332 248	1 801 869	1 347 208
Space science	N/A	N/A	N/A	N/A	N/A	N/A	33 099	42 291	47 018	19 990
<b>Total</b>	<b>927 783</b>	<b>1 206 869</b>	<b>1 426 139</b>	<b>1 606 909</b>	<b>1 746 571</b>	<b>1 900 794</b>	<b>1 854 375</b>	<b>2 131 666</b>	<b>2 744 839</b>	<b>2 523 667</b>
<b>Business expenditure on R&amp;D</b>	<b>10 059 010</b>	<b>10 464 022</b>	<b>10 570 726</b>	<b>11 782 848</b>	<b>13 290 951</b>	<b>13 814 995</b>	<b>14 781 270</b>	<b>15 859 185</b>	<b>14 447 833</b>	<b>10 704 481</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.43: Proportional business sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11 %	2011/12 %	2012/13 %	2013/14 %	2014/15 %	2015/16 %	2016/17 %	2017/18 %	2018/19 %	2019/20 %
Environment related	N/A	0.3	1.7	1.9	1.3	1.3	1.9	2.4	3.3	5.0
Open-source software	0.7	0.8	0.8	2.0	1.8	2.4	1.4	1.2	1.1	1.6
New materials	2.3	2.6	2.1	1.3	1.8	1.6	1.2	1.2	1.9	4.2
Tuberculosis, HIV/AIDS, malaria	6.3	7.8	8.8	8.4	8.1	8.5	7.8	8.4	12.5	12.6
Space science	N/A	N/A	N/A	N/A	N/A	N/A	0.2	0.3	0.3	0.2
<b>Total</b>	<b>9.2</b>	<b>11.5</b>	<b>13.5</b>	<b>13.6</b>	<b>13.1</b>	<b>13.8</b>	<b>12.5</b>	<b>13.4</b>	<b>19.0</b>	<b>23.6</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.44: Business sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11 R'000	2011/12 R'000	2012/13 R'000	2013/14 R'000	2014/15 R'000	2015/16 R'000	2016/17 R'000	2017/18 R'000	2018/19 R'000	2019/20 R'000
Division 1: Natural sciences, technology and engineering	9 612 221	9 992 916	9 127 446	9 765 859	10 977 250	11 447 693	11 918 539	11 793 445	11 719 001	10 552 496
Mathematical sciences	110 543	204 594	149 220	209 344	211 324	119 900	138 858	188 550	196 143	181 438
Physical sciences	32 669	28 490	47 672	50 708	56 997	35 616	45 816	90 281	87 440	108 895
Chemical sciences	687 843	934 005	980 021	979 760	847 321	972 398	1 153 685	1 154 404	1 102 373	800 201
Earth sciences	106 759	92 439	102 892	109 665	118 539	93 302	104 072	160 745	156 112	285 180
Information, computer and communication technologies	2 502 454	2 481 028	1 576 163	1 610 718	1 908 985	2 572 364	3 111 146	2 584 726	2 295 683	2 074 429
Applied sciences and technologies	1 132 538	902 425	872 014	808 899	955 119	903 958	915 101	1 143 251	942 480	608 833
Engineering sciences	2 768 035	2 751 145	2 827 677	3 093 088	3 548 019	3 429 786	2 651 327	2 971 162	2 786 664	2 332 755

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Biological sciences	207 456	212 633	210 627	213 124	248 838	254 071	250 356	220 193	154 696	175 572
Agricultural sciences	371 310	471 529	444 593	593 315	665 703	671 194	686 697	778 583	1 008 216	1 070 593
Medical and health sciences	1 622 215	1 843 005	1 812 411	1 974 213	2 170 317	2 300 587	2 283 200	2 384 920	2 855 116	2 395 653
Environmental sciences	5 818	2 206	44 563	50 909	85 932	21 920	480 612	60 379	69 676	130 311
Material sciences	59 723	65 092	53 855	64 090	154 500	71 967	97 670	56 253	63 653	388 110
Marine sciences	4 859	4 324	5 738	8 026	5 655	630	0	0	750	526
Division 2: Social sciences and humanities	446 789	471 106	1 443 280	2 016 989	2 313 701	2 367 302	2 862 731	4 065 740	2 728 832	151 985
Social sciences	446 789	471 106	1 443 280	2 016 989	2 313 701	2 367 302	2 858 585	4 065 740	2 727 641	151 985
Humanities	0	0	0	0	0	0	4 146	0	1 191	0
<b>Total</b>	<b>10 059 010</b>	<b>10 464 022</b>	<b>10 570 726</b>	<b>11 782 848</b>	<b>13 290 951</b>	<b>13 814 995</b>	<b>14 781 270</b>	<b>15 859 185</b>	<b>14 447 833</b>	<b>10 704 481</b>

**Table C.45: Proportional business sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Division 1: Natural sciences, technology and engineering	95.6	95.5	86.3	82.9	82.6	82.9	80.6	74.4	81.1	98.6
Mathematical sciences	1.1	2.0	1.4	1.8	1.6	0.9	0.9	1.2	1.4	1.7
Physical sciences	0.3	0.3	0.5	0.4	0.4	0.3	0.3	0.6	0.6	1.0
Chemical sciences	6.8	8.9	9.3	8.3	6.4	7.0	7.8	7.3	7.6	7.5
Earth sciences	1.1	0.9	1.0	0.9	0.9	0.7	0.7	1.0	1.1	2.7
Information, computer and communication technologies	24.9	23.7	14.9	13.7	14.4	18.6	21.0	16.3	15.9	19.4
Applied sciences and technologies	11.3	8.6	8.2	6.9	7.2	6.5	6.2	7.2	6.5	5.7
Engineering sciences	27.5	26.3	26.8	26.3	26.7	24.8	17.9	18.7	19.3	21.8
Biological sciences	2.1	2.0	2.0	1.8	1.9	1.8	1.7	1.4	1.1	1.6
Agricultural sciences	3.7	4.5	4.2	5.0	5.0	4.9	4.6	4.9	7.0	10.0
Medical and health sciences	16.1	17.6	17.1	16.8	16.3	16.7	15.4	15.0	19.8	22.4
Environmental sciences	0.1	0.0	0.4	0.4	0.6	0.2	3.3	0.4	0.5	1.2
Material sciences	0.6	0.6	0.5	0.5	1.2	0.5	0.7	0.4	0.4	3.6
Marine sciences	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Division 2: Social sciences and humanities	4.4	4.5	13.7	17.1	17.4	17.1	19.4	25.6	18.9	1.4
Social sciences	4.4	4.5	13.7	17.1	17.4	17.1	19.3	25.6	18.9	1.4
Humanities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.46: Business sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
<b>Division 1:</b>										
Defence	1 103 510	813 259	1 040 025	1 096 986	1 034 893	937 964	830 331	1 187 443	975 765	985 893
Defence	1 103 510	813 259	1 040 025	1 096 986	1 034 893	937 964	830 331	1 187 443	975 765	985 893
<b>Division 2:</b>										
Economic development	7 012 272	7 381 289	7 234 533	8 308 177	9 663 402	10 362 668	11 554 708	11 730 578	10 197 220	6 944 128
Economic development unclassified	0	0	0	0	0	0	0	0	0	0
Plant production and plant primary products	288 323	315 806	374 327	454 990	593 610	622 367	1 026 707	628 123	791 508	919 470
Animal production and animal primary products	46 709	46 316	38 484	69 916	74 045	74 267	66 547	41 588	55 615	45 062
Mineral resources (excluding energy)	728 130	733 280	853 544	977 365	1 405 074	1 348 618	947 258	812 439	867 249	787 924
Energy resources	93 532	90 377	90 975	95 375	100 061	79 210	470 860	431 681	488 026	116 459
Energy supply	470 030	490 490	321 456	349 710	503 222	362 656	461 804	555 067	574 180	674 663
Manufacturing	1 747 369	1 863 289	1 639 077	1 869 926	2 096 271	2 106 255	1 924 020	1 965 446	1 788 564	1 758 500
Construction	16 284	46 158	96 071	125 059	138 237	55 625	54 328	22 942	32 416	22 651
Transport	872 149	920 081	951 435	1 080 427	935 483	1 046 235	1 098 281	1 124 099	1 045 650	630 950
Information and communication services	851 392	978 187	908 640	842 341	1 097 649	1 685 124	2 085 856	1 403 512	1 011 167	690 243
Commercial services	1 773 253	1 739 933	1 755 506	2 255 642	2 555 783	2 643 503	2 929 445	4 196 652	3 154 500	897 099
Economic framework	70 795	57 474	103 240	91 464	79 065	273 497	422 742	476 032	302 938	326 180
Natural resources	54 306	99 898	101 778	95 962	84 901	65 312	66 859	72 996	85 409	74 926
<b>Division 3:</b>										
Society	1 041 616	1 232 867	1 242 066	1 303 321	1 435 870	1 433 935	1 498 255	2 027 742	2 476 255	2 106 630
Society unclassified	0	0	0	0	0	0	0	0	0	0
Health	880 549	1 054 182	1 045 048	1 097 446	1 212 844	1 216 127	1 289 142	1 364 830	2 419 773	1 459 043
Education and training	32 486	32 767	29 566	33 913	35 728	33 707	21 076	23 586	16 021	27 515
Social development and community services	128 581	145 918	167 452	171 962	187 298	184 102	188 036	639 326	40 461	620 072
<b>Division 4:</b>										
Environment	211 025	220 698	173 535	171 747	219 212	196 802	201 177	283 454	207 806	195 663
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental knowledge	51 845	58 565	46 213	43 935	55 885	62 471	45 213	116 313	50 017	57 772
Environmental aspects of development	55 577	42 226	17 957	14 344	38 437	18 915	48 553	52 852	52 754	16 820

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Environmental and other aspects	103 602	119 907	109 365	113 468	124 889	115 415	107 410	114 289	105 035	121 070
Division 5: Advancement of knowledge	690 587	815 909	880 567	902 617	937 575	883 626	696 800	629 967	590 788	472 168
Advancement of knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural sciences, technologies and engineering	682 401	813 150	877 557	899 840	932 030	880 474	696 770	629 967	590 788	472 168
Social sciences and humanities	8 186	2 758	3 010	2 776	5 545	3 152	30	0	0	0
<b>Total</b>	<b>10 059 010</b>	<b>10 464 022</b>	<b>10 570 726</b>	<b>11 782 848</b>	<b>13 290 951</b>	<b>13 814 995</b>	<b>14 781 270</b>	<b>15 859 185</b>	<b>14 447 833</b>	<b>10 704 481</b>

**Table C.47: Proportional business sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Division 1: Defence	11.0	7.8	9.8	9.3	7.8	6.8	5.6	7.5	6.8	9.2
Defence	11.0	7.8	9.8	9.3	7.8	6.8	5.6	7.5	6.8	9.2
Division 2: Economic development	69.7	70.5	68.4	70.5	72.7	75.0	78.2	74.0	70.6	64.9
Economic development unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant production and plant primary products	2.9	3.0	3.5	3.9	4.5	4.5	6.9	4.0	5.5	8.6
Animal production and animal primary products	0.5	0.4	0.4	0.6	0.6	0.5	0.5	0.3	0.4	0.4
Mineral resources (excluding energy)	7.2	7.0	8.1	8.3	10.6	9.8	6.4	5.1	6.0	7.4
Energy resources	0.9	0.9	0.9	0.8	0.8	0.6	3.2	2.7	3.4	1.1
Energy supply	4.7	4.7	3.0	3.0	3.8	2.6	3.1	3.5	4.0	6.3
Manufacturing	17.4	17.8	15.5	15.9	15.8	15.2	13.0	12.4	12.4	16.4
Construction	0.2	0.4	0.9	1.1	1.0	0.4	0.4	0.1	0.2	0.2
Transport	8.7	8.8	9.0	9.2	7.0	7.6	7.4	7.1	7.2	5.9
Information and communication services	8.5	9.3	8.6	7.1	8.3	12.2	14.1	8.8	7.0	6.4
Commercial services	17.6	16.6	16.6	19.1	19.2	19.1	19.8	26.5	21.8	8.4
Economic framework	0.7	0.5	1.0	0.8	0.6	2.0	2.9	3.0	2.1	3.0
Natural resources	0.5	1.0	1.0	0.8	0.6	0.5	0.5	0.5	0.6	0.7

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Division 3:</b>										
Society	10.4	11.8	11.8	11.1	10.8	10.4	10.1	12.8	17.1	19.7
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	8.8	10.1	9.9	9.3	9.1	8.8	8.7	8.6	16.7	13.6
Education and training	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.3
Social development and community services	1.3	1.4	1.6	1.5	1.4	1.3	1.3	4.0	0.3	5.8
<b>Division 4:</b>										
Environment	2.1	2.1	1.6	1.5	1.6	1.4	1.4	1.8	1.4	1.8
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental knowledge	0.5	0.6	0.4	0.4	0.4	0.5	0.3	0.7	0.3	0.5
Environmental aspects of development	0.6	0.4	0.2	0.1	0.3	0.1	0.3	0.3	0.4	0.2
Environmental and other aspects	1.0	1.1	1.0	1.0	0.9	0.8	0.7	0.7	0.7	1.1
<b>Division 5:</b>										
Advancement of knowledge	6.9	7.8	8.3	7.7	7.1	6.4	4.7	4.0	4.1	4.4
Advancement of knowledge unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Natural sciences, technologies and engineering	6.8	7.8	8.3	7.6	7.0	6.4	4.7	4.0	4.1	4.4
Social sciences and humanities	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.48: Business sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Eastern Cape	217 880	354 553	468 197	646 497	608 398	651 533	690 478	707 348	674 516	439 537
Free State	943 508	1 308 833	1 265 285	1 374 960	831 575	1 124 042	1 060 177	1 105 873	991 206	694 454
Gauteng	5 439 718	5 558 409	5 356 550	5 813 673	7 160 280	7 183 557	7 876 139	8 285 425	7 617 873	5 447 407
KwaZulu-Natal	1 280 014	1 160 507	1 237 563	1 434 084	1 501 659	1 436 737	1 553 130	1 679 718	1 446 281	1 193 914
Limpopo	41 850	62 728	127 451	140 026	161 331	145 736	171 567	223 014	184 199	78 484
Mpumalanga	139 771	157 158	222 974	301 831	435 770	339 985	284 655	304 990	392 986	370 695
North West	256 428	45 267	380 144	435 849	681 634	451 891	526 962	565 486	601 653	566 308
Northern Cape	17 017	302 164	78 471	124 150	226 303	206 786	49 508	60 007	50 561	39 576
Western Cape	1 722 823	1 514 404	1 434 090	1 511 778	1 684 001	2 274 728	2 568 653	2 927 324	2 488 558	1 874 107
<b>Total</b>	<b>10 059 010</b>	<b>10 464 022</b>	<b>10 570 726</b>	<b>11 782 848</b>	<b>13 290 951</b>	<b>13 814 995</b>	<b>14 781 270</b>	<b>15 859 185</b>	<b>14 447 833</b>	<b>10 704 481</b>

**Table C.49: Proportional business sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Eastern Cape	2.2	3.4	4.4	5.5	4.6	4.7	4.7	4.5	4.7	4.1
Free State	9.4	12.5	12.0	11.7	6.3	8.1	7.2	7.0	6.9	6.5
Gauteng	54.1	53.1	50.7	49.3	53.9	52.0	53.3	52.2	52.7	50.9
KwaZulu-Natal	12.7	11.1	11.7	12.2	11.3	10.4	10.5	10.6	10.0	11.2
Limpopo	0.4	0.6	1.2	1.2	1.2	1.1	1.2	1.4	1.3	0.7
Mpumalanga	1.4	1.5	2.1	2.6	3.3	2.5	1.9	1.9	2.7	3.5
North West	2.5	2.9	3.6	3.7	5.1	3.3	3.6	3.6	4.2	5.3
Northern Cape	0.2	0.4	0.7	1.1	1.7	1.5	0.3	0.4	0.3	0.4
Western Cape	17.1	14.5	13.6	12.8	12.7	16.5	17.4	18.5	17.2	17.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.50: Business sector R&D expenditure by Standard Industrial Classification code (2010/11 to 2019/20)**

STANDARD INDUSTRIAL CLASSIFICATION	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	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	157 916	211 132	286 832	364 424	460 464	484 384	472 472	395 011	560 631	707 251
Mining and quarrying	1 055 963	1 352 877	1 554 284	1 675 153	1 340 103	1 220 985	1 069 826	1 101 202	1 748 437	686 064
Manufacturing	3 592 204	3 551 234	3 476 647	3 793 066	4 501 146	4 442 466	4 107 936	4 473 167	3 166 486	3 456 739
Manufacture of food products, beverages and tobacco products	221 370	283 262	319 143	340 427	364 178	376 884	328 832	455 335	498 001	452 243
Manufacture of textiles, clothing and leather goods	2 437	0	2073	32 091	34 609	9 335	8 932	21 968	11 129	11 306
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	106 448	80 255	50 531	60 437	72 870	95 555	87 814	91 005	76 413	79 627
Manufacture of refined petroleum, coke and nuclear fuel; Manufacture of chemicals and chemical products (incl. pharmaceuticals); Manufacture of rubber and plastic products	1 197 179	1 381 001	1 139 617	1 256 313	1 835 837	1 800 420	1 696 770	1 692 447	802 217	1 165 107
Manufacture of non-metallic mineral products	87 037	72 039	49 974	52 263	51 097	28 095	37 531	24 657	43 350	19 376
Manufacture of basic metals, fabricated metal products, machinery & equipment; Manufacture of office, accounting and computing machinery	240 408	392 800	585 635	620 923	607 574	660 205	519 108	581 073	525 937	548 762
Manufacture of electrical machinery and apparatus	207 954	310 599	312 102	254 042	302 575	381 971	455 378	635 655	374 509	250 907



STANDARD INDUSTRIAL CLASSIFICATION	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Manufacture of radio, television and communication equipment & apparatus; Manufacture of medical, precision and optical instruments, watches & clocks	590 174	639 217	656 639	742 033	706 308	569 127	629 240	625 773	486 808	538 682
Manufacture of transport equipment	881 958	310 145	267 788	334 276	408 448	402 772	321 638	316 503	315 433	381 531
Manufacture of furniture; Recycling; Manufacturing not elsewhere classified	57 240	81 914	93 145	100 261	117 649	118 102	22 692	28 752	32 689	9 198
Electricity, gas and water supply	536 050	494 745	385 770	355 720	548 015	439 157	544 850	639 298	708 166	762 345
Construction	3 213	6 495	9 051	8 037	6 637	5 613	4 297	3 562	9 408	5 065
Wholesale and retail	620 541	547 194	179 383	100 176	85 491	42 977	54 553	84 403	102 393	89 487
Transport, storage & communication	354 311	484 222	467 411	451 336	632 243	897 359	1 543 763	978 548	1 111 760	503 415
Financial intermediation, real estate and business services	3 326 985	3 645 625	3 914 543	4 724 439	5 357 151	5 910 332	6 555 245	7 744 370	6 402 099	4 032 237
Community, social and personal services	411 826	170 499	296 805	310 498	359 701	371 723	428 328	439 625	638 452	461 877
<b>Total</b>	<b>10 059 010</b>	<b>10 464 022</b>	<b>10 570 726</b>	<b>11 782 848</b>	<b>13 290 951</b>	<b>13 814 995</b>	<b>14 781 270</b>	<b>15 859 185</b>	<b>14 447 833</b>	<b>10 704 481</b>

**Table C.51: Proportional business sector R&D expenditure by Standard Industrial Classification Code (SIC) (2010/11 to 2019/20)**

STANDARD INDUSTRIAL CLASSIFICATION	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Agriculture, hunting, forestry and fishing	1.6	2.0	2.7	3.1	3.5	3.5	3.2	2.5	3.9	6.6
Mining and quarrying	10.5	12.9	14.7	14.2	10.1	8.8	7.2	6.9	12.1	6.4
Manufacturing	35.7	33.9	32.9	32.2	33.9	32.2	27.8	28.2	21.9	32.3
Manufacture of food products, beverages and tobacco products	2.2	2.7	3.0	2.9	2.7	2.7	2.2	2.9	3.4	4.2
Manufacture of textiles, clothing and leather goods	0.0	0.0	0.0	0.3	0.3	0.1	0.1	0.1	0.1	0.1
Manufacture of wood and products of wood and cork, except furniture; Manufacture of articles of straw and plaiting materials; Manufacture of paper and paper products; Manufacture of publishing, printing and reproduction of recorded material	1.1	0.8	0.5	0.5	0.5	0.7	0.6	0.6	0.5	0.7
Manufacture of refined petroleum, coke and nuclear fuel; Manufacture of chemicals and chemical products (incl. pharmaceuticals); Manufacture of rubber and plastic products	11.9	13.2	10.8	10.7	13.8	13.0	11.5	10.7	5.6	10.9
Manufacture of non-metallic mineral products	0.9	0.7	0.5	0.4	0.4	0.2	0.3	0.2	0.3	0.2
Manufacture of basic metals, fabricated metal products, machinery & equipment; Manufacture of office, accounting and computing machinery	2.4	3.8	5.5	5.3	4.6	4.8	3.5	3.7	3.6	5.1

STANDARD INDUSTRIAL CLASSIFICATION	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Manufacture of electrical machinery and apparatus	2.1	3.0	3.0	2.2	2.3	2.8	3.1	4.0	2.6	2.3
Manufacture of radio, television and communication equipment & apparatus; Manufacture of medical, precision and optical instruments, watches & clocks	5.9	6.1	6.2	6.3	5.3	4.1	4.3	3.9	3.4	5.0
Manufacture of transport equipment	8.8	3.0	2.5	2.8	3.1	2.9	2.2	2.0	2.2	3.6
Manufacture of furniture; Recycling; Manufacturing not elsewhere classified	0.6	0.8	0.9	0.9	0.9	0.9	0.2	0.2	0.2	0.1
Electricity, gas and water supply	5.3	4.7	3.6	3.0	4.1	3.2	3.7	4.0	4.9	7.1
Construction	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.05
Wholesale and retail	6.2	5.2	1.7	0.9	0.6	0.3	0.4	0.5	0.7	0.8
Transport, storage & communication	3.5	4.6	4.4	3.8	4.8	6.5	10.4	6.2	7.7	4.7
Financial intermediation, real estate and business services	33.1	34.8	37.0	40.1	40.3	42.8	44.3	48.8	44.3	37.7
Community, social and personal services	4.1	1.6	2.8	2.6	2.7	2.7	2.9	2.8	4.4	4.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.52: Business sector R&D personnel in headcounts and full-time equivalents by occupation (2010/11 to 2019/20)**

YEAR	HEADCOUNTS				FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL
2010/11	14 933	6 372	4 630	3 931	10 205.1	4 804.0	3 318.7	2 082.3
2011/12	15 288	6 192	5 095	4 001	9 894.9	4 451.9	3 343.5	2 099.5
2012/13	17 155	6 191	6 394	4 570	11 322.3	4 555.9	4 065.5	2 700.9
2013/14	17 599	6 182	6 397	5 020	11 877.4	4 530.1	4 253.1	3 094.2
2014/15	18 743	6 261	6 912	5 570	12 927.5	4 636.2	4 494.4	3 796.9
2015/16	17 245	6 128	6 090	5 027	12 457.8	4 626.8	4 227.4	3 603.6
2016/17	17 998	6 463	6 156	5 379	12 549.2	4 777.3	4 149.4	3 622.5
2017/18	17 554	7 142	5 655	4 757	12 952.9	5 481.7	3 807.5	3 663.8
2018/19	16 876	6 942	5 286	4 648	11 691.0	4 535.1	3 546.9	3 609.0
2019/20	12 748	4 641	4 989	3 118	9 300.8	3 227.8	3 486.8	2 586.3

Note: Headcounts include non-SA R&D personnel (from 2016/17).

Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.53: Business sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2017/18 to 2019/20)**

OCCUPATION	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)				
	2017/18	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS
Researchers		7 142	4 515	2 627	5 481.7	3 263.5	2 218.2	76.8
Technicians directly supporting R&D		5 655	3 839	1 816	3 807.5	2 482.9	1 324.6	67.3
Other personnel directly supporting R&D		4 757	2 893	1 864	3 663.8	2 184.4	1 479.4	77.0
<b>Total</b>		<b>17 554</b>	<b>11 247</b>	<b>6 307</b>	<b>12 952.9</b>	<b>7 930.8</b>	<b>5 022.1</b>	<b>73.8</b>
2018/19	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS	
Researchers		6 942	4 323	2 619	4 535.1	2 577.4	1 957.7	65.3
Technicians directly supporting R&D		5 286	3 508	1 778	3 546.9	2 199.3	1 347.6	67.1
Other personnel directly supporting R&D		4 648	2 823	1 825	3 609.0	2 034.5	1 574.5	77.6
<b>Total</b>		<b>16 876</b>	<b>10 654</b>	<b>6 222</b>	<b>11 691.0</b>	<b>6 811.1</b>	<b>4 879.8</b>	<b>69.3</b>
2019/20	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS	
Researchers		4 641	3 076	1 565	3 227.8	1 973.7	1 254.0	69.5
Technicians directly supporting R&D		4 989	3 023	1 966	3 486.8	1 885.1	1 601.7	69.9
Other personnel directly supporting R&D		3 118	1 432	1 686	2 586.3	1 114.1	1 472.2	82.9
<b>Total</b>		<b>12 748</b>	<b>7 531</b>	<b>5 217</b>	<b>9 300.8</b>	<b>4 973.0</b>	<b>4 327.9</b>	<b>73.0</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17).

Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.54: Business sector R&D personnel in headcounts by occupation, qualification, population group and gender (2019/20)**

OCCUPATION AND QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN/ASIAN		WHITE		NON-SA	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers	4 641	3 076	1 565	591	447	111	76	275	184	2 036	833	63	25
Doctoral degree or equivalent	572	321	251	43	23	16	12	10	13	237	200	15	3
Master's, honours, bachelor or equivalent	3 153	2 203	950	415	276	76	49	230	138	1 448	471	34	16
Diplomas	916	552	364	133	148	19	15	35	33	351	162	14	6
Technicians directly supporting R&D	4 989	3 023	1 966	1 063	1 163	273	182	252	168	1 405	423	30	30
Doctoral degree or equivalent	62	21	41	3	10	1	2	3	6	12	18	2	5
Master's, honours, bachelor or equivalent	1 559	923	636	237	278	60	78	100	89	511	184	15	7
Diplomas	3 368	2 079	1 289	823	875	212	102	149	73	882	221	13	18
Other personnel directly supporting R&D	3 118	1 432	1 686	706	999	128	176	82	61	486	411	30	39
Doctoral degree or equivalent	22	10	12	3	3	0	0	0	1	7	7	0	1
Master's, honours, bachelor or equivalent	636	271	365	61	152	23	13	26	27	149	154	12	19
Diplomas	2 460	1 151	1 309	642	844	105	163	56	33	330	250	18	19
<b>Total</b>	<b>12 748</b>	<b>7 531</b>	<b>5 217</b>	<b>2 360</b>	<b>2 609</b>	<b>512</b>	<b>434</b>	<b>609</b>	<b>413</b>	<b>3 927</b>	<b>1 667</b>	<b>123</b>	<b>94</b>

Note: Headcounts Includes Non-SA R&D staff.

**Table C.55: Number of foreign and local business sector partners engaged in collaborative R&D, and total R&D collaboration expenditure (2017/18 to 2019/20)**

COLLABORATION PARTNERS	2017/18		2018/19		2019/20	
	WITHIN SOUTH AFRICA	OUTSIDE SOUTH AFRICA	WITHIN SOUTH AFRICA	OUTSIDE SOUTH AFRICA	WITHIN SOUTH AFRICA	OUTSIDE SOUTH AFRICA
Government research institutes	28	13	27	12	24	7
Higher education institutions	81	28	81	25	84	24
Members of own company	35	17	34	16	37	15
Not-for-profit organisations	11	5	12	3	11	2
Other companies	60	33	60	34	70	33
Science councils	59	11	61	10	61	11
<b>Total number of R&amp;D collaborations</b>	<b>274</b>	<b>107</b>	<b>275</b>	<b>100</b>	<b>287</b>	<b>92</b>
No collaboration	N/A	N/A	N/A	N/A	N/A	N/A
<b>R&amp;D EXPENDITURE</b>	<b>R'000</b>	<b>R'000</b>	<b>R'000</b>	<b>R'000</b>	<b>R'000</b>	<b>R'000</b>
Total in-house plus outsourced R&D collaboration expenditure (excl. VAT)	N/A	N/A	N/A	N/A	N/A	N/A

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

N/A: The indicator 'No collaboration' was not assessed from 2016/17 onwards.

### C.2.1.1 Business sector: State-owned enterprises

**Table C.56: Business sector: SOEs – Number, R&D expenditure, and R&D expenditure as a proportion of BERD (2010/11 to 2019/20)**

YEAR	NUMBER OF R&D PERFORMERS	R&D EXPENDITURE		PROPORTION OF BERD
		R'000	R'000	%
2010/11	19	1 685 520	16.8	
2011/12	18	1 318 492	12.6	
2012/13	19	1 512 021	14.3	
2013/14	19	1 609 771	13.7	
2014/15	19	2 019 919	15.2	
2015/16	18	1 973 416	14.3	
2016/17	16	2 621 883	17.7	
2017/18	16	2 536 374	16.0	
2018/19	16	2 492 520	17.3	
2019/20	16	2 053 331	19.2	

Note: SOEs revised list differ from the 2014/15 list.

**Table C.57: Business sector: SOEs - R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Basic research	68 838	55 107	59 187	263 523	65 489	65 556	110 249	140 989	153 137	132 998
Applied research	835 262	832 505	805 106	641 358	1 216 953	860 904	1 588 222	1 886 756	1 970 733	1 406 439
Experimental development research	781 421	430 880	647 728	704 890	737 477	1 046 956	923 413	508 629	368 650	513 895
<b>Total</b>	<b>1 685 520</b>	<b>1 318 492</b>	<b>1 512 021</b>	<b>1 609 771</b>	<b>2 019 919</b>	<b>1 973 416</b>	<b>2 621 883</b>	<b>2 536 374</b>	<b>2 492 520</b>	<b>2 053 331</b>

**Table C.58: Business sector: SOEs - Proportional R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Basic research	4.1	4.2	3.9	16.4	3.2	3.3	4.2	5.6	6.1	6.5
Applied research	49.6	63.1	53.2	39.8	60.2	43.6	60.6	74.4	79.1	68.5
Experimental development research	46.4	32.7	42.8	43.8	36.5	53.1	35.2	20.1	14.8	25.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.59: Business sector: SOEs - R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Capital expenditure	408 927	333 325	179 959	245 077	355 725	122 272	726 071	702 156	768 912	368 628
Land: buildings & other structures	47 672	14 032	11 195	12 920	16 307	31 884	183 145	173 025	193 483	204 147
TOTAL: Vehicles, plant, machinery, equipment and software	361 255	319 293	168 764	232 157	339 418	90 388	542 926	529 131	575 429	164 481
Vehicles, plant, machinery, equipment	361 255	319 293	168 764	232 157	339 418	90 388	542 926	529 131	575 429	164 331
*Capitalised computer software	NA	NA	NA	NA	NA	NA	NA	NA	NA	150
Current expenditure	1 276 593	985 167	1 332 062	1 364 694	1 664 194	1 851 145	1 895 812	1 834 218	1 723 607	1 684 703
Labour costs	692 407	658 509	795 414	849 371	922 321	976 713	1 040 703	968 562	892 376	842 680
Other current expenditure	584 186	326 658	536 648	515 323	741 873	874 432	855 109	865 656	831 231	842 023
<b>Total</b>	<b>1 685 520</b>	<b>1 318 492</b>	<b>1 512 021</b>	<b>1 609 771</b>	<b>2 019 919</b>	<b>1 973 417</b>	<b>2 621 883</b>	<b>2 536 374</b>	<b>2 492 520</b>	<b>2 053 331</b>

\*Capitalised computer software collected from 2019/20.

**Table C.60: Business sector: SOEs - Proportional R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Capital expenditure	24.3	25.3	11.9	15.2	17.6	6.2	27.7	27.7	30.8	18.0
Land: buildings & other structures	2.8	1.1	0.7	0.8	0.8	1.6	7.0	6.8	7.8	9.9
TOTAL: Vehicles, plant, machinery, equipment and software	21.4	24.2	11.2	14.4	16.8	4.6	20.7	20.9	23.1	8.0
Vehicles, plant, machinery, equipment	21.4	24.2	11.2	14.4	16.8	4.6	20.7	20.9	23.1	8.0
*Capitalised computer software	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01
Current expenditure	75.7	74.7	88.1	84.8	82.4	93.8	72.3	72.3	69.2	82.0
Labour costs	41.1	49.9	52.6	52.8	45.7	49.5	39.7	38.2	35.8	41.0
Other current expenditure	34.7	24.8	35.5	32.0	36.7	44.3	32.6	34.1	33.3	41.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\*Capitalised computer software collected from 2019/20.

**Table C.61: Business sector: SOEs - R&D expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Biotechnology	15 100	14 615	23 479	21 845	16 591	12 278	16 457	18 514	8 116	9 352
Nanotechnology	2 995	7 103	3 768	654	700	144	0	0	0	369
<b>Total</b>	<b>18 095</b>	<b>21 717</b>	<b>27 247</b>	<b>22 499</b>	<b>17 290</b>	<b>12 422</b>	<b>16 457</b>	<b>18 514</b>	<b>8 116</b>	<b>9 721</b>
<b>Business expenditure on R&amp;D</b>	<b>1 685 520</b>	<b>1 318 492</b>	<b>1 512 021</b>	<b>1 609 771</b>	<b>2 019 919</b>	<b>1 973 416</b>	<b>2 621 883</b>	<b>2 536 374</b>	<b>2 492 520</b>	<b>2 053 331</b>

**Table C.62: Business sector: SOEs - Proportional expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Biotechnology	0.9	1.1	1.6	1.4	0.8	0.6	0.6	0.7	0.3	0.5
Nanotechnology	0.2	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>1.1</b>	<b>1.6</b>	<b>1.8</b>	<b>1.4</b>	<b>0.9</b>	<b>0.6</b>	<b>0.6</b>	<b>0.7</b>	<b>0.3</b>	<b>0.5</b>

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

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

**Table C.63: Business sector: SOEs - R&D expenditure on selective areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Environment related	N/A	10 029	15 284	22 448	51 522	30 864	136 523	150 811	171 166	187 339
Open-source software	9 087	8 736	7 599	4 124	0	50 589	0	0	0	19 769
New materials	14 598	14 872	12 082	12 233	11 111	64 021	15 353	21 144	23 841	32 115
Tuberculosis, HIV/AIDS, malaria	0	0	0	0	0	0	0	0	0	943
Space science	N/A	N/A	N/A	N/A	N/A	N/A	32 571.42	33 063	34 998	9 462
<b>Total</b>	<b>23 684</b>	<b>33 636</b>	<b>34 965</b>	<b>38 806</b>	<b>62 633</b>	<b>145 474</b>	<b>184 446</b>	<b>205 018</b>	<b>230 005</b>	<b>249 628</b>
<b>Business expenditure on R&amp;D</b>	<b>1 685 520</b>	<b>1 318 492</b>	<b>1 512 021</b>	<b>1 609 771</b>	<b>2 019 919</b>	<b>1 973 416</b>	<b>2 621 883</b>	<b>2 536 374</b>	<b>2 492 520</b>	<b>2 053 331</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.64: Business sector: SOEs - Proportional R&D expenditure on selective areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environment related	N/A	0.8	1.0	1.4	2.6	1.6	5.2	5.9	6.9	9.1
Open-source software	0.5	0.7	0.5	0.3	0.0	2.6	0.0	0.0	0.0	1.0
New materials	0.9	1.1	0.8	0.8	0.6	3.2	0.6	0.8	1.0	1.6
Tuberculosis, HIV/AIDS, malaria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Space science	N/A	N/A	N/A	N/A	N/A	N/A	1.2	1.3	1.4	0.5
<b>Total</b>	<b>1.4</b>	<b>2.6</b>	<b>2.3</b>	<b>2.4</b>	<b>3.1</b>	<b>7.4</b>	<b>7.0</b>	<b>8.1</b>	<b>9.2</b>	<b>12.2</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.65: Business sector: SOEs - R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	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	1 670 869	1 318 492	1 512 021	1 609 771	1 963 779	1 963 821	2 524 169	2 437 185	2 387 524	2 043 870
Mathematical sciences	38 311	142 930	86 576	93 820	137 076	87 387	85 055	134 335	142 171	143 412
Physical sciences	21 123	14 992	40 742	44 460	46 559	32 100	42 210	81 896	86 032	83 931
Chemical sciences	66 503	80 556	133 867	132 399	86 408	64 230	68 251	55 705	50 406	56 752
Earth sciences	27 912	0	44 006	48 671	24 356	12 254	17 750	17 522	9 297	27 651
Information, computer and communication technologies	64 163	126 456	155 601	168 174	304 806	541 009	935 325	483 015	511 409	219 824
Applied sciences and technologies	493 368	151 475	176 600	176 391	165 214	133 687	277 702	446 635	363 768	274 949
Engineering sciences	926 729	768 675	781 073	824 057	1 034 900	981 683	971 414	1 059 843	1 040 397	924 156
Biological sciences	0	0	13 496	30 701	29 183	33 874	13 112	12 338	26 520	27 002
Agricultural sciences	6816	8 137	5 343	11 711	12 507	12 665	9 079	9 282	5 857	16 669
Medical and health sciences	15 614	17 491	18 012	18 316	49 357	36 548	23 990	76 571	80 711	153 719
Environmental sciences	3 052	0	42 440	45 772	59 270	16 310	47 674	51 225	58 605	67 425
Material sciences	7 279	7 780	8 605	9 198	9 849	12 073	32 605	8 818	12 352	48 380
Marine sciences	0	0	5659	6103	4294	0	0	0	0	0
Division 2: Social sciences and humanities	14 651	0	0	0	56140	9 595	97 714	99 189	104 995	9 462
Social sciences	14 651	0	0	0	56140	9 595	97 714	99 189	104 995	9 462
Humanities	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>1 685 520</b>	<b>1 318 492</b>	<b>1 512 021</b>	<b>1 609 771</b>	<b>2 019 919</b>	<b>1 973 416</b>	<b>2 621 883</b>	<b>2 536 374</b>	<b>2 492 520</b>	<b>2 053 331</b>

**Table C.66: Business sector: SOEs - Proportional R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Division 1: Natural sciences, technology and engineering	99.1	100.0	100.0	100.0	97.2	99.5	96.3	96.1	95.8	99.5
Mathematical sciences	2.3	10.8	5.7	5.8	6.8	4.4	3.2	5.3	5.7	7.0
Physical sciences	1.3	1.1	2.7	2.8	2.3	1.6	1.6	3.2	3.5	4.1
Chemical sciences	3.9	6.1	8.9	8.2	4.3	3.3	2.6	2.2	2.0	2.8
Earth sciences	1.7	0.0	2.9	3.0	1.2	0.6	0.7	0.7	0.4	1.3

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Information, computer and communication technologies	3.8	9.6	10.3	10.4	15.1	27.4	35.7	19.0	20.5	10.7
Applied sciences and technologies	29.3	11.5	11.7	11.0	8.2	6.8	10.6	17.6	14.6	13.4
Engineering sciences	55.0	58.3	51.7	51.2	51.2	49.7	37.1	41.8	41.7	45.0
Biological sciences	0.0	0.0	0.9	1.9	1.4	1.7	0.5	0.5	1.1	1.3
Agricultural sciences	0.4	0.6	0.4	0.7	0.6	0.6	0.3	0.4	0.2	0.8
Medical and health sciences	0.9	1.3	1.2	1.1	2.4	1.9	0.9	3.0	3.2	7.5
Environmental sciences	0.2	0.0	2.8	2.8	2.9	0.8	1.8	2.0	2.4	3.3
Material sciences	0.4	0.6	0.6	0.6	0.5	0.6	1.2	0.3	0.5	2.4
Marine sciences	0.0	0.0	0.4	0.4	0.2	0.0	0.0	0.0	0.0	0.0
Division 2: Social sciences and humanities	0.9	0.0	0.0	0.0	2.8	0.5	3.7	3.9	4.2	0.5
Social sciences	0.9	0.0	0.0	0.0	2.8	0.5	3.7	3.9	4.2	0.5
Humanities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.67: Business sector: SOEs - R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1:										
Defence	718 698	356 627	485 487	512 440	563 927	399 183	304 302	676 595	497 808	524 278
Defence	718 698	356 627	485 487	512 440	563 927	399 183	304 302	676 595	497 808	524 278
Division 2:										
Economic development	765 929	770 791	831 597	887 024	1 187 718	1 360 120	1 901 235	1 424 957	1 522 995	1 257 352
Economic development unclassified	0	0	0	0	0	0	0	0	0	0
Plant production and plant primary products	0	0	9 030	9 380	10 076	10 203	8 610	8 610	9 287	10 302
Animal production and animal primary products	1 704	4 069	0	0	0	0	0	0	0	0
Mineral resources (excluding energy)	5 576	6 247	6 433	6 541	6 996	7 743	8 500	8 818	9 236	0
Energy resources	20 372	22 488	23 158	23 549	25 185	27 874	30 602	12 479	13 070	71 813
Energy supply	405 120	367 866	249 963	253 757	419 084	316 868	410 091	516 908	546 952	614 824
Manufacturing	26 828	57 794	77 574	105 372	178 376	103 757	110 104	112 307	114 695	103 465
Construction	603	26 433	70 899	99 484	81 944	0	0	0	0	0
Transport	250 553	60 839	125 965	122 633	126 069	253 742	333 284	335 410	357 608	222 975



SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Information and communication services	35 131	179 318	193 815	191 811	270 175	609 251	873 600	302 316	319 210	72 508
Commercial services	19 290	1 504	9 893	10 644	11 434	16 235	16 878	18 002	19 049	16 898
Economic framework	0	17 049	36 408	40 833	37 065	14 447	109 566	110 107	115 191	120 014
Natural resources	752	27 185	28 459	23 019	21 316	0	0	0	18 697	24 554
<b>Division 3: Society</b>	<b>61 017</b>	<b>57 479</b>	<b>46 872</b>	<b>59 171</b>	<b>67 371</b>	<b>54 784</b>	<b>51 876</b>	<b>70 963</b>	<b>87 496</b>	<b>188 813</b>
Society unclassified	0	0	0	0	0	0	0	0	0	
Health	25 320	22 992	19 743	29 360	26 193	19 804	25 631	39 533	54 213	150 830
Education and training	3 052	11 496	10 862	13 281	14 266	14 447	0	0	0	0
Social development and community services	32 645	22 992	16 268	16 530	26 912	20 533	26 246	31 431	33 282	37 984
<b>Division 4: Environment</b>	<b>55 984</b>	<b>47 487</b>	<b>31 245</b>	<b>31 720</b>	<b>68 425</b>	<b>56 760</b>	<b>86 865</b>	<b>94 694</b>	<b>100 236</b>	<b>82 888</b>
Environment unclassified	0	0	0	0	0	0	0	0	0	
Environmental knowledge	25 696	23 368	15 623	15 860	26 193	33 494	28 662	30 816	32 619	39 060
Environmental aspects of development	3 841	0	0	0	16 040	2 741	32 571	33 063	34 998	0
Environmental and other aspects	26 448	24 119	15 623	15 860	26 193	20 525	25 631	30 816	32 619	43 828
<b>Division 5: Advancement of knowledge</b>	<b>83 891</b>	<b>86 108</b>	<b>116 819</b>	<b>119 417</b>	<b>132 476</b>	<b>102 570</b>	<b>277 605</b>	<b>269 165</b>	<b>283 984</b>	<b>0</b>
Advancement of knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural sciences, technologies and engineering	75 716	83 349	113 836	116 668	129 393	99 448	277 605	269 165	283 984	0
Social sciences and humanities	8 176	2 758	2 983	2 750	3 083	3 122	0	0	0	0
<b>Total</b>	<b>1 685 520</b>	<b>1 318 492</b>	<b>1 512 021</b>	<b>1 609 771</b>	<b>2 019 919</b>	<b>1 973 416</b>	<b>2 621 883</b>	<b>2 536 374</b>	<b>2 492 520</b>	<b>2 053 331</b>

**Table C.68: Business sector: SOEs - Proportional R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Division 1:</b>										
Defence	42.6	27.0	32.1	31.8	27.9	20.2	11.6	26.7	20.0	25.5
Defence	42.6	27.0	32.1	31.8	27.9	20.2	11.6	26.7	20.0	25.5
<b>Division 2:</b>										
Economic development	45.4	58.5	55.0	55.1	58.8	68.9	72.5	56.2	61.1	61.2
Economic development unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant production and plant primary products	0.0	0.0	0.6	0.6	0.5	0.5	0.3	0.3	0.4	0.5
Animal production and animal primary products	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mineral resources (excluding energy)	0.3	0.5	0.4	0.4	0.3	0.4	0.3	0.3	0.4	0.0
Energy resources	1.2	1.7	1.5	1.5	1.2	1.4	1.2	0.5	0.5	3.5
Energy supply	24.0	27.9	16.5	15.8	20.7	16.1	15.6	20.4	21.9	29.9
Manufacturing	1.6	4.4	5.1	6.5	8.8	5.3	4.2	4.4	4.6	5.0
Construction	0.0	2.0	4.7	6.2	4.1	0.0	0.0	0.0	0.0	0.0
Transport	14.9	4.6	8.3	7.6	6.2	12.9	12.7	13.2	14.3	10.9
Information and communication services	2.1	13.6	12.8	11.9	13.4	30.9	33.3	11.9	12.8	3.5
Commercial services	1.1	0.1	0.7	0.7	0.6	0.8	0.6	0.7	0.8	0.8
Economic framework	0.0	1.3	2.4	2.5	1.8	0.7	4.2	4.3	4.6	5.8
Natural resources	0.0	2.1	1.9	1.4	1.1	0.0	0.0	0.0	0.8	1.2
<b>Division 3:</b>										
Society	3.6	4.4	3.1	3.7	3.3	2.8	2.0	2.8	3.5	9.2
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	1.5	1.7	1.3	1.8	1.3	1.0	1.0	1.6	2.2	7.3
Education and training	0.2	0.9	0.7	0.8	0.7	0.7	0.0	0.0	0.0	0.0
Social development and community services	1.9	1.7	1.1	1.0	1.3	1.0	1.0	1.2	1.3	1.8
<b>Division 4:</b>										
Environment	3.3	3.6	2.1	2.0	3.4	2.9	3.3	3.7	4.0	4.0
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental knowledge	1.5	1.8	1.0	1.0	1.3	1.7	1.1	1.2	1.3	1.9
Environmental aspects of development	0.2	0.0	0.0	0.0	0.8	0.1	1.2	1.3	1.4	0.0

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environmental and other aspects	1.6	1.8	1.0	1.0	1.3	1.0	1.0	1.2	1.3	2.1
Division 5: Advancement of knowledge	5.0	6.5	7.7	7.4	6.6	5.2	10.6	10.6	11.4	0.0
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	4.5	6.3	7.5	7.2	6.4	5.0	10.6	10.6	11.4	0.0
Social sciences and humanities	0.5	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.69: Business sector: SOEs - R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Eastern Cape	12 562	21 897	33 436	38 634	37 244	10 854	45 081	52 404	50 850	27 532
Free State	24 865	31 842	28 367	26 428	25 193	10 854	42 824	45 798	48 477	34 521
Gauteng	1 169 019	915 824	1 014 194	1 012 556	1 448 092	1 558 538	1 937 851	1 682 598	1 715 224	1 306 669
KwaZulu-Natal	54 716	61 139	66 477	91 406	45 588	86 565	188 606	197 355	242 371	222 198
Limpopo	7 157	15 917	19 724	19 596	18 612	3 019	615	1 024	1 094	2 619
Mpumalanga	7 157	15 917	27 038	28 976	33 927	13 222	9 594	9 594	10 348	19 056
North West	118 682	140 853	151 514	160 739	289 990	170 118	180 261	214 709	189 393	245 578
Northern Cape	7 157	17 446	18 630	52 104	17 998	2 397	0	409	431	11 465
Western Cape	284 206	97 655	152 641	179 332	103 275	117 850	217 052	332 484	234 330	183 695
<b>Total</b>	<b>1 685 520</b>	<b>1 318 492</b>	<b>1 512 021</b>	<b>1 609 771</b>	<b>2 019 919</b>	<b>1 973 416</b>	<b>2 621 883</b>	<b>2 536 374</b>	<b>2 492 520</b>	<b>2 053 331</b>

**Table C.70: Business sector: SOEs - Proportional R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Eastern Cape	0.7	1.7	2.2	2.4	1.8	0.5	1.7	2.1	2.0	1.3
Free State	1.5	2.4	1.9	1.6	1.2	0.5	1.6	1.8	1.9	1.7
Gauteng	69.4	69.5	67.1	62.9	71.7	79.0	73.9	66.3	68.8	63.6
KwaZulu-Natal	3.2	4.6	4.4	5.7	2.3	4.4	7.2	7.8	9.7	10.8
Limpopo	0.4	1.2	1.3	1.2	0.9	0.2	0.0	0.0	0.0	0.1
Mpumalanga	0.4	1.2	1.8	1.8	1.7	0.7	0.4	0.4	0.4	0.9
North West	7.0	10.7	10.0	10.0	14.4	8.6	6.9	8.5	7.6	12.0
Northern Cape	0.4	1.3	1.2	3.2	0.9	0.1	0.0	0.0	0.0	0.6
Western Cape	16.9	7.4	10.1	11.1	5.1	6.0	8.3	13.1	9.4	8.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.71: Business sector: SOEs - R&D expenditure by Standard Industrial Classification code (2010/11 to 2019/20)**

STANDARD INDUSTRIAL CLASSIFICATION	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	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	0	0	12 592	17 187	18 413	18 646	20 052	20 390	21 702	24 242
Mining and quarrying	0	0	0	0	0	0	0	0	0	0
Manufacturing	530 635	248 309	444 185	475 294	480 601	370 407	161 096	461 776	270 718	284 344
Manufacture of food products, beverages and tobacco products	0	0	0	0	0	0	0	0	0	0
Manufacture of textiles, clothing and leather goods	0	0	0	0	0	0	0	0	0	0
Manufacture of wood and products of wood and cork, except furniture; Manufacture of articles of straw and plaiting materials; Manufacture of paper and paper products; Manufacture of publishing, printing and reproduction of recorded material	0	0	1 290	1 340	1 439	1 458	1 230	1 230	1 327	1 230
Manufacture of refined petroleum, coke and nuclear fuel; Manufacture of chemicals and chemical products (incl. pharmaceuticals); Manufacture of rubber and plastic products	61 654	58 362	69 607	72 216	77 350	8 616	14 489	24 007	14 343	14 950
Manufacture of non-metallic mineral products	6 692	7 496	7 719	7 850	8 395	0	0	0	0	0
Manufacture of basic metals, fabricated metal products, machinery & equipment; Manufacture of office, accounting and computing machinery	0	84 285	224 661	272 253	293 575	297 289	75 855	146 953	74 588	212 512
Manufacture of electrical machinery and apparatus	0	88 159	76 590	63 824	52 760	20 430	21 690	242 822	127 036	0
Manufacture of radio, television and communication equipment & apparatus; Manufacture of medical, precision and optical instruments, watches & clocks	0	0	0	0	0	0	0	0	0	0
Manufacture of transport equipment	462 290	10 007	64 318	57 812	47 081	42 614	47 833	46 764	53 425	55 652
Manufacture of furniture; Recycling; Manufacturing not elsewhere classified	0	0	0	0	0	0	0	0	0	0
Electricity, gas and water supply	521 665	463 592	325 822	340 670	534 569	424 561	531 606	633 700	698 810	725 835
Construction	0	0	0	0	0	0	0	0	0	0
Wholesale and retail	3 052	0	0	0	0	0	0	0	0	0
Transport, storage and communication	164 337	304 346	371 495	397 326	565 363	826 532	1 516 160	952 348	1 004 572	396 000
Financial intermediation, real estate and business services	204 455	302 245	137 898	158 060	150 347	196 661	174 576	176 127	184 533	288 975
Community, social and personal services	261 375	0	220 029	221 233	270 626	136 609	218 393	292 033	312 183	333 936
<b>Total</b>	<b>1 685 520</b>	<b>1 318 492</b>	<b>1 512 021</b>	<b>1 609 771</b>	<b>2 019 919</b>	<b>1 973 416</b>	<b>2 621 883</b>	<b>2 536 374</b>	<b>2 492 520</b>	<b>2 053 331</b>

**Table C.72: Business sector: SOEs - Proportional R&D expenditure by Standard Industrial Classification code (2010/11 to 2019/20)**

STANDARD INDUSTRIAL CLASSIFICATION	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Agriculture, hunting, forestry and fishing	0.0	0.0	0.8	1.1	0.9	0.9	0.8	0.8	0.9	1.2
Mining and quarrying	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacturing	31.5	18.8	29.4	29.5	23.8	18.8	6.1	18.2	10.9	13.8
Manufacture of food products, beverages and tobacco products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of textiles, clothing and leather goods	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Manufacture of wood and products of wood and cork, except furniture; Manufacture of articles of straw and plaiting materials; Manufacture of paper and paper products; Manufacture of publishing, printing and reproduction of recorded material	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.7
Manufacture of refined petroleum, coke and nuclear fuel; Manufacture of chemicals and chemical products (incl. pharmaceuticals); Manufacture of rubber and plastic products	3.7	4.4	4.6	4.5	3.8	0.4	0.6	0.9	0.6	0.0
Manufacture of non-metallic mineral products	0.4	0.6	0.5	0.5	0.4	0.0	0.0	0.0	0.0	10.3
Manufacture of basic metals, fabricated metal products, machinery & equipment; Manufacture of office, accounting and computing machinery	0.0	6.4	14.9	16.9	14.5	15.1	2.9	5.8	3.0	0.0
Manufacture of electrical machinery and apparatus	0.0	6.7	5.1	4.0	2.6	1.0	0.8	9.6	5.1	0.0
Manufacture of radio, television and communication equipment & apparatus; Manufacture of medical, precision and optical instruments, watches & clocks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
Manufacture of transport equipment	27.4	0.8	4.3	3.6	2.3	2.2	1.8	1.8	2.1	0.0
Manufacture of furniture; Recycling; Manufacturing not elsewhere classified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electricity, gas and water supply	30.9	35.2	21.5	21.2	26.5	21.5	20.3	25.0	28.0	35.3
Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale and retail	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transport, storage and communication	9.7	23.1	24.6	24.7	28.0	41.9	57.8	37.5	40.3	19.3
Financial intermediation, real estate and business services	0.0	0.0	0.8	1.1	0.9	0.9	0.8	0.8	0.9	1.2
Community, social and personal services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>31.5</b>	<b>18.8</b>	<b>29.4</b>	<b>29.5</b>	<b>23.8</b>	<b>18.8</b>	<b>6.1</b>	<b>18.2</b>	<b>10.9</b>	<b>13.8</b>

**Table C.73: Business sector: SOEs – R&D personnel in headcounts and full-time equivalents by occupation (2010/11 to 2019/20)**

YEAR	HEADCOUNTS				FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL
2010/11	1 878	773	681	424	1 366.3	598.0	493.0	275.3
2011/12	2 336	841	1 018	477	1 068.6	458.2	431.0	179.4
2012/13	2 699	890	1 351	458	1 307.1	548.4	563.8	194.9
2013/14	2 674	892	1 334	448	1 301.1	541.8	573.0	186.3
2014/15	2 760	918	1 479	363	1 335.3	541.5	593.2	200.7
2015/16	2 476	959	1 163	354	1 150.1	477.7	587.9	84.5
2016/17	2 983	1 113	1 437	433	1 213.8	415.2	688.2	110.4
2017/18	2 853	1 509	1 021	323	1 182.5	668.6	394.4	119.6
2018/19	2 738	1 445	992	301	984.3	555.0	316.9	112.5
2019/20	2 327	1 146	864	317	932.8	472.3	322.5	138.0

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.74: Business sector: SOEs – R&D personnel in headcounts and full-time equivalents by occupation and gender (2017/18 to 2019/20)**

OCCUPATION	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS
<b>2017/18</b>							
Researchers	1 509	1 228	281	668.6	539.9	128.8	44.3
Technicians directly supporting R&D	1 021	761	260	394.4	309.2	85.2	38.6
Other personnel directly supporting R&D	323	143	180	119.6	49.7	69.9	37.0
<b>Total</b>	<b>2 853</b>	<b>2 132</b>	<b>721</b>	<b>1 182.5</b>	<b>898.7</b>	<b>283.8</b>	<b>41.4</b>
<b>2018/19</b>							
Researchers	1 445	1 173	272	555.0	424.5	130.6	38.4
Technicians directly supporting R&D	992	732	260	316.9	235.9	81.0	31.9
Other personnel directly supporting R&D	301	131	170	112.5	45.2	67.3	37.4
<b>Total</b>	<b>2 738</b>	<b>2 036</b>	<b>702</b>	<b>984.3</b>	<b>705.5</b>	<b>278.8</b>	<b>36.0</b>
<b>2019/20</b>							
Researchers	1 146	904	242	472.3	357.5	114.8	41.2
Technicians directly supporting R&D	864	643	221	322.5	225.6	96.9	37.3
Other personnel directly supporting R&D	317	132	185	138.0	52.4	85.7	43.5
<b>Total</b>	<b>2 327</b>	<b>1 679</b>	<b>648</b>	<b>932.8</b>	<b>635.4</b>	<b>297.4</b>	<b>40.1</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.75: Business sector: SOEs – R&D personnel in headcounts by occupation, qualification, population group and gender (2019/20)**

OCCUPATION AND QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN/ASIAN		WHITE		NON-SA	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers	1 146	904	242	260	121	35	10	113	31	481	77	15	3
Doctoral degree or equivalent	95	77	18	20	12	2	0	6	3	39	2	10	1
Master's, honours, bachelor or equivalent	941	740	201	222	95	31	10	99	26	383	68	5	2
Diplomas	110	87	23	18	14	2	0	8	2	59	7	0	0
Technicians directly supporting R&D	864	643	221	279	146	21	20	25	8	318	47	0	0
Doctoral degree or equivalent	1	1	0	0	0	0	0	0	0	1	0	0	0
Master's, honours, bachelor or equivalent	164	106	58	50	38	2	2	10	6	44	12	0	0
Diplomas	699	536	163	229	108	19	18	15	2	273	35	0	0
Other personnel directly supporting R&D	317	132	185	65	98	8	9	5	3	54	75	0	0
Doctoral degree or equivalent	4	2	2	0	1	0	0	0	0	2	1	0	0
Master's, honours, bachelor or equivalent	43	16	27	8	20	0	3	4	0	4	4	0	0
Diplomas	270	114	156	57	77	8	6	1	3	48	70	0	0
<b>Total</b>	<b>2 327</b>	<b>1 679</b>	<b>648</b>	<b>604</b>	<b>365</b>	<b>64</b>	<b>39</b>	<b>143</b>	<b>42</b>	<b>853</b>	<b>199</b>	<b>15</b>	<b>3</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.76: Business sector: SOEs – Number of foreign and local business sector partners engaged in collaborative R&D, and total R&D collaboration expenditure (2017/18 to 2019/20)**

COLLABORATION PARTNERS	2017/18		2018/19		2019/20	
	WITHIN SOUTH AFRICA	OUTSIDE SOUTH AFRICA	WITHIN SOUTH AFRICA	OUTSIDE SOUTH AFRICA	WITHIN SOUTH AFRICA	OUTSIDE SOUTH AFRICA
Government research institutes	3	3	5	3	5	3
Higher education institutions	11	4	11	4	11	5
Members of own company	5	3	5	2	5	0
Not-for-profit organisations	3	1	4	1	4	1
Other companies	3	1	3	1	4	1
Science councils	10	2	9	2	11	2
<b>Total number of R&amp;D collaborations</b>	<b>35</b>	<b>14</b>	<b>37</b>	<b>13</b>	<b>40</b>	<b>12</b>
No collaboration	N/A	N/A	N/A	N/A	N/A	N/A
<b>R&amp;D EXPENDITURE</b>	<b>R'000</b>	<b>R'000</b>	<b>R'000</b>	<b>R'000</b>	<b>R'000</b>	<b>R'000</b>
Total in-house plus outsourced R&D collaboration expenditure (excl. VAT)	N/A	N/A	N/A	N/A	N/A	N/A

Note: Collaborative R&D entails partnerships, alliances and collaborations.  
N/A: The indicator 'No collaboration' was not assessed from 2016/17 onwards.

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

**Table C.77: Not-for-profit sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11 R'000	2011/12 R'000	2012/13 R'000	2013/14 R'000	2014/15 R'000	2015/16 R'000	2016/17 R'000	2017/18 R'000	2018/19 R'000	2019/20 R'000
Basic research	59 302	62 134	114 755	132 478	181 492	200 040	232 304	280 032	291 509	349 219
Applied research	87 435	79 105	346 179	322 295	426 132	508 738	558 059	661 575	841 861	779 943
Experimental development research	16 092	29 366	42 898	128 391	171 149	182 365	227 254	274 703	352 334	380 353
<b>Total</b>	<b>162 830</b>	<b>170 605</b>	<b>503 833</b>	<b>583 165</b>	<b>778 772</b>	<b>891 142</b>	<b>1 017 616</b>	<b>1 216 310</b>	<b>1 485 704</b>	<b>1 509 515</b>

The NPO sector in 2012/13 improved coverage by R281 509 000 contributing 1.2% of GERD. In 2015/16 the NPO sector improved coverage by R185 302 000, contributing to 0.6% of GERD.

**Table C.78: Proportional not-for-profit sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11 %	2011/12 %	2012/13 %	2013/14 %	2014/15 %	2015/16 %	2016/17 %	2017/18 %	2018/19 %	2019/20 %
Basic research	36.4	36.4	22.8	22.7	23.3	22.4	22.8	23.0	19.6	23.1
Applied research	53.7	46.4	68.7	55.3	54.7	57.1	54.8	54.4	56.7	51.7
Experimental development research	9.9	17.2	8.5	22.0	22.0	20.5	22.3	22.6	23.7	25.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.79: Not-for-profit sector R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11 R'000	2011/12 R'000	2012/13 R'000	2013/14 R'000	2014/15 R'000	2015/16 R'000	2016/17 R'000	2017/18 R'000	2018/19 R'000	2019/20 R'000
Capital expenditure	8 820	18 702	37 564	39 983	49 647	53 800	91 083	75 522	103 851	57 865
Land: buildings & other structures	4 447	6 905	11 152	19 047	18 794	18 391	20 765	23 962	41 676	15 201
TOTAL: Vehicles, plant, machinery, equipment and software	4 373	11 797	26 412	20 936	30 853	35 409	70 318	51 560	62 175	42 664
Vehicles, plant, machinery, equipment	4 373	11 797	26 412	20 936	30 853	35 409	70 318	51 560	62 175	38 076
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4 588
Current expenditure	154 010	151 903	466 269	543 182	729 125	837 342	926 534	1 140 787	1 381 853	1 451 650
Labour costs	92 098	100 176	243 871	303 644	420 462	468 883	506 181	634 168	648 726	681 740
Other current expenditure	61 912	51 727	222 398	239 538	308 663	368 459	420 353	506 620	733 127	769 910
<b>Total</b>	<b>162 830</b>	<b>170 605</b>	<b>503 833</b>	<b>583 165</b>	<b>778 772</b>	<b>891 142</b>	<b>1 017 616</b>	<b>1 216 310</b>	<b>1 485 704</b>	<b>1 509 515</b>

\*Capitalised computer software collected from 2019/20.



**Table C.80: Proportional not-for-profit sector R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Capital expenditure	5.4	11.0	7.5	6.9	6.4	6.0	9.0	6.2	7.0	3.8
Land: buildings & other structures	2.7	4.0	2.2	3.3	2.4	2.1	2.0	2.0	2.8	1.0
TOTAL: Vehicles, plant, machinery, equipment and software	2.7	6.9	5.2	3.6	4.0	4.0	6.9	4.2	4.2	2.8
Vehicles, plant, machinery, equipment	2.7	6.9	5.2	3.6	4.0	4.0	6.9	4.2	4.2	2.5
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.3
Current expenditure	94.6	89.0	92.5	93.1	93.6	94.0	91.0	93.8	93.0	96.2
Labour costs	56.6	58.7	48.4	52.1	54.0	52.6	49.7	52.1	43.7	45.2
Other current expenditure	38.0	30.3	44.1	41.1	39.6	41.3	41.3	41.7	49.3	51.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\*Capitalised computer software collected from 2019/20.

**Table C.81: Not-for-profit sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Biotechnology	5 666	8 667	29 062	62 082	128 964	159 045	123 879	160 846	261 324	339 841
Nanotechnology	1475	0	10187	4 915	70 348	81 103	841	543	569	0
<b>Total</b>	<b>7 141</b>	<b>8 667</b>	<b>39 249</b>	<b>66 997</b>	<b>199 312</b>	<b>240 148</b>	<b>124 720</b>	<b>161 389</b>	<b>261 892</b>	<b>339 841</b>
<b>NPO expenditure on R&amp;D</b>	<b>162 830</b>	<b>170 605</b>	<b>503 833</b>	<b>583 165</b>	<b>778 772</b>	<b>891 142</b>	<b>1 017 616</b>	<b>1 216 310</b>	<b>1 485 704</b>	<b>1 509 515</b>

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

**Table C.82: Proportional not-for-profit sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Biotechnology	3.5	5.1	5.8	10.6	16.6	17.8	12.2	13.2	17.6	22.5
Nanotechnology	0.9	0.0	2.0	0.8	9	9.1	0.1	0.0	0.0	0.0
<b>Total</b>	<b>4.4</b>	<b>5.1</b>	<b>7.8</b>	<b>11.5</b>	<b>25.6</b>	<b>26.9</b>	<b>12.3</b>	<b>13.3</b>	<b>17.6</b>	<b>22.5</b>

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

**Table C.83: Not-for-profit sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Environment related	N/A	15 133	18 022	27 142	50 364	52 156	54 904	56 218	70 733	85 245
Open-source software	0	20	419	481	69 509	756	824	952	930	1 335
New materials	830	395	178	191	634	79 322	223	1 814	0	20 594
Tuberculosis, HIV/AIDS, malaria	13 979	5 034	246 760	301 086	374 460	482 298	689 315	876 132	1 118 507	1 147 804
Space science	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0
<b>Total</b>	<b>14 809</b>	<b>20 581</b>	<b>265 379</b>	<b>328 901</b>	<b>494 966</b>	<b>614 532</b>	<b>745 265</b>	<b>935 117</b>	<b>1 190 170</b>	<b>1 254 979</b>
<b>NPO expenditure on R&amp;D</b>	<b>162 830</b>	<b>170 605</b>	<b>503 833</b>	<b>583 165</b>	<b>778 772</b>	<b>891 142</b>	<b>1 017 616</b>	<b>1 216 310</b>	<b>1 485 704</b>	<b>1 509 515</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.84: Proportional not-for-profit sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environment related	N/A	8.9	3.6	4.7	6.5	5.9	5.4	4.6	4.8	5.6
Open-source software	0.0	0.0	0.1	0.1	8.9	0.1	0.1	0.1	0.1	0.1
New materials	0.5	0.2	0.0	0.0	0.1	8.9	0.0	0.1	0.0	1.4
Tuberculosis, HIV/AIDS, malaria	8.6	3.0	49.0	51.6	48.1	54.1	67.7	72.0	75.3	76.0
Space science	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.0	0.0	0.0
<b>Total</b>	<b>9.1</b>	<b>12.1</b>	<b>52.7</b>	<b>56.4</b>	<b>63.6</b>	<b>69.0</b>	<b>73.2</b>	<b>76.9</b>	<b>80.1</b>	<b>83.1</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.85: Not-for-profit sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	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	54 776	64 042	346 961	427 237	647 068	766 355	909 337	1 096 247	1 374 844	1 402 157
Mathematical sciences	0	0	8 223	9 674	14 613	14 293	13 540	14 797	16 009	16 684
Physical sciences	0	0	765	802	989	1 191	1 300	1 504	1 551	1 616
Chemical sciences	0	0	0	1 309	0	0	0	0	0	0
Earth sciences	2 585	2 407	2 598	5 907	8 371	8 356	8 727	8 008	8 594	7 532
Information, computer and communication technologies	0	595	2 919	39	197	528	0	1 925	0	365
Applied sciences and technologies	0	1 487	4 317	4 666	19 123	30 565	29 946	29 379	30 941	31 097
Engineering sciences	0	0	4 075	4 915	4 638	4 005	3 393	1 572	1 645	1 746
Biological sciences	1 473	7 978	15 475	23 435	23 338	11 400	42 787	44 312	62 027	64 866

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Agricultural sciences	25 679	25 819	33 105	34 165	53 777	60 727	62 269	63 037	52 807	52 884
Medical and health sciences	15 920	17 423	265 031	329 293	497 588	614 889	719 902	905 867	1 174 074	1 200 011
Environmental sciences	3 433	7 553	10 122	12 238	23 548	19 552	25 746	24 150	25 335	23 586
Material sciences	0	0	0	0	0	0	0	0	0	0
Marine sciences	5 687	781	331	794	886	848	1 725	1 697	1 860	1 770
Division 2: Social sciences and humanities	108 054	106 563	156 872	155 928	131 705	124 787	108 280	120 063	110 860	107 358
Social sciences	104 306	104 842	142 525	147 029	122 105	117 549	98 355	109 068	99 304	87 132
Humanities	3 749	1 720	14 348	8 898	9 599	7 238	9 925	10 995	11 556	20 226
<b>Total</b>	<b>162 830</b>	<b>170 605</b>	<b>503 833</b>	<b>583 165</b>	<b>778 772</b>	<b>891 142</b>	<b>1 017 616</b>	<b>1 216 310</b>	<b>1 485 704</b>	<b>1 509 515</b>

**Table C.86: Proportional not-for-profit sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Division 1: Natural sciences, technology and engineering	33.6	37.5	68.9	73.3	83.1	86.0	89.4	90.1	92.5	92.9
Mathematical sciences	0.0	0.0	1.6	1.7	1.9	1.6	1.3	1.2	1.1	1.1
Physical sciences	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Chemical sciences	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Earth sciences	1.6	1.4	0.5	1.0	1.1	0.9	0.9	0.7	0.6	0.5
Information, computer and communication technologies	0.0	0.3	0.6	0.0	0.0	0.1	0.0	0.2	0.0	0.0
Applied sciences and technologies	0.0	0.9	0.9	0.8	2.5	3.4	2.9	2.4	2.1	2.1
Engineering sciences	0.0	0.0	0.8	0.8	0.6	0.4	0.3	0.1	0.1	0.1
Biological sciences	0.9	4.7	3.1	4.0	3.0	1.3	4.2	3.6	4.2	4.3
Agricultural sciences	15.8	15.1	6.6	5.9	6.9	6.8	6.1	5.2	3.6	3.5
Medical and health sciences	9.8	10.2	52.6	56.5	63.9	69.0	70.7	74.5	79.0	79.5
Environmental sciences	2.1	4.4	2.0	2.1	3.0	2.2	2.5	2.0	1.7	1.6
Material sciences	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marine sciences	3.5	0.5	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Division 2: Social sciences and humanities	66.4	62.5	31.1	26.7	16.9	14.0	10.6	9.9	7.5	7.1
Social sciences	64.1	61.5	28.3	25.2	15.7	13.2	9.7	9.0	6.7	5.8
Humanities	2.3	1.0	2.8	1.5	1.2	0.8	1.0	0.9	0.8	1.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.87: Not-for-profit sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
<b>Division 1:</b>										
Defence	0	0	0	0	690	0	0	0	0	0
<b>Division 2:</b>										
<b>Economic development</b>	<b>65 777</b>	<b>60 758</b>	<b>110 866</b>	<b>113 991</b>	<b>152 573</b>	<b>157 608</b>	<b>129 359</b>	<b>118 415</b>	<b>103 702</b>	<b>92 455</b>
Economic development unclassified	0	0	0	0	0	0	0	0	0	0
Plant production and plant primary products	25 441	24 850	36 127	35 511	28 974	32 936	35 240	35 197	26 579	23 124
Animal production and animal primary products	1 389	828	2 538	3 083	4 000	7 628	9 856	2 635	2 858	2 378
Mineral resources (excluding energy)	763	0	8 150	9 831	9 242	7 955	7 708	0	0	0
Energy resources	1 653	969	2 538	3 083	3 993	4 008	3 278	4 022	4 875	4 508
Energy supply	3 307	3 430	4 363	8 690	7 663	6 242	10 628	7 994	8 852	7 102
Manufacturing	0	2 197	3 896	2 955	26 291	31 646	230	0	308	321
Construction	0	0	0	0	0	0	0	0	0	0
Transport	0	137	465	424	0	0	0	0	0	0
Information and communication services	0	1 480	2 031	1 823	316	2 411	327	2 513	0	365
Commercial services	0	0	0	0	0	1 135	1 962	1 675	0	0
Economic framework	27 068	22 228	45 252	42 423	54 435	53 406	47 465	57 125	53 099	47 407
Natural resources	6 157	4 640	5 507	6 167	17 659	10 242	12 665	7 253	7 131	7 251
<b>Division 3:</b>										
<b>Society</b>	<b>82 481</b>	<b>75 597</b>	<b>360 333</b>	<b>415 093</b>	<b>555 151</b>	<b>632 030</b>	<b>767 620</b>	<b>941 505</b>	<b>1 058 928</b>	<b>1 079 921</b>
Society unclassified	0	0	0	0	0	0	0	0	0	0
Health	15 050	13 496	260 712	303 535	449 619	527 783	667 371	835 603	955 738	962 721
Education and training	22 303	23 762	58 894	63 833	61 150	59 917	59 123	61 652	60 123	80 287
Social development and community services	45 128	38 339	40 726	47 725	44 382	44 330	41 126	44 250	43 066	36 913
<b>Division 4:</b>										
<b>Environment</b>	<b>10 051</b>	<b>13 356</b>	<b>12 841</b>	<b>15 044</b>	<b>16 135</b>	<b>17 503</b>	<b>19 734</b>	<b>38 078</b>	<b>39 974</b>	<b>37 194</b>
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental knowledge	6 139	7 233	4 716	7 845	8 697	9 949	9 712	23 780	23 201	22 225
Environmental aspects of development	504	3 746	5 771	4 545	4 569	4 494	6 269	6 559	7 544	6 393

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Environmental and other aspects	3 408	2 377	2 355	2 654	2 869	3 060	3 753	7 739	9 229	8 576
Division 5: Advancement of knowledge	4 521	20 895	19 793	39 036	54 223	84 002	100 903	118 312	283 100	299 945
Advancement of knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural sciences, technologies and engineering	632	13 166	7 754	31 450	42 017	69 845	90 114	107 310	272 540	286 464
Social sciences and humanities	3 889	7 729	12 039	7 586	12 206	14 157	10 789	11 001	10 561	13 481
<b>Total</b>	<b>162 830</b>	<b>170 605</b>	<b>503 833</b>	<b>583 165</b>	<b>778 772</b>	<b>891 142</b>	<b>1 017 616</b>	<b>1 216 310</b>	<b>1 485 704</b>	<b>1 509 515</b>

**Table C.88: Proportional not-for-profit sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Division 1: Defence	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Defence	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Division 2: Economic development	40.4	35.6	22.0	19.5	19.6	17.7	12.7	9.7	7.0	6.1
Economic development unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant production and plant primary products	15.6	14.6	7.2	6.1	3.7	3.7	3.5	2.9	1.8	1.5
Animal production and animal primary products	0.9	0.5	0.5	0.5	0.5	0.9	1.0	0.2	0.2	0.2
Mineral resources (excluding energy)	0.5	0.0	1.6	1.7	1.2	0.9	0.8	0.0	0.0	0.0
Energy resources	1.0	0.6	0.5	0.5	0.5	0.4	0.3	0.3	0.3	0.3
Energy supply	2.0	2.0	0.9	1.5	1.0	0.7	1.0	0.7	0.6	0.5
Manufacturing	0.0	1.3	0.8	0.5	3.4	3.6	0.0	0.0	0.0	0.0
Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transport	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Information and communication services	0.0	0.9	0.4	0.3	0.0	0.3	0.0	0.2	0.0	0.0
Commercial services	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0
Economic framework	16.6	13.0	9.0	7.3	7.0	6.0	4.7	4.7	3.6	3.1
Natural resources	3.8	2.7	1.1	1.1	2.3	1.1	1.2	0.6	0.5	0.5

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Division 3:</b>										
Society	50.7	44.3	71.5	71.2	71.3	70.9	75.4	77.4	71.3	71.5
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	9.2	7.9	51.7	52.0	57.7	59.2	65.6	68.7	64.3	63.8
Education and training	13.7	13.9	11.7	10.9	7.9	6.7	5.8	5.1	4.0	5.3
Social development and community services	27.7	22.5	8.1	8.2	5.7	5.0	4.0	3.6	2.9	2.4
<b>Division 4:</b>										
Environment	6.2	7.8	2.5	2.6	2.1	2.0	1.9	3.1	2.7	2.5
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental knowledge	3.8	4.2	0.9	1.3	1.1	1.1	1.0	2.0	1.6	1.5
Environmental aspects of development	0.3	2.2	1.1	0.8	0.6	0.5	0.6	0.5	0.5	0.4
Environmental and other aspects	2.1	1.4	0.5	0.5	0.4	0.3	0.4	0.6	0.6	0.6
<b>Division 5:</b>										
Advancement of knowledge	2.8	12.2	3.9	6.7	7.0	9.4	9.9	9.7	19.1	19.9
Advancement of knowledge unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Natural sciences, technologies and engineering	0.4	7.7	1.5	5.4	5.4	7.8	8.9	8.8	18.3	19.0
Social sciences and humanities	2.4	4.5	2.4	1.3	1.6	1.6	1.1	0.9	0.7	0.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.89: Not-for-profit sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Eastern Cape	9 790	9 493	25 610	25 478	27 219	21 026	17 053	15 150	19 452	19 676
Free State	6 385	5 096	15 297	15 953	14 214	8 890	6 643	8 086	11 332	29 633
Gauteng	61 496	69 321	162 866	175 651	287 783	345 937	333 359	440 863	528 725	543 971
KwaZulu-Natal	35 765	33 740	163 221	166 603	181 052	232 636	277 770	317 706	316 771	267 615
Limpopo	4 541	7 449	11 779	13 719	49 971	56 143	64 105	78 996	67 940	79 897
Mpumalanga	13 206	16 027	23 195	26 979	30 594	25 944	29 964	32 775	29 863	25 003
North West	5 612	6 353	42 960	72 446	105 904	97 918	136 641	133 473	136 626	162 503
Northern Cape	2 030	1 889	3 867	3 583	1 546	2 200	4 782	4 868	3 238	3 837
Western Cape	24 003	21 236	55 038	82 753	80 489	100 448	147 299	184 392	371 758	377 380
<b>Total</b>	<b>162 830</b>	<b>170 605</b>	<b>503 833</b>	<b>583 165</b>	<b>778 772</b>	<b>891 142</b>	<b>1 017 616</b>	<b>1 216 310</b>	<b>1 485 704</b>	<b>1 509 515</b>

**Table C.90: Proportional not-for-profit sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Eastern Cape	6.0	5.6	5.1	4.4	3.5	2.4	1.7	1.2	1.3	1.3
Free State	3.9	3.0	3.0	2.7	1.8	1.0	0.7	0.7	0.8	2.0
Gauteng	37.8	40.6	32.3	30.1	37.0	38.8	32.8	36.2	35.6	36.0
KwaZulu-Natal	22.0	19.8	32.4	28.6	23.2	26.1	27.3	26.1	21.3	17.7
Limpopo	2.8	4.4	2.3	2.4	6.4	6.3	6.3	6.5	4.6	5.3
Mpumalanga	8.1	9.4	4.6	4.6	3.9	2.9	2.9	2.7	2.0	1.7
North West	3.4	1.1	8.5	12.4	13.6	11.0	13.4	11.0	9.2	10.8
Northern Cape	1.2	3.7	0.8	0.6	0.2	0.2	0.5	0.4	0.2	0.3
Western Cape	14.7	12.4	10.9	14.2	10.3	11.3	14.5	15.2	25.0	25.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.91: Not-for-profit sector R&D personnel in headcounts and full-time equivalents by occupation (2010/11 to 2019/20)**

YEAR	HEADCOUNTS				FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL
2010/11	400	250	49	101	313.1	196.2	47.6	69.3
2011/12	405	254	56	95	312.1	190.8	47.2	74.1
2012/13	906	394	132	380	768.0	294.5	114.2	359.4
2013/14	1 017	435	205	377	891.4	338.4	195.1	357.9
2014/15	1 471	506	368	597	1 231.2	396.0	355.5	479.8
2015/16	1 493	465	436	592	1 367.3	384.8	411.2	571.2
2016/17	1 616	404	607	605	1 469.5	340.5	575.6	553.4
2017/18	1 741	425	678	638	1 596.0	346.1	644.7	605.2
2018/19	1 937	424	843	670	1 685.8	367.3	693.2	625.4
2019/20	1 925	390	878	657	1 710.1	330.9	766.0	613.3

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.92: Not-for-profit sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2017/18 to 2019/20)**

OCCUPATION	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS
<b>2017/18</b>							
Researchers	425	181	244	346.1	139.8	206.4	81.4
Technicians directly supporting R&D	678	207	471	644.7	191.3	453.4	95.1
Other personnel directly supporting R&D	638	169	469	605.2	160.7	444.5	94.9
<b>Total</b>	<b>1 741</b>	<b>557</b>	<b>1 184</b>	<b>1 596.0</b>	<b>491.7</b>	<b>1 104.3</b>	<b>91.7</b>
<b>2018/19</b>							
Researchers	424	165	259	367.3	142.6	224.7	86.6
Technicians directly supporting R&D	843	231	612	693.2	192.0	501.2	82.2
Other personnel directly supporting R&D	670	182	488	625.4	167.8	457.5	93.3
<b>Total</b>	<b>1 937</b>	<b>578</b>	<b>1 359</b>	<b>1 685.8</b>	<b>502.4</b>	<b>1 183.4</b>	<b>87.0</b>
<b>2019/20</b>							
Researchers	390	162	228	330.9	132.7	198.2	84.8
Technicians directly supporting R&D	878	214	664	766.0	195.3	570.7	87.2
Other personnel directly supporting R&D	657	189	468	613.3	175.0	438.3	93.3
<b>Total</b>	<b>1 925</b>	<b>565</b>	<b>1 360</b>	<b>1 710.1</b>	<b>502.9</b>	<b>1 207.1</b>	<b>88.8</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.93: Not-for-profit sector R&D personnel in headcounts by occupation, qualification, population group and gender (2019/20)**

OCCUPATION AND QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN/ASIAN		WHITE		NON-SA	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers	390	162	228	49	73	6	17	15	38	79	78	13	22
Doctoral degree or equivalent	117	63	54	12	10	1	4	5	14	39	20	6	6
Master's, honours, bachelor or equivalent	216	79	137	27	46	2	9	7	18	37	52	6	12
Diplomas	57	20	37	10	17	3	4	3	6	3	6	1	4
Technicians directly supporting R&D	878	214	664	163	497	13	66	14	52	17	46	7	3
Doctoral degree or equivalent	1	0	1	0	0	0	0	0	0	0	1	0	0
Master's, honours, bachelor or equivalent	222	46	176	17	85	4	25	7	34	14	31	4	1
Diplomas	655	168	487	146	412	9	41	7	18	3	14	3	2
Other personnel directly supporting R&D	657	189	468	140	330	13	33	15	35	13	62	8	8
Doctoral degree or equivalent	5	1	4	1	4	0	0	0	0	0	0	0	0
Master's, honours, bachelor or equivalent	121	29	92	12	32	3	14	6	18	5	23	3	5
Diplomas	531	159	372	127	294	10	19	9	17	8	39	5	3
<b>Total</b>	<b>1 925</b>	<b>565</b>	<b>1 360</b>	<b>352</b>	<b>900</b>	<b>32</b>	<b>116</b>	<b>44</b>	<b>125</b>	<b>109</b>	<b>186</b>	<b>28</b>	<b>33</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

### C.2.3. Government sector

**Table C.94: Government sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11 R'000	2011/12 R'000	2012/13 R'000	2013/14 R'000	2014/15 R'000	2015/16 R'000	2016/17 R'000	2017/18 R'000	2018/19 R'000	2019/20 R'000
Basic research	257 235	263 380	331 587	245 167	338 250	358 666	348 775	329 263	416 131	400 775
Applied research	600 205	812 067	873 469	1 194 866	1 292 421	1 390 221	1 444 821	1 685 367	1 495 783	1 241 999
Experimental development research	153 900	160 223	232 453	257 118	262 339	264 134	305 051	311 246	311 513	250 769
<b>Total</b>	<b>1 011 340</b>	<b>1 235 669</b>	<b>1 437 509</b>	<b>1 697 151</b>	<b>1 893 010</b>	<b>2 013 021</b>	<b>2 098 646</b>	<b>2 325 875</b>	<b>2 223 426</b>	<b>1 893 543</b>

**Table C.95: Proportional government sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11 %	2011/12 %	2012/13 %	2013/14 %	2014/15 %	2015/16 %	2016/17 %	2017/18 %	2018/19 %	2019/20 %
Basic research	25.4	21.3	23.1	14.4	17.9	17.8	16.6	14.2	18.7	21.2
Applied research	59.3	65.7	60.8	70.4	68.3	69.1	68.8	72.5	67.3	65.6
Experimental development research	15.2	13.0	16.2	15.1	13.9	13.1	14.5	13.4	14.0	13.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>





**Table C.97: Proportional government sector R&D expenditure by spheres and institutes of government and accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Municipalities</b>	N/A	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>Capital expenditure</b>	N/A	1.0	28.4	38.8	20.7	21.2	26.5	22.4	35.7	20.2
Land: buildings and other structures	N/A	0.0	8.2	16.8	10.5	10.7	12.5	12.0	15.8	8.5
TOTAL: Vehicles, plant, machinery, equipment and software	N/A	1.0	20.1	21.9	10.2	10.5	14.0	10.5	19.9	11.6
Vehicles, plant, machinery, equipment	N/A	1.0	20.1	21.9	10.2	10.5	14.0	10.5	19.9	7.9
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.7
<b>Current expenditure</b>	N/A	99.0	71.6	61.2	79.3	78.8	73.5	77.6	64.3	79.8
Labour costs	N/A	85.0	46.0	46.3	62.9	62.7	54.1	64.8	50.3	70.5
Other current expenditure	N/A	14.0	25.6	14.9	16.4	16.1	19.4	12.8	14.0	9.3
<b>Provincial departments</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>Capital expenditure</b>	10.7	12.8	12.3	11.8	9.3	10.9	11.9	8.6	6.7	10.7
Land: buildings and other structures	4.6	3.2	1.9	1.6	1.3	2.0	3.0	3.6	3.0	3.4
TOTAL: Vehicles, plant, machinery, equipment and software	6.1	9.6	10.4	10.1	8.0	9.0	8.8	5.0	3.7	7.3
Vehicles, plant, machinery, equipment	6.1	9.6	10.4	10.1	8.0	9.0	8.8	5.0	3.7	6.1
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.2
<b>Current expenditure</b>	89.3	87.2	87.7	88.2	90.7	89.1	88.1	91.4	93.3	89.3
Labour costs	64.0	61.6	63.5	59.8	59.1	56.2	62.2	64.3	61.4	64.4
Other current expenditure	25.3	25.7	24.2	28.5	31.6	32.9	26.0	27.1	31.9	24.9
<b>National departments</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>Capital expenditure</b>	18.3	11.4	10.2	7.0	1.8	16.2	13.9	14.0	14.1	14.7
Land: buildings and other structures	1.7	4.2	4.0	0.8	0.3	5.1	1.6	1.3	3.0	4.0
TOTAL: Vehicles, plant, machinery, equipment and software	16.6	7.2	6.2	6.2	1.4	11.2	12.4	12.6	11.2	10.7
Vehicles, plant, machinery, equipment	16.6	7.2	6.2	6.2	1.4	11.2	12.4	12.6	11.2	10.3
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.4
<b>Current expenditure</b>	81.7	88.6	89.8	93.0	98.2	83.8	86.1	86.0	85.9	85.3
Labour costs	68.6	50.1	49.4	79.5	60.8	48.2	52.9	44.6	35.6	45.0
Other current expenditure	13.1	38.6	40.5	13.5	37.4	35.6	33.2	41.4	50.3	40.3
<b>Government research institutes</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>Capital expenditure</b>	23.4	6.1	24.4	10.1	20.6	17.4	16.9	20.4	29.5	28.7
Land: buildings and other structures	9.0	0.4	9.0	0.5	8.2	9.7	9.2	9.9	9.1	13.1
TOTAL: Vehicles, plant, machinery, equipment and software	14.5	5.7	15.4	9.6	12.3	7.7	7.8	10.5	20.4	15.6
Vehicles, plant, machinery, equipment	14.5	5.7	15.4	9.6	12.3	7.7	7.8	10.5	20.4	15.0
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.6
<b>Current expenditure</b>	76.6	93.9	75.6	89.9	79.4	82.6	83.1	79.6	70.5	71.3
Labour costs	55.8	55.2	55.2	32.5	33.1	26.8	27.4	24.8	33.9	48.1
Other current expenditure	20.8	38.7	20.4	57.5	46.3	55.8	55.7	54.8	36.6	23.3
<b>Museums</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>Capital expenditure</b>	11.7	10.4	1.9	4.0	7.5	7.1	9.8	4.9	9.9	13.4
Land: buildings and other structures	6.8	7.4	0.1	2.7	2.6	2.4	2.8	0.0	0.0	3.2
TOTAL: Vehicles, plant, machinery, equipment and software	4.9	2.9	1.8	1.3	4.9	4.8	7.0	4.9	9.9	10.1
Vehicles, plant, machinery, equipment	4.9	2.9	1.8	1.3	4.9	4.8	7.0	4.9	9.9	6.3
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.8
<b>Current expenditure</b>	88.3	89.6	98.1	96.0	92.5	92.9	90.2	95.1	90.1	86.6
Labour costs	65.8	68.2	75.5	86.8	84.7	84.6	87.0	90.1	83.1	71.6
Other current expenditure	22.5	21.4	22.6	9.2	7.8	8.2	3.2	5.0	6.9	15.1
<b>Government sector</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>Capital expenditure</b>	18.4	9.2	17.7	10.9	15.4	15.9	15.6	16.9	21.5	20.6
Land: buildings and other structures	6.1	2.2	5.8	1.4	5.7	7.2	6.5	6.9	6.6	8.4
TOTAL: Vehicles, plant, machinery, equipment and software	12.3	7.0	11.9	9.5	9.8	8.6	9.1	10.0	14.9	12.3
Vehicles, plant, machinery, equipment	12.3	7.0	11.9	9.5	9.8	8.6	9.1	10.0	14.9	11.3
*Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.9
<b>Current expenditure</b>	81.6	90.8	82.3	89.1	84.6	84.1	84.4	83.1	78.5	79.4
Labour costs	61.1	56.5	56.1	46.9	44.2	38.3	40.8	37.6	40.5	52.6
Other current expenditure	20.5	34.4	26.2	42.2	40.3	45.8	43.5	45.5	38.0	26.8

N/A: Municipal data were collected from the 2011/12 R&D survey onwards. \*Capitalised computer software collected from 2019/20.

**Table C.98: Government sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Biotechnology	213 817	81 993	124 429	97 816	85 385	81 409	87 557	84 738	89 293	100 237
Nanotechnology	4 196	4 609	15 035	16 929	13 112	11 774	12 620	12 741	24 732	10 784
<b>Total</b>	<b>218 013</b>	<b>86 602</b>	<b>139 464</b>	<b>114 745</b>	<b>98 497</b>	<b>93 183</b>	<b>100 176</b>	<b>97 479</b>	<b>114 025</b>	<b>111 021</b>
<b>Government expenditure on R&amp;D</b>	<b>1 011 340</b>	<b>1 235 669</b>	<b>1 437 509</b>	<b>1 697 151</b>	<b>1 893 010</b>	<b>2 013 021</b>	<b>2 098 646</b>	<b>2 325 875</b>	<b>2 223 426</b>	<b>1 893 543</b>

**Table C.99: Proportional government sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Biotechnology	21.1	6.6	8.7	5.8	4.5	4.0	4.2	3.6	4.0	5.3
Nanotechnology	0.4	0.4	1.0	1.0	0.7	0.6	0.6	0.5	1.1	0.6
<b>Total</b>	<b>21.6</b>	<b>7.0</b>	<b>9.7</b>	<b>6.8</b>	<b>5.2</b>	<b>4.6</b>	<b>4.8</b>	<b>4.2</b>	<b>5.1</b>	<b>5.9</b>

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

**Table C.100: Government sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Environment related	N/A	109 774	170 304	194 564	232 090	192 774	202 351	316 188	339 012	314 713
Open-source software	7 261	1 345	1 501	0	0	0	0	597	710.62	5 553
New materials	26 166	4 107	28 708	30 945	12 062	5 291	6 143	7 599	13 172	8 594
Tuberculosis, HIV/AIDS, malaria	174 382	167 522	132 264	380 640	359 074	389 279	395 996	435 045	237 974	114 727
Space science	N/A	N/A	N/A	N/A	N/A	N/A	39 882	0	0	51 887
<b>Total</b>	<b>207 809</b>	<b>282 748</b>	<b>332 777</b>	<b>606 149</b>	<b>603 226</b>	<b>587 343</b>	<b>644 372</b>	<b>759 430</b>	<b>590 869</b>	<b>495 475</b>
<b>Government expenditure on R&amp;D</b>	<b>1 011 340</b>	<b>1 235 669</b>	<b>1 437 509</b>	<b>1 697 151</b>	<b>1 893 010</b>	<b>2 013 021</b>	<b>2 098 646</b>	<b>2 325 875</b>	<b>2 223 426</b>	<b>1 893 543</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.101: Proportional government sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environment related	N/A	8.9	11.8	11.5	12.3	9.6	9.6	13.6	15.2	16.6
Open-source software	0.7	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
New materials	2.6	0.3	2.0	1.8	0.6	0.3	0.3	0.3	0.6	0.5
Tuberculosis, HIV/AIDS, malaria	17.2	13.6	9.2	22.4	19.0	19.3	18.9	18.7	10.7	6.1
Space science	N/A	N/A	N/A	N/A	N/A	N/A	1.9	0.0	0.0	2.7
<b>Total</b>	<b>20.5</b>	<b>22.9</b>	<b>23.1</b>	<b>24.3</b>	<b>19.6</b>	<b>29.2</b>	<b>30.7</b>	<b>32.7</b>	<b>26.6</b>	<b>26.2</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.102: Government sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	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	634 237	863 949	1 045 006	1 359 179	1 558 094	1 520 894	1 560 315	1 722 617	1 592 766	1 401 551
Mathematical sciences	22 811	2 349	1 076	1 525	28 302	397	539	85	1 855	11 408
Physical sciences	0	0	5064	0	30154	26 455	28 529	49 051	54 017	8 725
Chemical sciences	10 653	1 223	21 823	19 394	61 881	61 688	68 937	73 898	81 603	45 405
Earth sciences	42 081	39 303	90 571	65 501	139 388	79 942	85 550	50 110	103 767	163 319
Information, computer and communication technologies	31 960	15 642	7 760	8 431	12 141	4 662	5 540	398	0	0
Applied sciences and technologies	4 154	10 183	32 467	23 216	29 723	22 531	25 444	23 016	38 562	49 438
Engineering sciences	4 165	4 515	10 430	11 853	13 176	12 129	13 572	17 076	14 574	14 071
Biological sciences	85 990	94 662	111 871	138 000	152 735	196 053	195 922	215 624	254 654	246 541
Agricultural sciences	225 441	362 241	460 921	397 687	506 445	471 798	485 417	523 343	557 157	591 668
Medical and health sciences	168 400	270 312	211 840	594 684	553 534	608 530	615 067	673 437	370 294	167 039
Environmental sciences	9 147	34 231	54 394	55 245	14 353	14 478	13 921	13 085	17 270	29 249
Material sciences	0	4107	9 771	10 537	0	0	0	0	0	0
Marine sciences	29 434	25 182	27 019	33 106	16 262	22 232	21 877	83 495	99 013	74 686
Division 2: Social sciences and humanities	377 103	371 720	392 503	337 972	334 916	492 127	538 331	603 258	630 660	491 992
Social sciences	363 055	358 892	383 172	326 603	328 522	479 316	529 080	591 813	620 433	476 565
Humanities	14 048	12 828	9 331	11 369	6 394	12 811	9 251	11 445	10 227	15 427
<b>Total</b>	<b>1 011 340</b>	<b>1 235 669</b>	<b>1 437 509</b>	<b>1 697 151</b>	<b>1 893 010</b>	<b>2 013 021</b>	<b>2 098 646</b>	<b>2 325 875</b>	<b>2 223 426</b>	<b>1 893 543</b>

**Table C.103: Proportional government sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Division 1: Natural sciences, technology and engineering	62.7	69.9	72.7	80.1	82.3	75.6	74.3	74.1	71.6	74.0
Mathematical sciences	2.3	0.2	0.1	0.1	1.5	0.0	0.0	0.0	0.1	0.6
Physical sciences	0.0	0.0	0.4	0.0	1.6	1.3	1.4	2.1	2.4	0.5
Chemical sciences	1.1	0.1	1.5	1.1	3.3	3.1	3.3	3.2	3.7	2.4
Earth sciences	4.2	3.2	6.3	3.9	7.4	4.0	4.1	2.2	4.7	8.6

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Information, computer and communication technologies	3.2	1.3	0.5	0.5	0.6	0.2	0.3	0.0	0.0	0.0
Applied sciences and technologies	0.4	0.8	2.3	1.4	1.6	1.1	1.2	1.0	1.7	2.6
Engineering sciences	0.4	0.4	0.7	0.7	0.7	0.6	0.6	0.7	0.7	0.7
Biological sciences	8.5	7.7	7.8	8.1	8.1	9.7	9.3	9.3	11.5	13.0
Agricultural sciences	22.3	29.3	32.1	23.4	26.8	23.4	23.1	22.5	25.1	31.2
Medical and health sciences	16.7	21.9	14.7	35.0	29.2	30.2	29.3	29.0	16.7	8.8
Environmental sciences	0.9	2.8	3.8	3.3	0.8	0.7	0.7	0.6	0.8	1.5
Material sciences	0.0	0.3	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Marine sciences	2.9	2.0	1.9	2.0	0.9	1.1	1.0	3.6	4.5	3.9
Division 2: Social sciences and humanities	37.3	30.1	27.3	19.9	17.7	24.4	25.7	25.9	28.4	26.0
Social sciences	35.9	29.0	26.7	19.2	17.4	23.8	25.2	25.4	27.9	25.2
Humanities	1.4	1.0	0.6	0.7	0.3	0.6	0.4	0.5	0.5	0.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.104: Government sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1:										
Defence	2303	2 736	19 314	21 118	21 472	42 233	34 213	7 582	46 886	31 484
Defence	2303	2 736	19 314	21 118	21 472	42 233	34 213	7 582	46 886	31 484
Division 2:										
Economic development	500 343	469 129	480 373	510 688	763 932	745 129	826 860	1 009 575	1 117 257	1 045 765
Economic development unclassified	0	0	0	0	0	0	0	0	0	0
Plant production and plant primary products	64 400	70 754	100 956	89 446	107 672	92 506	103 212	117 664	115 406	127 551
Animal production and animal primary products	91 877	86 710	93 504	137 279	156 437	125 737	134 227	129 024	135 755	141 189
Mineral resources (excluding energy)	0	0	0	311	5403	6 548	2 854	12 395	5 508	5 729
Energy resources	37	0	0	1023	12 062	5 291	5 716	5 706	6 413	2 446
Energy supply	6 154	10 552	7 193	8 482	34 845	29 705	32 772	40 959	53 254	15 204
Manufacturing	15 870	1 005	1 557	1 544	79 583	1 318	5 201	5 433	10 794	15 855
Construction	148	9545	543	741	4312	1 394	1 501	1 584	8 501	6 112
Transport	9 377	10 964	8 774	1 672	24 105	21 537	24 896	21 926	7 268	9 686

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Information and communication services	44 257	20 590	5 678	5 515	14 397	7 977	6 071	19 938	18 583	13 385
Commercial services	7 471	4 708	3 587	12 162	15 532	13 531	12 616	47 515	72 388	55 141
Economic framework	187 931	157 364	161 541	116 604	167 690	262 289	343 537	394 216	404 073	381 306
Natural resources	72 820	96 938	97 042	135 909	141 895	177 298	154 258	213 214	279 313	272 162
<b>Division 3: Society</b>	<b>341 387</b>	<b>538 749</b>	<b>592 285</b>	<b>872 096</b>	<b>912 216</b>	<b>952 108</b>	<b>951 859</b>	<b>1 029 316</b>	<b>746 234</b>	<b>529 902</b>
Society unclassified	0	0	0	0	0	0	0	0	0	0
Health	106 522	221 435	171 741	487 130	475 983	482 472	511 031	554 746	303 831	137 831
Education and training	42 234	69 185	116 788	165 906	174 540	209 544	169 499	173 547	139 984	96 114
Social development and community services	192 630	248 129	303 756	219 061	261 693	260 092	271 328	301 023	302 419	295 956
<b>Division 4: Environment</b>	<b>85 347</b>	<b>130 742</b>	<b>199 677</b>	<b>172 006</b>	<b>127 394</b>	<b>191 334</b>	<b>204 573</b>	<b>208 704</b>	<b>237 373</b>	<b>191 622</b>
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental knowledge	40 610	83 089	137 679	124 445	91 677	107 265	116 996	100 339	117 228	123 194
Environmental aspects of development	27 635	38 467	51 795	38 877	27 206	53 541	55 508	50 936	64 148	48 503
Environmental and other aspects	17 102	9 186	10 204	8 684	8 511	30 528	32 069	57 429	55 997	19 924
<b>Division 5: Advancement of knowledge</b>	<b>81 960</b>	<b>94 314</b>	<b>145 860</b>	<b>121 243</b>	<b>67 996</b>	<b>82 217</b>	<b>81 141</b>	<b>70 698</b>	<b>75 676</b>	<b>94 771</b>
Advancement of knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural sciences, technologies and engineering	50 968	61 357	120 173	96 381	43 170	58 401	57 655	57 473	61 475	78 751
Social sciences and humanities	30 992	32 956	25 687	24 862	24 825	23 816	23 486	13 225	14 201	16 019
<b>Total</b>	<b>1 011 340</b>	<b>1 235 669</b>	<b>1 437 509</b>	<b>1 697 151</b>	<b>1 893 010</b>	<b>2 013 021</b>	<b>2 098 646</b>	<b>2 325 875</b>	<b>2 223 426</b>	<b>1 893 543</b>

**Table C.105: Proportional government sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

<b>SOCIO-ECONOMIC OBJECTIVE</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
	%	%	%	%	%	%	%	%	%	%
<b>Division 1:</b>										
Defence	0.2	0.2	1.3	1.2	1.1	2.1	1.6	0.3	2.1	1.7
Defence	0.2	0.2	1.3	1.2	1.1	2.1	1.6	0.3	2.1	1.7
<b>Division 2:</b>										
Economic development	49.5	38.0	33.4	30.1	40.4	37.0	39.4	43.4	50.2	55.2
Economic development unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant production and plant primary products	6.4	5.7	7.0	5.3	5.7	4.6	4.9	5.1	5.2	6.7
Animal production and animal primary products	9.1	7.0	6.5	8.1	8.3	6.2	6.4	5.5	6.1	7.5
Mineral resources (excluding energy)	0.0	0.0	0.0	0.0	0.3	0.3	0.1	0.5	0.2	0.3
Energy resources	0.0	0.0	0.0	0.1	0.6	0.3	0.3	0.2	0.3	0.1
Energy supply	0.6	0.9	0.5	0.5	1.8	1.5	1.6	1.8	2.4	0.8
Manufacturing	1.6	0.1	0.1	0.1	4.2	0.1	0.2	0.2	0.5	0.8
Construction	0.0	0.8	0.0	0.0	0.2	0.1	0.1	0.1	0.4	0.3
Transport	0.9	0.9	0.6	0.1	1.3	1.1	1.2	0.9	0.3	0.5
Information and communication services	4.4	1.7	0.4	0.3	0.8	0.4	0.3	0.9	0.8	0.7
Commercial services	0.7	0.4	0.2	0.7	0.8	0.7	0.6	2.0	3.3	2.9
Economic framework	18.6	12.7	11.2	6.9	8.9	13.0	16.4	16.9	18.2	20.1
Natural resources	7.2	7.8	6.8	8.0	7.5	8.8	7.4	9.2	12.6	14.4
<b>Division 3:</b>										
Society	33.8	43.6	41.2	51.4	48.2	47.3	45.4	44.3	33.6	28.0
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	10.5	17.9	11.9	28.7	25.1	24.0	24.4	23.9	13.7	7.3
Education and training	4.2	5.6	8.1	9.8	9.2	10.4	8.1	7.5	6.3	5.1
Social development and community services	19.0	20.1	21.1	12.9	13.8	12.9	12.9	12.9	13.6	15.6
<b>Division 4:</b>										
Environment	8.4	10.6	13.9	10.1	6.7	9.5	9.7	9.0	10.7	10.1
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental knowledge	4.0	6.7	9.6	7.3	4.8	5.3	5.6	4.3	5.3	6.5
Environmental aspects of development	2.7	3.1	3.6	2.3	1.4	2.7	2.6	2.2	2.9	2.6

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environmental and other aspects	1.7	0.7	0.7	0.5	0.4	1.5	1.5	2.5	2.5	1.1
Division 5: Advancement of knowledge	8.1	7.6	10.1	7.1	3.6	4.1	3.9	3.0	3.4	5.0
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	5.0	5.0	8.4	5.7	2.3	2.9	2.7	2.5	2.8	4.2
Social sciences and humanities	3.1	2.7	1.8	1.5	1.3	1.2	1.1	0.6	0.6	0.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.106: Government sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Eastern Cape	114 127	127 415	194 258	133 657	227 427	225 603	222 456	281 201	305 629	301 816
Free State	39 998	44 200	38 659	55 095	60 860	61 802	81 957	81 890	59 694	45 660
Gauteng	343 096	447 635	427 173	689 915	760 199	832 397	885 142	974 192	836 827	581 945
KwaZulu-Natal	48 056	126 857	168 029	161 962	177 517	187 088	172 655	206 551	236 602	205 503
Limpopo	57 797	65 017	74 621	95 668	83 683	84 232	76 541	86 876	89 889	81 308
Mpumalanga	69 980	78 335	80 201	77 479	93 566	112 173	107 237	104 154	88 922	83 648
North West	43 048	44 618	45 573	73 576	56 719	61 815	57 994	60 594	66 727	57 423
Northern Cape	58 918	63 556	75 440	61 932	52 579	69 174	66 200	94 659	88 575	52 399
Western Cape	236 320	238 035	333 555	347 869	380 461	378 737	428 465	435 757	450 560	483 841
<b>Total</b>	<b>1 011 340</b>	<b>1 235 669</b>	<b>1 437 509</b>	<b>1 697 151</b>	<b>1 893 010</b>	<b>2 013 021</b>	<b>2 098 646</b>	<b>2 325 875</b>	<b>2 223 426</b>	<b>1 893 543</b>

**Table C.107: Proportional government sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Eastern Cape	11.3	10.3	13.5	7.9	12.0	11.2	10.6	12.1	13.7	15.9
Free State	4.0	3.6	2.7	3.2	3.2	3.1	3.9	3.5	2.7	2.4
Gauteng	33.9	36.2	29.7	40.7	40.2	41.4	42.2	41.9	37.6	30.7
KwaZulu-Natal	4.8	10.3	11.7	9.5	9.4	9.3	8.2	8.9	10.6	10.9
Limpopo	5.7	5.3	5.2	5.6	4.4	4.2	3.6	3.7	4.0	4.3
Mpumalanga	6.9	6.3	5.6	4.6	4.9	5.6	5.1	4.5	4.0	4.4
North West	4.3	3.6	3.2	4.3	3.0	3.1	2.8	2.6	3.0	3.0
Northern Cape	5.8	5.1	5.2	3.6	2.8	3.4	3.2	4.1	4.0	2.8
Western Cape	23.4	19.3	23.2	20.5	20.1	18.8	20.4	18.7	20.3	25.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>



**Table C.108: Government sector R&D personnel in headcounts and full-time equivalents by occupation (2010/11 to 2019/20)**

YEAR	HEADCOUNTS				FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL
2010/11	2 704	1 184	421	1 099	2 178.6	874.2	352.9	951.6
2011/12	3 143	1 411	432	1 300	2 404.5	1 009.8	330.4	1 064.3
2012/13	3 252	1 409	517	1 326	2 597.0	1 091.4	385.8	1 119.9
2013/14	2 874	1 229	518	1 127	2 245.5	923.7	366.3	955.4
2014/15	2 893	1 343	550	1 000	2 181.5	970.0	337.9	873.5
2015/16	2 997	1 573	537	887	2 056.2	953.9	365.7	736.7
2016/17	3 076	1 677	538	861	2 031.6	969.1	357.9	704.6
2017/18	3 027	1 671	517	839	2 000.4	899.1	347.7	753.7
2018/19	2 910	1 662	416	832	1 999.0	920.8	324.9	753.3
2019/20	3 157	1 742	548	867	2 173.1	1 027.3	374.3	771.6

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.109: Government sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2017/18 to 2019/20)**

OCCUPATION	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS
<b>2017/18</b>							
Researchers	1 671	756	915	899.1	429.4	469.7	53.8
Technicians directly supporting R&D	517	263	254	347.7	186.6	161.0	67.2
Other personnel directly supporting R&D	839	554	285	753.7	516.6	237.1	89.8
<b>Total</b>	<b>3 027</b>	<b>1 573</b>	<b>1 454</b>	<b>2 000.4</b>	<b>1 132.6</b>	<b>867.9</b>	<b>66.1</b>
<b>2018/19</b>							
Researchers	1 662	757	905	920.8	435.7	485.2	55.4
Technicians directly supporting R&D	416	226	190	324.9	179.6	145.3	78.1
Other personnel directly supporting R&D	832	573	259	753.3	533.7	219.6	90.5
<b>Total</b>	<b>2 910</b>	<b>1 556</b>	<b>1 354</b>	<b>1 999.0</b>	<b>1 148.9</b>	<b>850.1</b>	<b>68.7</b>
<b>2019/20</b>							
Researchers	1 742	819	923	1 027.3	480.6	546.7	59.0
Technicians directly supporting R&D	548	304	244	374.3	214.7	159.6	68.3
Other personnel directly supporting R&D	867	603	264	771.6	549.8	221.8	89.0
<b>Total</b>	<b>3 157</b>	<b>1 726</b>	<b>1 431</b>	<b>2 173.1</b>	<b>1 245.0</b>	<b>928.1</b>	<b>68.8</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.110: Government sector R&D personnel in headcounts by occupation, qualification, population group and gender (2019/20)**

OCCUPATION AND QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN/ASIAN		WHITE		NON-SA	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers	1 742	819	923	460	541	58	82	52	89	237	207	12	4
Doctoral degree or equivalent	329	168	161	57	38	11	14	15	19	78	88	7	2
Master's, honours, bachelor or equivalent	1 206	560	646	351	417	39	57	30	59	137	112	3	1
Diplomas	207	91	116	52	86	8	11	7	11	22	7	2	1
Technicians directly supporting R&D	548	304	244	176	142	50	39	8	6	66	56	4	1
Doctoral degree or equivalent	16	12	4	4	2	1	0	0	0	5	2	2	0
Master's, honours, bachelor or equivalent	333	167	166	98	92	26	28	4	6	39	39	0	1
Diplomas	199	125	74	74	48	23	11	4	0	22	15	2	0
Other personnel directly supporting R&D	867	603	264	408	177	156	52	1	2	30	32	8	1
Doctoral degree or equivalent	11	6	5	0	0	0	0	0	1	2	3	4	1
Master's, honours, bachelor or equivalent	76	34	42	13	24	9	10	0	0	8	8	4	0
Diplomas	780	563	217	395	153	147	42	1	1	20	21	0	0
<b>Total</b>	<b>3 157</b>	<b>1 726</b>	<b>1 431</b>	<b>1 044</b>	<b>860</b>	<b>264</b>	<b>173</b>	<b>61</b>	<b>97</b>	<b>333</b>	<b>295</b>	<b>24</b>	<b>6</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

## C.2.4. Science councils sector

**Table C.111: Science councils sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Basic research	871 635	900 830	937 826	970 785	1 166 491	1 348 533	1 372 702	1 349 946	1 244 253	1 388 847
Applied research	1 531 563	1 756 157	1 885 484	2 114 943	2 421 309	2 781 198	3 202 019	3 460 650	2 855 564	3 337 342
Experimental development research	1 192 825	1 072 693	1 202 689	1 218 827	1 416 869	1 611 166	1 561 462	1 502 748	1 344 068	1 472 175
<b>Total</b>	<b>3 596 023</b>	<b>3 729 680</b>	<b>4 025 998</b>	<b>4 304 556</b>	<b>5 004 669</b>	<b>5 740 897</b>	<b>6 136 183</b>	<b>6 313 344</b>	<b>5 443 885</b>	<b>6 198 363</b>

**Table C.112: Proportional science councils sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Basic research	24.2	24.2	23.3	22.6	23.3	23.5	22.4	21.4	22.9	22.4
Applied research	42.6	47.1	46.8	49.1	48.4	48.4	52.2	54.8	52.5	53.8
Experimental development research	33.2	28.8	29.9	28.3	28.3	28.1	25.4	23.8	24.7	23.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.113: Science councils sector R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Capital expenditure	291 830	323 070	275 750	323 190	598 429	916 480	857 241	823 937	460 304	571 628
Land: buildings & other structures	56 141	65 442	68 565	71 602	362 246	162 904	211 246	386 063	62 598	105 660
TOTAL: Vehicles, plant, machinery, equipment and software	235 689	257 628	207 185	251 588	236 183	753 576	645 995	437 874	397 706	465 968
Vehicles, plant, machinery, equipment	235 689	257 628	207 185	251 588	236 183	753 576	645 995	437 874	397 706	430 090
*Capitalised computer software	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 878
Current expenditure	3 304 193	3 406 610	3 750 248	3 981 366	4 406 240	4 824 418	5 278 942	5 489 407	4 983 581	5 626 735
Labour costs	1 293 033	1 531 460	2 053 204	2 187 401	1 986 918	2 142 875	2 339 348	2 421 297	2 371 273	2 260 207
Other current expenditure	2 011 160	1 875 150	1 697 044	1 793 965	2 419 322	2 681 543	2 939 594	3 068 110	2 612 308	3 366 528
<b>Total</b>	<b>3 596 023</b>	<b>3 729 680</b>	<b>4 025 998</b>	<b>4 304 556</b>	<b>5 004 669</b>	<b>5 740 897</b>	<b>6 136 183</b>	<b>6 313 344</b>	<b>5 443 885</b>	<b>6 198 363</b>

\*Capitalised computer software collected from 2019/20.

**Table C.114: Proportional science councils sector R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Capital expenditure	13.1	8.1	8.7	6.8	7.5	12.0	16.0	14.0	13.1	9.2
Land: buildings & other structures	3.1	1.6	1.8	1.7	1.7	7.2	2.8	3.4	6.1	1.7
TOTAL: Vehicles, plant, machinery, equipment and software	10.0	6.6	6.9	5.1	5.8	4.7	13.1	10.5	6.9	7.5
Vehicles, plant, machinery, equipment	10.0	6.6	6.9	5.1	5.8	4.7	13.1	10.5	6.9	6.9
*Capitalised computer software	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.6
Current expenditure	86.9	91.9	91.3	93.2	92.5	88.0	84.0	86.0	86.9	90.8
Labour costs	40.9	36.0	41.1	51.0	50.8	39.7	37.3	38.1	38.4	36.5
Other current expenditure	46.0	55.9	50.3	42.2	41.7	48.3	46.7	47.9	48.6	54.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\*Capitalised computer software collected from 2019/20.

**Table C.115: Science councils sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Biotechnology	199 934	208 466	145 671	143 868	312 793	320 048	360 163	299 783	257 498	325 251
Nanotechnology	101 386	102 007	118 555	114 990	125 107	139 107	139 783	272 372	222 662	289 934
<b>Total</b>	<b>301 320</b>	<b>310 473</b>	<b>264 226</b>	<b>258 857</b>	<b>437 900</b>	<b>459 154</b>	<b>499 946</b>	<b>572 155</b>	<b>480 160</b>	<b>615 186</b>
<b>Science councils expenditure on R&amp;D</b>	<b>3 596 023</b>	<b>3 729 680</b>	<b>4 025 998</b>	<b>4 304 556</b>	<b>5 004 669</b>	<b>5 740 897</b>	<b>6 136 183</b>	<b>6 313 344</b>	<b>5 443 885</b>	<b>6 198 363</b>

**Table C.116: Proportional science councils sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Biotechnology	5.6	5.6	3.6	3.3	6.3	5.6	5.9	4.7	4.7	5.2
Nanotechnology	2.8	2.7	2.9	2.7	2.5	2.4	2.3	4.3	4.1	4.7
<b>Total</b>	<b>8.4</b>	<b>8.3</b>	<b>6.6</b>	<b>6.0</b>	<b>8.7</b>	<b>8.0</b>	<b>8.1</b>	<b>9.1</b>	<b>8.8</b>	<b>9.9</b>

**Table C.117: Science councils sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Environment related	N/A	770339	378 782	297 097	1 037 320	1 054 651	1 031 393	953 077	831 377	881 520
Open-source software	7 228	15 982	36 636	0	389871	692 096	453 879	842 548	107 063	226 090
New materials	201 071	197 430	751 305	229 854	358 361	374 463	373 768	401 995	329 199	297 042
Tuberculosis, HIV/AIDS, malaria	386 948	399 070	455 311	398 880	346 751	470 488	625 806	670 209	572 650	492 341
Space science	N/A	N/A	N/A	N/A	N/A	N/A	296 236	0	593 920	614 780
<b>Total</b>	<b>595 247</b>	<b>1 382 821</b>	<b>1 622 034</b>	<b>925 831</b>	<b>2 132 304</b>	<b>2 591 697</b>	<b>2 781 082</b>	<b>2 867 828</b>	<b>2 434 208</b>	<b>2 511 774</b>
<b>Science councils expenditure on R&amp;D</b>	<b>3 596 023</b>	<b>3 729 680</b>	<b>4 025 998</b>	<b>4 304 556</b>	<b>5 004 669</b>	<b>5 740 897</b>	<b>6 136 183</b>	<b>6 313 344</b>	<b>5 443 885</b>	<b>6 198 363</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.118: Proportional science councils sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environment related	N/A	20.7	9.4	6.9	20.7	18.4	16.8	15.1	15.3	14.2
Open-source software	0.2	0.4	0.9	0.0	7.8	12.1	7.4	13.3	2.0	3.6
New materials	5.6	5.3	18.7	5.3	7.2	6.5	6.1	6.4	6.0	4.8
Tuberculosis, HIV/AIDS, malaria	10.8	10.7	11.3	9.3	6.9	8.2	10.2	10.6	10.5	7.9
Space science	N/A	N/A	N/A	N/A	N/A	N/A	4.8	0.0	10.9	9.9
<b>Total</b>	<b>16.6</b>	<b>37.1</b>	<b>40.3</b>	<b>21.5</b>	<b>42.6</b>	<b>45.1</b>	<b>45.3</b>	<b>45.4</b>	<b>44.7</b>	<b>40.5</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.119: Science councils sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	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	3 414 985	3 517 520	3 819 642	4 109 105	4 800 742	5 486 847	5 889 463	6 112 974	5 314 694	6 062 356
Mathematical sciences	113 396	117 637	134 046	128 291	48 258	54 212	47 890	61 223	180 075	154 147
Physical sciences	97 922	120 267	123 267	129 568	263 302	418 648	444 274	502 615	410 797	457 042
Chemical sciences	8 074	20 972	14 078	18 166	63 775	71 024	66 188	77 952	48 685	94 308
Earth sciences	94 642	100 921	112 406	110 092	162 880	181 876	254 414	198 140	202 037	231 490

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Information, computer and communication technologies	161 282	168 115	181 521	182 402	780 044	977 891	999 538	1 124 366	852 856	996 778
Applied sciences and technologies	924 104	954 616	1 092 098	1 046 934	277 649	296 162	475 568	356 409	369 603	474 058
Engineering sciences	365 980	278 125	292 940	349 666	1 001 486	1 107 289	1 016 283	1 171 287	849 940	1 171 031
Biological sciences	437 938	425 036	485 673	482 728	148 268	144 341	138 673	169 717	87 630	138 416
Agricultural sciences	479 449	582 438	594 638	859 600	1 075 165	1 043 494	1 067 146	989 974	898 199	886 212
Medical and health sciences	428 642	443 156	426 520	430 472	596 600	775 858	836 967	1 021 905	984 580	885 544
Environmental sciences	273 283	284 116	330 667	326 122	228 909	240 075	343 218	267 495	212 887	283 782
Material sciences	23 199	15 462	22 905	35 093	113 457	133 231	122 130	143 684	114 491	151 654
Marine sciences	7 073	6 656	8 885	9 970	40 949	42 747	77 173	28 207	102 913	137 894
<b>Division 2: Social sciences and humanities</b>	<b>181 038</b>	<b>212 160</b>	<b>206 356</b>	<b>195 452</b>	<b>203 927</b>	<b>254 050</b>	<b>246 721</b>	<b>200 370</b>	<b>129 191</b>	<b>136 007</b>
Social sciences	164 954	190 845	186 132	173 407	179 456	223 966	239 011	192 200	123 414	136 007
Humanities	16 084	21 315	20 224	22 044	24 471	30 084	7 710	8 170	5 777	0
<b>Total</b>	<b>3 596 023</b>	<b>3 729 680</b>	<b>4 025 998</b>	<b>4 304 556</b>	<b>5 004 669</b>	<b>5 740 897</b>	<b>6 136 183</b>	<b>6 313 344</b>	<b>5 443 885</b>	<b>6 198 363</b>

**Table C.120: Proportional science councils sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Division 1: Natural sciences, technology and engineering</b>	<b>95.0</b>	<b>94.3</b>	<b>94.9</b>	<b>95.5</b>	<b>95.9</b>	<b>95.6</b>	<b>96.0</b>	<b>96.8</b>	<b>97.6</b>	<b>97.8</b>
Mathematical sciences	3.2	3.2	3.3	3.0	1.0	0.9	0.8	1.0	3.3	2.5
Physical sciences	2.7	3.2	3.1	3.0	5.3	7.3	7.2	8.0	7.5	7.4
Chemical sciences	0.2	0.6	0.3	0.4	1.3	1.2	1.1	1.2	0.9	1.5
Earth sciences	2.6	2.7	2.8	2.6	3.3	3.2	4.1	3.1	3.7	3.7
Information, computer and communication technologies	4.5	4.5	4.5	4.2	15.6	17.0	16.3	17.8	15.7	16.1
Applied sciences and technologies	25.7	25.6	27.1	24.3	5.5	5.2	7.8	5.6	6.8	7.6
Engineering sciences	10.2	7.5	7.3	8.1	20.0	19.3	16.6	18.6	15.6	18.9
Biological sciences	12.2	11.4	12.1	11.2	3.0	2.5	2.3	2.7	1.6	2.2
Agricultural sciences	13.3	15.6	14.8	20.0	21.5	18.2	17.4	15.7	16.5	14.3
Medical and health sciences	11.9	11.9	10.6	10.0	11.9	13.5	13.6	16.2	18.1	14.3

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environmental sciences	7.6	7.6	8.2	7.6	4.6	4.2	5.6	4.2	3.9	4.6
Material sciences	0.6	0.4	0.6	0.8	2.3	2.3	2.0	2.3	2.1	2.4
Marine sciences	0.2	0.2	0.2	0.2	0.8	0.7	1.3	0.4	1.9	2.2
Division 2: Social sciences and humanities	5.0	5.7	5.1	4.5	4.1	4.4	4.0	3.2	2.4	2.2
Social sciences	4.6	5.1	4.6	4.0	3.6	3.9	3.9	3.0	2.3	2.2
Humanities	0.4	0.6	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.121: Science councils sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1:										
Defence	228 376	243 083	279 989	262 203	762 464	826 261	754 207	915 281	536 553	715 553
Defence	228 376	243 083	279 989	262 203	762 464	826 261	754 207	915 281	536 553	715 553
Division 2:										
Economic development	2 111 033	2 191 098	2 400 747	2 686 504	2 306 795	2 529 244	2 471 163	2 625 282	2 140 026	2 419 541
Economic development unclassified	0	0	0	0	0	0	0	0	0	0
Plant production and plant primary products	478 437	448 531	473 133	624 675	413 737	396 612	396 536	368 829	339 896	290 267
Animal production and animal primary products	25 193	280 542	287 431	419 259	269 519	247 883	247 835	230 518	212 435	207 333
Mineral resources (excluding energy)	294 203	202 919	213 007	234 273	232 114	265 006	255 226	274 778	287 423	303 480
Energy resources	90 342	94 385	108 360	106 823	5 590	5 063	8 108	6 682	5 568	21 334
Energy supply	0	14 715	13 237	2 937	0	0	0	1 468	1 499	4 072
Manufacturing	366 380	351 021	400 864	393 152	88 746	146 395	170 040	179 215	138 141	147 634
Construction	222 124	220 595	256 024	245 333	31 034	60 828	67 003	70 943	65 389	69 621
Transport	0	0	0	0	0	0	0	0	0	0
Information and communication services	115 342	127 021	141 495	135 629	396 310	419 252	410 724	462 785	386 839	499 564
Commercial services	14 152	15 522	25 053	19 724	5 236	5 671	7 756	2 937	2 998	0
Economic framework	97 367	72 109	70 509	75 411	537 499	664 440	571 815	713 045	419 073	559 622
Natural resources	407 492	363 738	411 634	429 288	327 009	318 094	336 119	314 082	280 766	316 614
Division 3:										
Society	388 244	430 876	413 060	425 943	801 370	977 159	1 074 539	978 471	1 053 871	1 254 643
Society unclassified	0	0	0	0	0	0	0	0	0	0

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Health	310 760	326 500	314 412	316 987	424 639	552 314	613 932	632 851	722 673	653 443
Education and training	50 676	68 852	64 941	72 216	335 946	374 704	145 215	98 348	70 575	93 081
Social development and community services	26 807	35 525	33 707	36 741	40 785	50 141	315 392	247 273	260 622	508 119
<b>Division 4: Environment</b>	<b>52 334</b>	<b>31 241</b>	<b>39 169</b>	<b>46 559</b>	<b>422 650</b>	<b>455 404</b>	<b>852 597</b>	<b>782 034</b>	<b>610 761</b>	<b>423 727</b>
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental knowledge	24 043	19 956	22 939	28 295	402 820	426 582	466 312	434 251	304 725	373 973
Environmental aspects of development	19 333	8 623	13 665	14 071	15 824	14 179	17 451	13 215	13 493	0
Environmental and other aspects	8 958	2 662	2 565	4 194	4 006	14 644	368 834	334 567	292 543	49 754
<b>Division 5: Advancement of knowledge</b>	<b>816 035</b>	<b>833 382</b>	<b>893 033</b>	<b>883 346</b>	<b>711 390</b>	<b>952 830</b>	<b>983 677</b>	<b>1 012 276</b>	<b>1 102 675</b>	<b>1 384 899</b>
Advancement of knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural sciences, technologies and engineering	674 421	694 254	760 107	746 397	422 429	620 283	692 258	708 020	723 871	1 074 410
Social sciences and humanities	141 614	139 127	132 926	136 949	288 961	332 547	291 419	304 256	378 804	310 489
<b>Total</b>	<b>3 596 023</b>	<b>3 729 680</b>	<b>4 025 998</b>	<b>4 304 556</b>	<b>5 004 669</b>	<b>5 740 897</b>	<b>6 136 183</b>	<b>6 313 344</b>	<b>5 443 885</b>	<b>6 198 363</b>

**Table C.122: Proportional science councils sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Division 1: Defence</b>	<b>6.4</b>	<b>6.5</b>	<b>7.0</b>	<b>6.1</b>	<b>15.2</b>	<b>14.4</b>	<b>12.3</b>	<b>14.5</b>	<b>9.9</b>	<b>11.5</b>
Defence	6.4	6.5	7.0	6.1	15.2	14.4	12.3	14.5	9.9	11.5
<b>Division 2: Economic development</b>	<b>58.7</b>	<b>58.7</b>	<b>59.6</b>	<b>62.4</b>	<b>46.1</b>	<b>44.1</b>	<b>40.3</b>	<b>41.6</b>	<b>39.3</b>	<b>39.0</b>
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	13.3	12.0	11.8	14.5	8.3	6.9	6.5	5.8	6.2	4.7
Animal production and animal primary products	0.7	7.5	7.1	9.7	5.4	4.3	4.0	3.7	3.9	3.3

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Mineral resources (excluding energy)	8.2	5.4	5.3	5.4	4.6	4.6	4.2	4.4	5.3	4.9
Energy resources	2.5	2.5	2.7	2.5	0.1	0.1	0.1	0.1	0.1	0.3
Energy supply	0.0	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Manufacturing	10.2	9.4	10.0	9.1	1.8	2.6	2.8	2.8	2.5	2.4
Construction	6.2	5.9	6.4	5.7	0.6	1.1	1.1	1.1	1.2	1.1
Transport	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Information and communication services	3.2	3.4	3.5	3.2	7.9	7.3	6.7	7.3	7.1	8.1
Commercial services	0.4	0.4	0.6	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Economic framework	2.7	1.9	1.8	1.8	10.7	11.6	9.3	11.3	7.7	9.0
Natural resources	11.3	9.8	10.2	10.0	6.5	5.5	5.5	5.0	5.2	5.1
<b>Division 3:</b>										
<b>Society</b>	<b>10.8</b>	<b>11.6</b>	<b>10.3</b>	<b>9.9</b>	<b>16.0</b>	<b>17.0</b>	<b>17.5</b>	<b>15.5</b>	<b>19.4</b>	<b>20.2</b>
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	8.6	8.8	7.8	7.4	8.5	9.6	10.0	10.0	13.3	10.5
Education and training	1.4	1.8	1.6	1.7	6.7	6.5	2.4	1.6	1.3	1.5
Social development and community services	0.7	1.0	0.8	0.9	0.8	0.9	5.1	3.9	4.8	8.2
<b>Division 4:</b>										
<b>Environment</b>	<b>1.5</b>	<b>0.8</b>	<b>1.0</b>	<b>1.1</b>	<b>8.4</b>	<b>7.9</b>	<b>13.9</b>	<b>12.4</b>	<b>11.2</b>	<b>6.8</b>
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	0.5	0.6	0.7	8.0	7.4	7.6	6.9	5.6	6.0
Environmental aspects of development	0.5	0.2	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.0
Environmental and other aspects	0.2	0.1	0.1	0.1	0.1	0.3	6.0	5.3	5.4	0.8
<b>Division 5:</b>										
<b>Advancement of knowledge</b>	<b>22.7</b>	<b>22.3</b>	<b>22.2</b>	<b>20.5</b>	<b>14.2</b>	<b>16.6</b>	<b>16.0</b>	<b>16.0</b>	<b>20.3</b>	<b>22.3</b>
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	18.8	18.6	18.9	17.3	8.4	10.8	11.3	11.2	13.3	17.3
Social sciences and humanities	3.9	3.7	3.3	3.2	5.8	5.8	4.7	4.8	7.0	5.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>



**Table C.123: Science councils sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Eastern Cape	150 665	178 594	182 664	115 925	259 128	269 658	273 509	279 550	183 931	206 142
Free State	60 443	37 138	39 054	47 271	58 608	59 953	60 149	59 300	110 995	94 188
Gauteng	2 327 712	2 287 762	2 537 028	3 062 983	2 745 142	2 998 643	3 221 705	3 350 135	3 053 440	3 624 098
KwaZulu-Natal	249 137	292 246	307 302	239 387	484 142	575 016	477 823	540 084	427 585	448 070
Limpopo	66 250	99 104	105 150	7 286	117 270	111 649	114 852	107 457	80 249	65 682
Mpumalanga	55 690	100 476	103 468	62 349	124 613	122 432	128 883	118 267	171 535	148 618
North West	42 854	104 139	110 361	39 615	153 911	153 676	108 010	97 730	43 764	57 117
Northern Cape	64 774	81 998	78 714	122 454	148 387	218 317	223 524	236 797	601 757	634 734
Western Cape	578 497	548 223	562 256	607 285	913 468	1 231 555	1 527 729	1 524 025	770 631	919 714
<b>Total</b>	<b>3 596 023</b>	<b>3 729 680</b>	<b>4 025 998</b>	<b>4 304 556</b>	<b>5 004 669</b>	<b>5 740 897</b>	<b>6 136 183</b>	<b>6 313 344</b>	<b>5 443 885</b>	<b>6 198 363</b>

**Table C.124: Proportional science councils sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Eastern Cape	4.2	4.8	4.5	2.7	5.2	4.7	4.5	4.4	3.4	3.3
Free State	1.7	1.0	1.0	1.1	1.2	1.0	1.0	0.9	2.0	1.5
Gauteng	64.7	61.3	63.0	71.2	54.9	52.2	52.5	53.1	56.1	58.5
KwaZulu-Natal	6.9	7.8	7.6	5.6	9.7	10.0	7.8	8.6	7.9	7.2
Limpopo	1.8	2.7	2.6	0.2	2.3	1.9	1.9	1.7	1.5	1.1
Mpumalanga	1.5	2.7	2.6	1.4	2.5	2.1	2.1	1.9	3.2	2.4
North West	1.2	2.8	2.7	0.9	3.1	2.7	1.8	1.5	0.8	0.9
Northern Cape	1.8	2.2	2.0	2.8	3.0	3.8	3.6	3.8	11.1	10.2
Western Cape	16.1	14.7	14.0	14.1	18.3	21.5	24.9	24.1	14.2	14.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.125: Science councils sector R&D personnel in headcounts and full-time equivalents by occupation (2010/11 to 2019/20)**

YEAR	HEADCOUNTS				FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL	TOTAL	RESEARCHERS	TECHNICIANS	OTHER R&D PERSONNEL
2010/11	4 923	1 941	1 336	1 646	4 312.4	1 777.3	1 155.5	1 379.6
2011/12	4 494	1 803	1 333	1 358	3 803.5	1 634.9	1 172.4	996.1
2012/13	5 399	1 879	1 403	2 117	4 748.5	1 697.1	1 279.6	1 771.8
2013/14	5 884	1 956	1 396	2 532	5 164.5	1 781.3	1 247.3	2 136.0
2014/15	4 836	1 988	1 857	991	4 180.4	1 765.4	1 686.2	728.9
2015/16	5 162	2 072	1 839	1 251	4 361.2	1 827.2	1 683.7	850.4
2016/17	4 955	2 189	1 818	948	4 421.4	1 940.5	1 676.0	804.9
2017/18	4 866	2 053	1 885	928	4 294.9	1 792.1	1 745.4	757.4
2018/19	4 514	1 951	1 728	835	3 941.8	1 697.0	1 579.6	665.2
2019/20	4 070	1 858	1 505	707	3 562.8	1 619.4	1 403.7	539.7

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.126: Science councils sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2010/11 to 2019/20)**

OCCUPATION	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)				
	2017/18	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS
Researchers		2 053	1 037	1 016	1 792.1	884.6	907.5	87.3
Technicians directly supporting R&D		1 885	1 012	873	1 745.4	914.1	831.3	92.6
Other personnel directly supporting R&D		928	623	305	757.4	507.6	249.8	81.6
<b>Total</b>		<b>4 866</b>	<b>2 672</b>	<b>2 194</b>	<b>4 294.9</b>	<b>2 306.3</b>	<b>1 988.6</b>	<b>88.3</b>
2018/19	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS	
Researchers		1 951	1 059	892	1 697.0	911.9	785.1	87.0
Technicians directly supporting R&D		1 728	998	730	1 579.6	895.4	684.2	91.4
Other personnel directly supporting R&D		835	426	409	665.2	309.4	355.8	79.7
<b>Total</b>		<b>4 514</b>	<b>2 483</b>	<b>2 031</b>	<b>3 941.8</b>	<b>2 116.7</b>	<b>1 825.1</b>	<b>87.3</b>
2019/20	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS	
Researchers		1 858	1 009	849	1 619.4	870.6	748.8	87.2
Technicians directly supporting R&D		1 505	886	619	1 403.7	815.9	587.8	93.3
Other personnel directly supporting R&D		707	380	327	539.7	263.3	276.4	76.3
<b>Total</b>		<b>4 070</b>	<b>2 275</b>	<b>1 795</b>	<b>3 562.8</b>	<b>1 949.8</b>	<b>1 613.0</b>	<b>87.5</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.127: Science councils sector R&D personnel in headcounts by occupation, qualification, population group and gender (2019/20)**

OCCUPATION AND QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN/ASIAN		WHITE		NON-SA	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers	1 858	1 009	849	377	364	51	67	70	91	348	267	163	60
Doctoral degree or equivalent	854	502	352	142	97	22	30	30	39	177	139	131	47
Master's, honours, bachelor or equivalent	939	471	468	224	251	22	33	38	48	156	123	31	13
Diplomas	65	36	29	11	16	7	4	2	4	15	5	1	0
Technicians directly supporting R&D	1 505	886	619	485	395	84	38	39	50	252	133	26	3
Doctoral degree or equivalent	60	45	15	7	3	0	1	2	3	29	7	7	1
Master's, honours, bachelor or equivalent	860	459	401	242	259	37	17	31	38	135	85	14	2
Diplomas	585	382	203	236	133	47	20	6	9	88	41	5	0
Other personnel directly supporting R&D	707	380	327	271	198	40	53	21	23	34	43	14	10
Doctoral degree or equivalent	24	17	7	6	2	4	1	1	1	4	2	2	1
Master's, honours, bachelor or equivalent	315	145	170	95	119	11	8	15	16	18	25	6	2
Diplomas	368	218	150	170	77	25	44	5	6	12	16	6	7
<b>Total</b>	<b>4 070</b>	<b>2 275</b>	<b>1 795</b>	<b>1 133</b>	<b>957</b>	<b>175</b>	<b>158</b>	<b>130</b>	<b>164</b>	<b>634</b>	<b>443</b>	<b>203</b>	<b>73</b>

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.128: Science councils sector overview (2018/19 to 2019/20)**

SCIENCE COUNCILS	2018/19				2019/20			
	R&D EXPENDITURE	RESEARCHERS	BASIC RESEARCH	CAPITAL EXPENDITURE	R&D EXPENDITURE	RESEARCHERS	BASIC RESEARCH	CAPITAL EXPENDITURE
	R'000	FTEs	R'000	R'000	R'000	FTEs	R'000	R'000
Agricultural Research Council	849 740	470.0	169 948	65 114	829 333	439.0	165 867	90 056
Council for Scientific and Industrial Research	2 027 427	516.0	86 368	40 172	2 739 257	458.0	206 266	44 009
Council for Geoscience	149 921	97.8	22 488	30 701	203 586	97.8	30 538	88 830
Human Sciences Research Council	288 853	146.0	43 328	1 918	231 581	144.0	34 737	1 353
Medical Research Council	894 054	202.0	536 432	23 822	859 223	218.0	515 534	12 672
Mintek	380 458	150.4	76 092	53 900	396 052	150.4	79 210	56 110
National Research Foundation	853 433	114.8	309 597	244 677	939 331	112.2	356 695	278 598
<b>Total</b>	<b>5 443 885</b>	<b>1 697</b>	<b>1 244 253</b>	<b>460 304</b>	<b>6 198 363</b>	<b>1 619</b>	<b>1 388 847</b>	<b>571 628</b>

### C.2.5. Higher education sector

**Table C.129: Higher education sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Basic research	2 634 722	3 290 328	3 843 906	3 785 149	4 601 453	5 395 693	6 679 585	7 243 562	7 463 879	8 145 359
Applied research	1 890 185	2 279 175	2 390 090	2 412 316	2 649 558	3 176 685	3 466 381	4 264 753	4 303 881	4 497 102
Experimental development research	899 695	1 039 712	1 099 157	1 095 388	1 126 565	1 304 245	1 513 291	1 501 561	1 415 358	1 536 500
<b>Total</b>	<b>5 424 602</b>	<b>6 609 216</b>	<b>7 333 153</b>	<b>7 292 853</b>	<b>8 377 575</b>	<b>9 876 623</b>	<b>11 659 258</b>	<b>13 009 876</b>	<b>13 183 119</b>	<b>14 178 960</b>

**Table C.130: Proportional higher education sector R&D expenditure by type of research (2010/11 to 2019/20)**

TYPE OF RESEARCH	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Basic research	48.6	49.8	52.4	51.9	54.9	54.6	57.3	55.7	56.6	57.4
Applied research	34.8	34.5	32.6	33.1	31.6	32.2	29.7	32.8	32.6	31.7
Experimental development research	16.6	15.7	15.0	15.0	13.4	13.2	13.0	11.5	10.7	10.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.131: Higher education sector R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Capital expenditure	393 758	564 179	602 116	706 336	779 789	1 141 349	1 092 704	1 386 695	683 592	706 929
Land: buildings & other structures	146 602	137 530	192 324	256 114	200 253	198 032	616 761	874 171	257 899	220 810
TOTAL: Vehicles, plant, machinery, equipment and software	247 156	426 649	409 792	450 222	579 536	943 317	475 943	512 524	425 693	486 119
Vehicles, plant, machinery, equipment	247 156	426 649	409 792	450 222	579 536	943 317	475 943	512 524	425 693	465 711

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
#Capitalised computer software	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 408
Current expenditure	5 030 844	6 045 037	6 731 037	6 586 517	7 597 786	8 735 274	10 566 554	11 623 181	12 499 527	13 472 031
Labour costs	1 883 176	2 481 322	2 996 929	3 248 542	3 539 733	3 576 140	4 315 989	5 080 369	5 579 653	6 054 648
Total cost of R&D postgraduate students	756 930	1 074 207	1 186 653	1 224 611	1 579 088	1 926 301	1 928 108	1 889 065	1 938 984	1 969 872
Other current expenditure*	2 390 738	2 489 508	2 547 455	2 113 364	2 478 965	3 232 833	4 322 457	4 653 747	4 980 889	5 447 511
<b>Total</b>	<b>5 424 602</b>	<b>6 609 216</b>	<b>7 333 153</b>	<b>7 292 853</b>	<b>8 377 575</b>	<b>9 876 623</b>	<b>11 659 258</b>	<b>13 009 876</b>	<b>13 183 119</b>	<b>14 178 960</b>

\*Includes specific categories of R&D personnel costs for 2016/17.

#Capitalised computer software collected from 2019/20.

**Table C.132: Proportional higher education sector R&D expenditure by accounting category (2010/11 to 2019/20)**

TYPE OF EXPENDITURE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Capital expenditure	7.3	8.5	8.2	9.7	9.3	11.6	9.4	10.7	5.2	5.0
Land: buildings & other structures	2.7	2.1	2.6	3.5	2.4	2.0	5.3	6.7	2.0	1.6
TOTAL: Vehicles, plant, machinery, equipment and software	4.6	6.5	5.6	6.2	6.9	9.6	4.1	3.9	3.2	3.4
Vehicles, plant, machinery, equipment	4.6	6.5	5.6	6.2	6.9	9.6	4.1	3.9	3.2	3.3
#Capitalised computer software	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.1
Current expenditure	92.7	91.5	91.8	90.3	90.7	88.4	90.6	89.3	94.8	95.0
Labour costs	34.7	37.5	40.9	44.5	42.3	36.2	37.0	39.1	42.3	42.7
Total cost of R&D postgraduate students	14.0	16.3	16.2	16.8	18.8	19.5	16.5	14.5	14.7	13.9
Other current expenditure*	44.1	37.7	34.7	29.0	29.6	32.7	37.1	35.8	37.8	38.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\*Includes specific categories of R&D personnel costs for 2016/17.

#Capitalised computer software collected from 2019/20.

**Table C.133: Higher education sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Biotechnology	381 225	344 039	380 727	406 285	470 837	553 562	531 958	529 948	552 583	701 411
Nanotechnology	204 802	317 649	293 300	356 826	393 137	505 380	431 558	319 610	420 500	477 909
<b>Total</b>	<b>586 027</b>	<b>661 688</b>	<b>674 028</b>	<b>763 111</b>	<b>863 974</b>	<b>1 058 942</b>	<b>963 516</b>	<b>849 558</b>	<b>973 083</b>	<b>1 179 319</b>
Higher education expenditure on R&D	5 424 602	6 609 216	7 333 153	7 292 853	8 377 575	9 876 623	11 659 258	13 009 876	13 183 119	14 178 960

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

**Table C.134: Proportional higher education sector expenditure on multidisciplinary areas of R&D (2010/11 to 2019/20)**

MULTI-DISCIPLINARY AREA OF R&D	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Biotechnology	7.0	5.2	5.2	5.6	5.6	5.6	4.6	4.1	4.2	4.9
Nanotechnology	3.8	4.8	4.0	4.9	4.7	5.1	3.7	2.5	3.2	3.4
<b>Total</b>	<b>10.8</b>	<b>10.0</b>	<b>9.2</b>	<b>10.5</b>	<b>10.3</b>	<b>10.7</b>	<b>8.3</b>	<b>6.5</b>	<b>7.4</b>	<b>8.3</b>

**Table C.135: Higher education sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Environment related	N/A	770 339	300 006	340 386	499 958	583 723	883 069	1 112 755	1 369 351	1 503 980
Open-source software	75 195	15 982	85 508	105 008	117 646	125 883	164 097	196 300	202 026	220 567
New materials	266 419	197 430	321 744	381 136	436 975	462 962	449 336	252 340	355 152	421 202
Tuberculosis, HIV/AIDS, malaria	845 216	399 070	714 966	794 810	845 245	944 490	1 082 645	1 308 224	1 374 952	1 582 666
Space science	N/A	N/A	N/A	N/A	N/A	N/A	264 712	258 472	247 276	296 166
<b>Total</b>	<b>1 186 830</b>	<b>1 382 821</b>	<b>1 422 224</b>	<b>1 621 339</b>	<b>1 899 823</b>	<b>2 117 058</b>	<b>2 843 859</b>	<b>3 128 090</b>	<b>3 548 757</b>	<b>4 024 580</b>
<b>Higher education expenditure on R&amp;D</b>	<b>5 424 602</b>	<b>6 609 216</b>	<b>7 333 153</b>	<b>7 292 853</b>	<b>8 377 575</b>	<b>9 876 623</b>	<b>11 659 258</b>	<b>13 009 876</b>	<b>13 183 119</b>	<b>14 178 960</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.136: Proportional higher education sector R&D expenditure on selected areas of interest (2010/11 to 2019/20)**

AREA OF INTEREST	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environment related	N/A	11.7	4.1	4.7	6.0	5.9	7.6	8.6	10.4	10.6
Open-source software	1.4	0.2	1.2	1.4	1.4	1.3	1.4	1.5	1.5	1.6
New materials	4.9	3.0	4.4	5.2	5.2	4.7	3.9	1.9	2.7	3.0
Tuberculosis, HIV/AIDS, malaria	15.6	6.0	9.7	10.9	10.1	9.6	9.3	10.1	10.4	11.2
Space science	N/A	N/A	N/A	N/A	N/A	N/A	2.3	2.0	1.9	2.1
<b>Total</b>	<b>21.9</b>	<b>20.9</b>	<b>19.4</b>	<b>22.2</b>	<b>22.7</b>	<b>21.4</b>	<b>24.4</b>	<b>24.0</b>	<b>26.9</b>	<b>28.4</b>

N/A: Environment-related data were collected from the 2011/12 R&D Survey onwards. Space science data were collected for the first time in the 2016/17 R&D Survey.

**Table C.137: Higher education sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	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	3 558 265	4 486 057	5 045 892	4 925 713	5 704 150	6 340 905	6 976 302	7 941 477	7 580 936	8 172 232
Mathematical sciences	283 942	311 572	342 093	278 183	333 587	458 068	512 534	614 391	540 054	605 557
Physical sciences	175 110	189 341	193 849	198 735	230 826	287 830	356 090	427 400	376 229	397 447
Chemical sciences	158 775	317 389	444 258	286 511	326 992	386 300	472 883	362 105	452 369	520 849
Earth sciences	157 781	174 141	190 744	207 261	260 862	271 814	327 638	349 553	356 360	333 039

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Information, computer and communication technologies	112 985	186 870	232 090	192 911	245 257	322 406	378 763	295 577	487 825	489 190
Applied sciences and technologies	90 761	245 611	251 278	280 310	274 283	272 429	139 046	76 434	155 627	199 427
Engineering sciences	461 980	741 462	768 810	855 529	918 494	891 532	926 463	907 241	1 082 308	1 107 713
Biological sciences	593 219	610 408	731 389	721 229	825 432	846 897	788 716	912 256	1 020 774	1 060 541
Agricultural sciences	205 311	268 834	276 857	311 355	354 949	326 296	440 433	644 885	535 299	517 978
Medical and health sciences	1 226 127	1 245 284	1 391 838	1 339 755	1 641 683	2 089 591	2 412 996	2 554 061	2 409 084	2 759 378
Environmental sciences	60 458	111 612	147 367	166 493	180 324	79 430	128 784	760 600	110 409	135 137
Material sciences	26 629	81 749	68 849	82 479	100 358	93 871	67 707	6 751	12 407	5 921
Marine sciences	5 186	1 783	6 469	4 961	11 105	14 441	24 249	30 223	42 192	40 056
<b>Division 2: Social sciences and humanities</b>	<b>1 866 337</b>	<b>2 123 159</b>	<b>2 287 261</b>	<b>2 367 140</b>	<b>2 673 425</b>	<b>3 535 718</b>	<b>4 682 956</b>	<b>5 068 399</b>	<b>5 602 183</b>	<b>6 006 728</b>
Social sciences	1 433 610	1 664 653	1 844 744	1 825 026	2 056 555	2 855 673	3 770 136	4 209 945	4 668 015	4 984 831
Humanities	432 727	458 505	442 517	542 114	616 870	680 046	912 820	858 454	934 167	1 021 897
<b>Total</b>	<b>5 424 602</b>	<b>6 609 216</b>	<b>7 333 153</b>	<b>7 292 853</b>	<b>8 377 575</b>	<b>9 876 623</b>	<b>11 659 258</b>	<b>13 009 876</b>	<b>13 183 119</b>	<b>14 178 960</b>

**Table C.138: Proportional higher education sector R&D expenditure by research field (2010/11 to 2019/20)**

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Division 1: Natural sciences, technology and engineering</b>	<b>65.6</b>	<b>67.9</b>	<b>68.8</b>	<b>67.5</b>	<b>68.1</b>	<b>64.2</b>	<b>59.8</b>	<b>61.0</b>	<b>57.5</b>	<b>57.6</b>
Mathematical sciences	5.2	4.7	4.7	3.8	4.0	4.6	4.4	4.7	4.1	4.3
Physical sciences	3.2	2.9	2.6	2.7	2.8	2.9	3.1	3.3	2.9	2.8
Chemical sciences	2.9	4.8	6.1	3.9	3.9	3.9	4.1	2.8	3.4	3.7
Earth sciences	2.9	2.6	2.6	2.8	3.1	2.8	2.8	2.7	2.7	2.3
Information, computer and communication technologies	2.1	2.8	3.2	2.6	2.9	3.3	3.2	2.3	3.7	3.5
Applied sciences and technologies	1.7	3.7	3.4	3.8	3.3	2.8	1.2	0.6	1.2	1.4
Engineering sciences	8.5	11.2	10.5	11.7	11.0	9.0	7.9	7.0	8.2	7.8
Biological sciences	10.9	9.2	10.0	9.9	9.9	8.6	6.8	7.0	7.7	7.5
Agricultural sciences	3.8	4.1	3.8	4.3	4.2	3.3	3.8	5.0	4.1	3.7
Medical and health sciences	22.6	18.8	19.0	18.4	19.6	21.2	20.7	19.6	18.3	19.5

MAIN RESEARCH FIELD	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Environmental sciences	1.1	1.7	2.0	2.3	2.2	0.8	1.1	5.8	0.8	1.0
Material sciences	0.5	1.2	0.9	1.1	1.2	1.0	0.6	0.1	0.1	0.0
Marine sciences	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3
Division 2: Social sciences and humanities	34.4	32.1	31.2	32.5	31.9	35.8	40.2	39.0	42.5	42.4
Social sciences	26.4	25.2	25.2	25.0	24.5	28.9	32.3	32.4	35.4	35.2
Humanities	8.0	6.9	6.0	7.4	7.4	6.9	7.8	6.6	7.1	7.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.139: Higher education sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Division 1:										
Defence	7 271	10 211	12 009	6 121	7 266	8 330	10 899	13 792	12 592	14 392
Defence	7 271	10 211	12 009	6 121	7 266	8 330	10 899	13 792	12 592	14 392
Division 2:										
Economic development	1 542 453	2 072 624	1 996 497	2 547 254	2 472 831	2 850 018	3 375 098	4 044 376	4 344 693	4 417 475
Economic development unclassified	0	0	0	0	0	0	0	0	0	0
Plant production and plant primary products	188 513	277 764	234 309	534 417	220 024	282 188	358 551	551 241	473 094	519 167
Animal production and animal primary products	128 705	151 334	176 645	173 865	190 421	199 545	288 114	390 549	341 481	368 539
Mineral resources (excluding energy)	99 966	129 185	69 062	129 459	127 236	131 141	115 367	157 215	161 069	162 124
Energy resources	88 657	87 659	92 947	82 011	75 367	84 862	68 184	98 739	100 429	121 081
Energy supply	144 462	157 304	162 879	221 160	233 075	237 993	225 645	247 610	289 618	307 754
Manufacturing	245 037	272 287	348 845	340 630	329 083	380 258	444 203	478 631	557 911	518 485
Construction	73 340	116 141	74 322	79 775	96 642	111 437	177 750	223 367	257 483	184 267
Transport	24 045	53 043	31 830	32 503	38 549	47 577	72 250	101 938	47 056	72 113
Information and communication services	93 281	144 313	101 980	139 305	152 987	232 257	191 378	240 992	351 560	355 508
Commercial services	54 659	106 287	111 587	156 001	124 971	125 771	182 456	199 639	262 863	317 151
Economic framework	217 501	302 693	335 217	363 483	493 154	544 118	612 373	703 369	968 057	933 506
Natural resources	184 287	274 612	256 874	294 645	391 322	472 871	638 827	651 085	534 072	557 782
Division 3:										
Society	1 393 700	1 583 800	1 865 914	1 569 371	2 180 662	2 820 755	3 266 113	3 540 172	2 988 330	3 750 653
Society unclassified	0	0	0	0	0	0	0	0	0	0

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Health	776 688	686 152	1 150 349	654 525	1 074 951	1 375 861	1 652 001	1 730 300	1 273 726	1 915 131
Education and training	294 482	359 897	402 285	547 108	739 611	925 245	912 877	1 041 714	1 057 301	1 297 282
Social development and community services	322 530	537 752	313 280	367 738	366 099	519 649	701 234	768 158	657 303	538 240
<b>Division 4: Environment</b>	<b>377 151</b>	<b>509 533</b>	<b>554 758</b>	<b>456 619</b>	<b>629 133</b>	<b>614 011</b>	<b>737 262</b>	<b>780 436</b>	<b>1 070 418</b>	<b>1 105 385</b>
Environment unclassified	0	0	0	0	0	0	0	0	0	0
Environmental knowledge	188 250	230 135	232 440	184 169	269 688	246 804	331 243	341 909	469 090	452 706
Environmental aspects of development	86 295	123 344	168 956	154 462	202 787	212 879	233 609	233 947	317 976	353 870
Environmental and other aspects	102 606	156 054	153 362	117 989	156 658	154 328	172 411	204 580	283 352	298 809
<b>Division 5: Advancement of knowledge</b>	<b>2 104 026</b>	<b>2 433 048</b>	<b>2 903 975</b>	<b>2 713 487</b>	<b>3 087 684</b>	<b>3 583 508</b>	<b>4 269 886</b>	<b>4 631 099</b>	<b>4 767 086</b>	<b>4 891 055</b>
Advancement of knowledge unclassified	0	0	0	0	0	0	0	0	0	0
Natural sciences, technologies and engineering	1 263 802	1 443 913	1 731 540	1 633 257	2 006 195	2 262 831	2 887 227	3 269 179	3 373 533	3 346 297
Social sciences and humanities	840 223	989 135	1 172 435	1 080 231	1 081 488	1 320 677	1 382 659	1 361 920	1 393 552	1 544 758
<b>Total</b>	<b>5 424 602</b>	<b>6 609 216</b>	<b>7 333 153</b>	<b>7 292 853</b>	<b>8 377 575</b>	<b>9 876 623</b>	<b>11 659 258</b>	<b>13 009 876</b>	<b>13 183 119</b>	<b>14 178 960</b>

**Table C.140: Proportional higher education sector R&D expenditure by socio-economic objective (2010/11 to 2019/20)**

SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
<b>Division 1: Defence</b>	<b>0.1</b>	<b>0.2</b>	<b>0.2</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>
Defence	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Division 2: Economic development</b>	<b>28.4</b>	<b>31.4</b>	<b>27.2</b>	<b>34.9</b>	<b>29.5</b>	<b>28.9</b>	<b>28.9</b>	<b>31.1</b>	<b>33.0</b>	<b>31.2</b>
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	3.5	4.2	3.2	7.3	2.6	2.9	3.1	4.2	3.6	3.7
Animal production and animal primary products	2.4	2.3	2.4	2.4	2.3	2.0	2.5	3.0	2.6	2.6



SOCIO-ECONOMIC OBJECTIVE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Mineral resources (excluding energy)	1.8	2.0	0.9	1.8	1.5	1.3	1.0	1.2	1.2	1.1
Energy resources	1.6	1.3	1.3	1.1	0.9	0.9	0.6	0.8	0.8	0.9
Energy supply	2.7	2.4	2.2	3.0	2.8	2.4	1.9	1.9	2.2	2.2
Manufacturing	4.5	4.1	4.8	4.7	3.9	3.9	3.8	3.7	4.2	3.7
Construction	1.4	1.8	1.0	1.1	1.2	1.1	1.5	1.7	2.0	1.3
Transport	0.4	0.8	0.4	0.4	0.5	0.5	0.6	0.8	0.4	0.5
Information and communication services	1.7	2.2	1.4	1.9	1.8	2.4	1.6	1.9	2.7	2.5
Commercial services	1.0	1.6	1.5	2.1	1.5	1.3	1.6	1.5	2.0	2.2
Economic framework	4.0	4.6	4.6	5.0	5.9	5.5	5.3	5.4	7.3	6.6
Natural resources	3.4	4.2	3.5	4.0	4.7	4.8	5.5	5.0	4.1	3.9
<b>Division 3:</b>										
<b>Society</b>	<b>25.7</b>	<b>24.0</b>	<b>25.4</b>	<b>21.5</b>	<b>26.0</b>	<b>28.6</b>	<b>28.0</b>	<b>27.2</b>	<b>22.7</b>	<b>26.5</b>
Society unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	14.3	10.4	15.7	9.0	12.8	13.9	14.2	13.3	9.7	13.5
Education and training	5.4	5.4	5.5	7.5	8.8	9.4	7.8	8.0	8.0	9.1
Social development and community services	5.9	8.1	4.3	5.0	4.4	5.3	6.0	5.9	5.0	3.8
<b>Division 4:</b>										
<b>Environment</b>	<b>7.0</b>	<b>7.7</b>	<b>7.6</b>	<b>6.3</b>	<b>7.5</b>	<b>6.2</b>	<b>6.3</b>	<b>6.0</b>	<b>8.1</b>	<b>7.8</b>
Environment unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environmental knowledge	3.5	3.5	3.2	2.5	3.2	2.5	2.8	2.6	3.6	3.2
Environmental aspects of development	1.6	1.9	2.3	2.1	2.4	2.2	2.0	1.8	2.4	2.5
Environmental and other aspects	1.9	2.4	2.1	1.6	1.9	1.6	1.5	1.6	2.1	2.1
<b>Division 5:</b>										
<b>Advancement of knowledge</b>	<b>38.8</b>	<b>36.8</b>	<b>39.6</b>	<b>37.2</b>	<b>36.9</b>	<b>36.3</b>	<b>36.6</b>	<b>35.6</b>	<b>36.2</b>	<b>34.5</b>
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	23.3	21.8	23.6	22.4	23.9	22.9	24.8	25.1	25.6	23.6
Social sciences and humanities	15.5	15.0	16.0	14.8	12.9	13.4	11.9	10.5	10.6	10.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.141: Higher education sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000
Eastern Cape	556 496	608 815	592 861	557 292	612 239	975 099	1 002 978	1 017 383	1 027 996	1 123 901
Free State	281 889	323 335	356 177	449 852	491 203	523 782	625 646	894 118	803 727	847 104
Gauteng	1 600 783	2 028 145	2 118 817	2 233 696	2 733 330	3 305 576	4 105 237	4 269 020	3 730 236	4 188 428
KwaZulu-Natal	677 740	902 386	1 137 258	750 507	843 111	903 664	1 157 722	1 428 653	1 646 915	1 514 301
Limpopo	224 603	349 559	300 435	187 317	216 352	229 364	301 809	358 543	384 346	466 703
Mpumalanga	119 231	170 966	182 192	147 134	174 657	190 716	148 981	155 430	170 553	213 914
North West	184 514	275 088	311 325	405 963	404 575	444 135	469 171	449 196	833 635	856 833
Northern Cape	107 581	148 425	164 483	161 603	146 769	164 487	188 515	180 632	161 714	169 999
Western Cape	1 671 766	1 802 496	2 169 606	2 399 489	2 755 339	3 139 800	3 659 198	4 256 902	4 423 997	4 797 779
<b>Total</b>	<b>5 424 602</b>	<b>6 609 216</b>	<b>7 333 153</b>	<b>7 292 853</b>	<b>8 377 575</b>	<b>9 876 623</b>	<b>11 659 258</b>	<b>13 009 876</b>	<b>13 183 119</b>	<b>14 178 960</b>

**Table C.142: Proportional higher education sector R&D expenditure by province (2010/11 to 2019/20)**

PROVINCE	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	%	%	%	%	%	%	%	%	%	%
Eastern Cape	10.3	9.2	8.1	7.6	7.3	9.9	8.6	7.8	7.8	7.9
Free State	5.2	4.9	4.9	6.2	5.9	5.3	5.4	6.9	6.1	6.0
Gauteng	29.5	30.7	28.9	30.6	32.6	33.5	35.2	32.8	28.3	29.5
KwaZulu-Natal	12.5	13.7	15.5	10.3	10.1	9.1	9.9	11.0	12.5	10.7
Limpopo	4.1	5.3	4.1	2.6	2.6	2.3	2.6	2.8	2.9	3.3
Mpumalanga	2.2	2.6	2.5	2.0	2.1	1.9	1.3	1.2	1.3	1.5
North West	3.4	4.2	4.2	5.6	4.8	4.5	4.0	3.5	6.3	6.0
Northern Cape	2.0	2.2	2.2	2.2	1.8	1.7	1.6	1.4	1.2	1.2
Western Cape	30.8	27.3	29.6	32.9	32.9	31.8	31.4	32.7	33.6	33.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table C.143: Higher education sector R&D personnel in headcounts and full-time equivalents by occupation (2010/11 to 2019/20)**

YEAR	HEADCOUNTS				FULL-TIME EQUIVALENTS (FTEs)			
	TOTAL	RESEARCHERS*	TECHNICIANS	OTHER R&D PERSONNEL	TOTAL	RESEARCHERS*	TECHNICIANS	OTHER R&D PERSONNEL
2010/11	19 970	15 553	2 123	2 294	5 023.0	3 613.7	534.9	874.5
2011/12	21 458	16 294	2 344	2 820	6 091.2	4 355.3	673.4	1 062.5
2012/13	22 691	17 441	2 344	2 906	6 571.5	4 700.6	737.3	1 133.5
2013/14	23 543	18 212	2 284	3 047	7 005.7	5 000.5	843.7	1 161.5
2014/15	24 701	18 625	2 496	3 580	7 237.8	5 097.7	857.3	1 282.8
2015/16	25 612	19 217	2 616	3 779	7 147.1	4 701.9	1 000.3	1 445.0
2016/17	28 658	22 302	2 227	4 129	7 652.9	5 220.4	804.2	1 628.3
2017/18	31 467	24 942	2 484	4 041	8 459.4	6 040.6	838.0	1 580.8
2018/19	31 230	24 618	2 272	4 340	8 873.3	6 007.2	924.5	1 941.6
2019/20	32 524	25 727	2 160	4 637	9 122.3	6 165.9	849.2	2 107.2

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

\* Excluding doctoral and post-doctoral students.

**Table C.144: Higher education sector R&D personnel (\*including and \*\*excluding doctoral students and post-doctoral fellows) in headcounts and full-time equivalents by occupation and gender (2017/18 to 2019/20)**

OCCUPATION	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)				
	2017/18	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS
Researchers*		50 549	27 577	22 972	20 996.2	11 687.1	9 309.2	41.5
Technicians directly supporting R&D		2 484	1 352	1 132	838.0	514.6	323.4	33.7
Other personnel directly supporting R&D		4 041	1 341	2 700	1 580.8	501.1	1 079.7	39.1
<b>Total</b>		<b>57 074</b>	<b>30 270</b>	<b>26 804</b>	<b>23 415.1</b>	<b>12 702.8</b>	<b>10 712.3</b>	<b>41.0</b>
Researchers**		24 942	13 311	11 631	6 040.6	3 291.4	2 749.2	24.2
Technicians directly supporting R&D		2 484	1 352	1 132	838.0	514.6	323.4	33.7
Other personnel directly supporting R&D		4 041	1 341	2 700	1 580.8	501.1	1 079.7	39.1
<b>Total</b>		<b>31 467</b>	<b>16 004</b>	<b>15 463</b>	<b>8 459.4</b>	<b>4 307.1</b>	<b>4 152.3</b>	<b>26.9</b>
2018/19	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS	
Researchers*		51 187	27 461	23 726	21 590.6	11 937.5	9 653.1	42.2
Technicians directly supporting R&D		2 272	1 307	965	924.5	569.9	354.7	40.7
Other personnel directly supporting R&D		4 340	1 469	2 871	1 941.6	615.5	1 326.2	44.7
<b>Total</b>		<b>57 799</b>	<b>30 237</b>	<b>27 562</b>	<b>24 456.8</b>	<b>13 122.8</b>	<b>11 334.0</b>	<b>42.3</b>
Researchers**		24 618	12 812	11 806	6 007.2	3 206.1	2 801.1	24.4
Technicians directly supporting R&D		2 272	1 307	965	924.5	569.9	354.7	40.7
Other personnel directly supporting R&D		4 340	1 469	2 871	1 941.6	615.5	1 326.2	44.7
<b>Total</b>		<b>31 230</b>	<b>15 588</b>	<b>15 642</b>	<b>8 873.3</b>	<b>4 391.4</b>	<b>4 481.9</b>	<b>28.4</b>
2019/20	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	FTEs AS % OF HEADCOUNTS	
Researchers*		53 371	28 313	25 058	22 153.0	12 012.2	10 140.8	41.5
Technicians directly supporting R&D		2 160	1 283	877	849.2	530.3	318.9	39.3
Other personnel directly supporting R&D		4 637	1 548	3 089	2 107.2	677.4	1 429.9	45.4
<b>Total</b>		<b>60 168</b>	<b>31 144</b>	<b>29 024</b>	<b>25 109.4</b>	<b>13 219.9</b>	<b>11 889.5</b>	<b>41.7</b>
Researchers**		25 727	13 481	12 246	6 165.6	3 255.4	2 910.2	24.0
Technicians directly supporting R&D		2 160	1 283	877	849.2	530.3	318.9	39.3
Other personnel directly supporting R&D		4 637	1 548	3 089	2 107.2	677.4	1 429.9	45.4
<b>Total</b>		<b>32 524</b>	<b>16 312</b>	<b>16 212</b>	<b>9 122.0</b>	<b>4 463.0</b>	<b>4 659.0</b>	<b>28.0</b>

\*Includes doctoral students and post-doctoral fellows. Also includes specific categories of R&D personnel (from 2016/17).

\*\*Excluding doctoral and post-doctoral students. Also includes specific categories of R&D personnel (from 2016/17).

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.145: Higher education sector R&D personnel in headcounts and full-time equivalents by occupation and gender (2017/18 to 2019/20)**

OCCUPATION	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)	
	TOTAL	MALE	FEMALE	TOTAL	FTEs AS % OF HEADCOUNTS
<b>2017/18</b>					
Researchers*	24 942	13 311	11 631	6 040.6	24.2
Technicians directly supporting R&D	2 484	1 352	1 132	838.0	33.7
Other personnel directly supporting R&D	4 041	1 341	2 700	1 580.8	39.1
<b>Total</b>	<b>31 467</b>	<b>16 004</b>	<b>15 463</b>	<b>8 459.4</b>	<b>26.9</b>
<b>2018/19</b>					
Researchers*	24 618	12 812	11 806	6 007.2	24.4
Technicians directly supporting R&D	2 272	1 307	965	924.5	40.7
Other personnel directly supporting R&D	4 340	1 469	2 871	1 941.6	44.7
<b>Total</b>	<b>31 230</b>	<b>15 588</b>	<b>15 642</b>	<b>8 873</b>	<b>28.4</b>
<b>2019/20</b>					
Researchers*	25 727	13 481	12 246	6 165.6	24.0
Technicians directly supporting R&D	2 160	1 283	877	849.2	39.3
Other personnel directly supporting R&D	4 637	1 548	3 089	2 107.2	45.4
<b>Total</b>	<b>32 524</b>	<b>16 312</b>	<b>16 212</b>	<b>9 122.0</b>	<b>28.0</b>

\*Excludes doctoral students and post-doctoral fellows. Includes specific categories of R&D personnel.

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.146: Higher education sector R&D postgraduates in headcounts by qualification and gender, and full-time equivalents by qualification (2017/18 to 2019/20)**

OCCUPATION	HEADCOUNTS			FULL-TIME EQUIVALENTS (FTEs)	
	TOTAL	MALE	FEMALE	TOTAL	FTEs AS % OF HEADCOUNTS
<b>2017/18</b>					
Post-doctoral fellows	2 741	1 545	1 196	2 597.6	94.8
Doctoral students	22 866	12 721	10 145	12 358.1	54.0
Master's students (full research master's)	24 769	11 702	13 067	12 348.9	49.9
Master's students (coursework plus thesis with research component)	30 272	14 261	16 011	10 740.1	35.5
<b>Total</b>	<b>80 648</b>	<b>40 229</b>	<b>40 419</b>	<b>38 044.6</b>	<b>47.2</b>
<b>2018/19</b>					
Post-doctoral fellows	2 727	1 577	1 150	2 564.9	94.1
Doctoral students	23 842	13 072	10 770	13 018.6	54.6
Master's students (full research master's)	29 554	13 689	15 865	15 075.1	51.0
Master's students (coursework plus thesis with research component)	30 272	14 037	16 235	10 262.9	33.9
<b>Total</b>	<b>86 395</b>	<b>42 375</b>	<b>44 020</b>	<b>40 921</b>	<b>47.4</b>
<b>2019/20</b>					
Post-doctoral fellows	2 867	1 693	1 174	2 717.6	94.8
Doctoral students	24 777	13 139	11 638	13 269.7	53.6
Master's students (full research master's)	29 578	13 507	16 071	14 593.6	49.3
Master's students (coursework plus thesis with research component)	29 924	14 019	15 905	9 758.2	32.6
<b>Total</b>	<b>87 146</b>	<b>42 358</b>	<b>44 788</b>	<b>40 339</b>	<b>46.3</b>

Note: Master's students are separated into two categories (from 2016/17).

**Table C.147: Higher education sector R&D personnel in headcounts by occupation, qualification, population group and gender (2019/20)**

OCCUPATION AND QUALIFICATION	TOTAL	SUBTOTAL		AFRICAN		COLOURED		INDIAN/ASIAN		WHITE		NON-SA	
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Researchers*	25 727	13 481	12 246	4 179	3 643	699	801	1 055	1 322	4 841	5 298	2 707	1 182
Doctoral degree or equivalent	12 838	7 310	5 528	1 619	1 142	350	334	517	576	2 815	2 721	2 009	755
Master's, honours, bachelor or equivalent	11 044	5 317	5 727	2 194	2 107	309	392	476	648	1 751	2 237	587	343
Diplomas	1 845	854	991	366	394	40	75	62	98	275	340	111	84
Technicians directly supporting R&D	2 160	1 283	877	505	322	67	49	260	124	349	292	102	90
Doctoral degree or equivalent	171	75	96	15	8	1	7	7	3	33	51	19	27
Master's, honours, bachelor or equivalent	863	467	396	215	151	29	25	52	54	129	142	42	24
Diplomas	1 126	741	385	275	163	37	17	201	67	187	99	41	39
Other personnel directly supporting R&D	4 637	1 548	3 089	715	1 176	52	129	201	703	337	886	243	195
Doctoral degree or equivalent	278	117	161	35	35	8	11	7	23	48	73	19	19
Master's, honours, bachelor or equivalent	1 760	594	1 166	271	450	22	55	59	183	148	398	94	80
Diplomas	2 599	837	1 762	409	691	22	63	135	497	141	415	130	96
<b>Total</b>	<b>32 524</b>	<b>16 312</b>	<b>16 212</b>	<b>5 399</b>	<b>5 141</b>	<b>818</b>	<b>979</b>	<b>1 516</b>	<b>2 149</b>	<b>5 527</b>	<b>6 476</b>	<b>3 052</b>	<b>1 467</b>

\*Excludes doctoral students and post-doctoral fellows. Includes specific categories of R&D personnel.

Note: Headcounts include non-SA R&D personnel (from 2016/17). Non-SA personnel are classified as those that are not from South Africa but are undertaking research in South Africa for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.148: Higher education sector overview (2018/19 to 2019/20)**

HIGHER EDUCATION OVERVIEW	2018/19					2019/20				
	R&D EXP- ENDITURE	RESEARCHER HEADCOUNT*	RESEARCHER FTE*	POSTGRAD HEADCOUNT	POSTGRAD FTE	R&D EXP- ENDITURE	RESEARCHER HEADCOUNT*	RESEARCHER FTE*	POSTGRAD HEADCOUNT	POSTGRAD FTE
	R' 000					R' 000				
Private universities	86 081	274	107.6	317	176.5	63 701	160	70.0	358	111.6
Universities	11 710 118	20 585	5 034.1	24 244	14 130.0	12 621 707	21 877	5 228.8	25 027	14 461.7
Nelson Mandela Metropolitan University	392 213	717	109.3	694	355.6	446 406	773	126.0	704	342.4
North West University	691 107	962	378.0	1 831	1 163.2	699 286	1 575	472.5	2 209	1 234.5
Rhodes University	347 916	433	153.7	699	699.0	362 523	433	153.7	687	687.0
Sefako Makgatho Health Sciences University** (SMU)	190 964	634	126.8	96	71.7	198 937	641	127.4	102	72.9
University of Cape Town	1 872 887	1 253	469.3	2 474	1 569.4	2 011 826	1 115	416.7	2 608	1 645.5
University of Fort Hare	168 721	356	71.2	857	540.6	172 342	354	70.8	706	450.0
University of Johannesburg	565 921	1 345	263.7	1 489	1 201.7	695 414	1 445	273.3	1 601	1 240.9
University of KwaZulu-Natal	961 572	2 406	549.8	3 687	1 685.8	902 454	2 355	503.9	3 655	1 644.7
University of Limpopo	226 660	559	159.3	370	250.4	289 652	602	257.9	361	196.6
University of Pretoria	1 261 937	2 140	495.2	2 522	1 269.1	1 427 785	2 466	566.0	2 592	1 452.4
University of South Africa	899 839	1 844	368.8	2 479	1 756.7	923 437	1 866	373.2	2 588	1 833.0
University of Stellenbosch	1 701 657	1 827	572.0	2 014	1 147.4	1 944 876	1 740	523.7	2 034	1 131.2
University of the Free State	415 392	734	197.9	1 127	592.9	436 578	966	188.6	1 162	593.1
University of the Western Cape	709 931	937	281.6	1 170	543.6	734 983	990	302.5	1 069	555.1
University of the Witwatersrand	1 117 959	4 118	645.6	2 424	1 060.8	1 192 541	4 237	713.1	2 575	1 116.1
University of Zululand	185 442	320	192.0	311	222.2	182 667	319	159.5	374	266.3

HIGHER EDUCATION OVERVIEW	2018/19					2019/20				
	R&D EXP- ENDITURE	RESEARCHER HEADCOUNT*	RESEARCHER FTE*	POSTGRAD HEADCOUNT	POSTGRAD FTE	R&D EXP- ENDITURE	RESEARCHER HEADCOUNT*	RESEARCHER FTE*	POSTGRAD HEADCOUNT	POSTGRAD FTE
	R' 000					R' 000				
Universities of (Science) and Technology	1 386 919	3 759	865.5	2 008	1 277.0	1 493 552	3 690	867.2	2 259	1 414.1
Cape Peninsula University of Technology	285 201	804	160.8	309	309.0	279 500	551	96.3	318	113.9
Walter Sisulu University of Technology and Science	70 795	619	92.9	69	48.3	97 453	616	92.4	94	65.8
Central University of Technology	257 798	431	273.6	204	96.4	252 933	316	273.6	236	169.0
Durban University of Technology	256 418	474	74.2	402	283.2	217 262	738	118.2	548	319.5
Mangosuthu University of Technology	34 220	209	35.1	14	14.0	34 558	209	36.5	14	12.0
Tshwane University of Technology	324 947	402	127.9	499	166.7	403 472	483	152.8	542	390.8
University of Venda for Science and Technology	60 630	431	43.1	396	277.2	104 923	431	43.1	374	261.8
Vaal University of Technology	96 910	389	58.0	115	82.2	103 452	346	54.3	133	81.3
<b>TOTAL</b>	<b>13 183 119</b>	<b>24 618</b>	<b>6 007.2</b>	<b>26 569</b>	<b>15 583.5</b>	<b>14 178 960</b>	<b>25 727</b>	<b>6 165.9</b>	<b>27 644</b>	<b>15 987.4</b>

\*\*Collected personnel data may differ from HEMIS data in some cases due to definitional differences in personnel categories.

\*Excludes post-doctoral and doctoral students. Includes specific categories of R&D personnel.

Note: Headcounts include non-SA R&D staff from 2016/17. Non-South African personnel are classified as those that are not from South Africa but undertaking research for a period exceeding six months. They can be temporary or permanent residents as described by the SNA.

**Table C.149: Gross domestic product, 1993/94 – 2019/20**

YEAR	GDP LEVEL (CURRENT VALUES)	GDP LEVEL (CONSTANT 2015 VALUES)
	R MILLIONS	R MILLIONS
1993/94	480 994	2 315 156
1994/95	545 093	2 389 241
1995/96	622 901	2 463 307
1996/97	701 804	2 569 229
1997/98	778 644	2 636 029
1998/99	845 733	2 649 210
1999/00	925 690	2 712 791
2000/01	1 053 138	2 826 728
2001/02	1 165 941	2 903 049
2002/03	1 360 679	3 010 473
2003/04	1 490 399	3 099 254
2004/05	1 652 434	3 240 412
2005/06	1 837 001	3 411 410
2006/07	2 057 594	3 602 579
2007/08	2 346 650	3 795 694
2008/09	2 611 631	3 916 816
2009/10	2 794 228	3 856 572
2010/11	3 055 613	3 973 802
2011/12	3 327 047	4 099 714
2012/13	3 566 385	4 197 952
2013/14	3 868 630	4 302 291
2014/15	4 133 873	4 363 118
2015/16	4 420 793	4 420 793
2016/17	4 759 555	4 450 171
2017/18	5 078 190	4 501 702
2018/19	5 357 640	4 568 670
2019/20	5 605 034	4 573 835

Data source: Stats SA (2020a)

# D. DESCRIPTION OF SURVEY METHODOLOGY

## D.1. Survey design and planning

The South African National Survey of Research and Experimental Development (R&D Survey) forms part of the tools used to monitor and evaluate the performance of the National System of Innovation (NSI).

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

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

The survey collects data in accordance with the guidelines recommended by the OECD in the Frascati Manual (OECD, 2002, 2015). This helps to maintain coherence and international comparability. The System of National Accounts (EC, IMF, OECD, UN and the World Bank, 2009) and the National System of Innovation differ on the identification of target units and definitions.

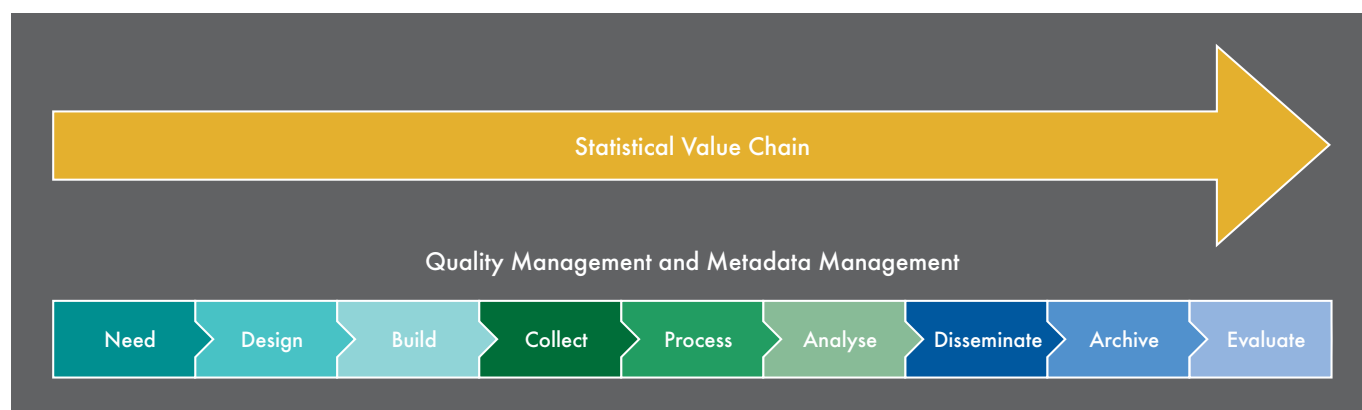
In the interests of coherence of its data with other South African economic survey data, the South African R&D Survey takes care to use standards and methods applied or recommended by Statistics South Africa. Concepts and definitions are aligned as far as possible with those in use by the National Statistical Organisation (NSO) (Stats SA, 2010a). Indicators that use external data are sourced from Stats SA surveys. These are:

- Gross domestic product values for the 2019 annual reference period taken from the quarterly Stats SA GDP statistical release P0441 (Stats SA, 2020a); and
- Employment level value for the Fourth quarter of 2020 obtained from the Stats SA Quarterly Labour Force Survey statistical release P0211 (Stats SA, 2020b).

The survey also uses the Standard Industrial Classification (Stats SA, 2004) codes for business sector industrial classifications employed by Stats SA.

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

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



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

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

R&D performers in sectors were taken to be any units that had R&D expenditure, or were likely to have had R&D expenditure, in 2019/20. Table D.1 describes each of the fieldwork periods employed by sector, and provides their respective reference periods.

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

SECTOR	DESCRIPTION	REFERENCE PERIOD	METHOD OF SURVEYING	FIELDWORK AND FOLLOW-UP PERIOD
Business	Large, medium and small (micro) business enterprises, including state-owned enterprises.	1 March 2019 to 28 February 2020 or nearest complete financial year	A purposive 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 and likely R&D performers were targeted.	8 February 2021 to 15 October 2021
Not-for-profit	Non-governmental and not-for-profit entities. Those registered as Section 21 companies.	1 April 2019 to 31 March 2020 or nearest complete financial year	All known and likely R&D performers were surveyed following an investigative process using a list of registered non-governmental and not-for-profit organisations including those that were on the current frame.	22 February 2021 to 30 June 2021
Government	National and provincial departments, local government, museums, research institutes and other research units with an R&D component.	Financial year 1 April 2019 to 31 March 2020 or nearest complete financial year	Government departments were surveyed using a census approach. All national government departments, associated research institutions and museums performing R&D at national, provincial and local levels were included in the government sector.	24 February 2021 to 31 August 2021
Science councils	The nine science councils established through acts of parliament.	Financial year 1 April 2019 to 31 March 2020 or nearest complete financial year	Seven statutory science councils were surveyed, using a census approach. Two of the nine science councils do not perform R&D.	23 February 2021 to 31 October 2021
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 2019)	Higher education institutions, namely universities, universities of science and technology, institutes of education and private higher education institutions were included in the higher education sector frame. All public higher education institutions were surveyed, using a census approach.	10 February 2021 to 30 September 2021

## D.3. Fieldwork

The R&D data were collected by means of questionnaires that were sent to the units in each sector by electronic mail. All five sectors were surveyed between 1 February 2021 and 31 October 2021.

A unit was considered as a response if:

- The unit completed and returned a questionnaire with non-zero in-house R&D expenditure;
- If the unit's in-house R&D expenditure, headcounts, and sources of fund data were reported by the respondent without a completed questionnaire; or,
- If data were confirmed by the respondent after being imputed based on secondary data sources.



The data sources used for imputation included previous R&D Survey responses as well as other private and public data sources such as the Higher Education Management Information System (HEMIS) and Support Programme for Industrial Innovation (SPII).

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

Changes made to the 2016/17 R&D Survey collection instruments on the R&D personnel tables for all sectors were maintained in the 2019/20 R&D Survey. This was done in an effort to report on foreign employees that could not be categorised by population group during previous surveys. The R&D personnel changes included an additional classification of the population group of R&D personnel, as non-South African personnel.

### Business sector

CeSTII has developed a register of known or likely R&D performers in the business sector from several information sources, including the JSE Top 100 Companies, Technology Top 100, Support Programme for Industrial Innovation (SPII) and Technology and Human Resources for Industry Programme (THRIP). A list of 581 companies was investigated. 25 new companies were added to the frame. A total of 571 business sector units were selected for the 2019/20 survey period. Of this cohort, 263 units were reported as in-scope units and 67 as out-of-scope. 55 units were imputed data.

Increased levels of non-response during the 2019/20 survey are attributed to several issues including resistance from respondents to participate in the survey and newly appointed individuals assigned to R&D activities within their companies. Negative outcomes of R&D tax incentives were also considered as a contributor to resistance to participation in the survey.

The 2019/20 survey cycle response rates were affected immensely by the national lockdown levels implemented due to the COVID-19 pandemic. Many companies advised of limited capacities within their companies due to laying off staff. A further challenge experienced was the difficulty in contacting respondents due to their working remotely which resulted in significant delays during the survey process.

A dedicated strategy to secure virtual meetings was implemented to address issues raised by some organisations which contributed to their resistance to participate in the survey. A total of 14 virtual meetings were conducted with individual companies and the representatives of entities.

### Science councils sector

Seven R&D-active science councils responded to the survey questionnaire. One of these science councils was surveyed at the level of its constituent units resulting in resulting in a total of 11 reporting units reporting for the 2019/20 financial period.

### Not-for-profit sector

A list of 115 units were investigated for the not-for-profit sector which consisted of known and likely R&D performers. Finalisation of the frame maintenance process identified 56 units as known and likely R&D performers for the 2019/20 survey period. A contributing factor for this reduced number was the higher number of out-of-scopes (14 units) recorded at the end of the 2018/19 survey period that could not remain on the frame for the 2019/20 R&D Survey.

One of the impacts of COVID-19 was the inability to add new units to the 2019/20 NPO frame during the improvement of coverage investigations. New respondents could not be reached at their offices as they were working remotely from home during the various lockdown stages. The lockdown further impacted the tasks of obtaining returned survey questionnaires as it was difficult to get a hold of respondents telephonically as many could only be reached via electronic communication.

Furthermore, some of the smaller units indicated that they were struggling to obtain funding to sustain their R&D projects and do not foresee the likelihood of any future R&D for their organisations during the COVID pandemic.

### Government sector

The government sector team investigated a list of 164 units consisting of national and provincial departments, municipalities, research centres and museums. Ninety-four possible R&D performing units were selected for surveying.

## Higher education sector

In the 2019/20 R&D Survey, the survey frame for the higher education sector was 30, which consisted of six private universities and 24 public universities. Over the last two survey cycles three private universities were removed; one notified that they would no longer be providing any data and, for the rest of the units, no response was ever obtained and they were found to be more involved in teaching activities only.

The funding of research chairs is included in these estimates.

Further amendments to the collection instrument included specific categories of R&D personnel relevant to higher education only – these are emeritus professors, research fellows, honorary research associates or equivalent. They do not incur a salary at the university but there are time and costs associated with them, therefore the separate headcount and FTE category. The Frascati guidelines classify specific categories of R&D personnel as researchers and recommends they be included for reporting R&D activity.

Costs incurred by the specific categories of R&D personnel are included as “specific categories of R&D personnel costs” and are included in the other current expenditure (Q8 of the HE questionnaire).

From the 2016/17 survey onwards, the master’s student category was split into two types: master’s students (full research master’s) and master’s students (coursework plus thesis with research component).

## D.4. Methodological note on the impact of COVID-19 on the R&D Survey 2019/20

The R&D Survey 2019/20 went into field in February 2021 due to delays experienced during the 2018/19 R&D Survey fieldwork because of significant impacts of the COVID-19 pandemic. Despite the absence of a hard ‘lock-down’ period the country experienced in March 2020, South Africa experienced second and third waves of COVID infections that led to increased lockdown levels which meant respondents were forced to work remotely. The CeSTII team worked from home and finalised the 2018/19 R&D Survey and rolled-out the 2019/20 R&D Survey working online. The potential impact on survey returns was not known, but it was expected to be severe.

Mid-way through the 2018/19 R&D Survey fieldwork, the CeSTII team initiated a process of consultation with global and national experts to determine how the pandemic was impacting their work, and to engage on responses and strategies that could be implemented to protect the R&D time series data. The fieldwork practices for the 2019/20 R&D Survey continued to build on the lessons learnt from the engagement with expert consultants.

Given the uncertainty about the trajectory and duration of the pandemic over the medium term the decision was made to continue with the strategies implemented during the 2018/19 R&D Survey and adjust where necessary to ensure that the quality of the dataset was as high as could possibly be obtained.

The mitigation strategy devised to ensure as high quality dataset as possible, to avoid a low response rate and hence, a potential break in series, included:

- 1. Extending fieldwork:** The period of fieldwork was much later than usual and extended from 1 February 2021 to 31 October 2021 as a result of extensions in the previous survey due to the COVID-19 pandemic. A focused effort on improving the rate of returns was employed and the decision was made to continue collecting units beyond survey closure dates. Fieldwork continued during lockdown levels 1 to 3 with most businesses, universities, government entities and not-for-profit entities who were able to do so, working remotely. The resulting delay in fieldwork was communicated to stakeholders via the CeSTII and DSI websites, as well as a dedicated mailout to all respondents and stakeholders.
- 2. Target top 200 firms:** The Frascati Manual recommends that all size classes be covered in an R&D Survey, but considering that large firms contribute significantly to R&D, every effort must be made to ensure coverage of large firms (FM 2015, Chapter 7). In addition to the units already in field, a list of the top 200 South African firms was identified to guide more focussed fieldwork effort in the business sector.

3. **Advised commutes:** Many respondents reported that the data required to complete the survey was stored in offices that could not be accessed during lockdown. To facilitate responses, a strategy of advised commutes was adopted. Firms were sent a completed questionnaire based on the previous return and adjusted by a statistically produced GDP inflation factor, for amendment or confirmation. This strategy was implemented for all sectors with outstanding units. If no response or adjustment was received, the commute would be recorded as a regular commute/estimated value.
4. **Digital meetings:** No face-to-face interviews were possible to adhere to strict COVID protocols. Where possible virtual meetings were scheduled with respondents to further improve response rates.
5. **Continuous recording/monitoring of metadata:** There was a strong likelihood of a high rate of imputations for the 2019/20 R&D Survey, given the fieldwork challenges. International R&D survey practitioners advised that they also anticipated higher levels of imputation due to the pandemic. The discussions with Stats SA in particular focused on what would be an acceptable imputation rate. Hence, a process of monitoring the metadata on an ongoing basis during the extended fieldwork period was instituted. We observed and monitored quality indicators such as response and collection rates and measured the levels of unit and GERD imputation rates. The 2019/20 R&D Survey reported an overall reduction in the imputation rate but at sector level some reported increased imputation rates.

All the sectors were significantly impacted by the difficulty in communicating with respondents. The business, government and not-for-profit sectors were the most impacted and recorded the lowest responses rate at the original closure date for the survey. The quality assessment of the R&D Survey is based on a range of indicators. A preliminary review indicated that the required quality levels could likely be obtained, taking into account performance across all the institutional sectors, based on a wider range of indicators.

## D.5. Quality indicators of survey coverage, fieldwork and analysis

The summary set of quality indicators for the collection and imputation phases of the survey processes in Table D.2 reflects an overall questionnaire response rate of 53.9% for 2019/20, compared to 50.4% in 2018/19 and the 63.4% in 2017/18.

The 2019/20 survey period returned a higher rate of out-of-scopes. A partial reason for the relatively high number of out-of-scopes in the business sector may be attributed to the nature of the scope of R&D surveys conducted according to Frascati standards, where the units selected for surveying include likely R&D performers in addition to known R&D performers. The nature of R&D is such that there may be a very small number of projects active in the R&D-performing business unit of a firm in any given year. These projects typically last for around three years, according to reports from the field. Upon termination of the project, the R&D expenditure of a firm would thus be nought for a particular reference period, which with the existing CeSTII operational procedures would classify it as an out-of-scope unit, even though it might very well perform R&D again in the future. For this reason, the R&D survey uses collection rates as well as questionnaire response rates as key quality indicators of the collect phase of the SVC.

*Non-response*<sup>3</sup> was defined as failure to obtain a measurement on one or more variables for one or more units selected for the survey. These include out-of-scope units.

*Out-of-scope units* are defined as units that should not be included in the survey frame because they did not belong to the target population in the reference period. Entities that returned a questionnaire stating nil in-house R&D expenditure for the survey reference period were counted as out-of-scope for the 2019/20 R&D Survey.

*In-scope units*<sup>4</sup> were defined as units performing in-house R&D or with likely in-house R&D activity.

<sup>3</sup> Adapted from Sarndal, Swensson and Wretman (1992).

<sup>4</sup> This is the HSRC-CeSTII operational definition.

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

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

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

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

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

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

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

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

**Table D.2: Quality indicators of survey coverage by sector (2019/20)**

SECTOR	NUMBER OF UNITS INVESTIGATED	NUMBER OF UNITS SELECTED TO COMPILE STATISTICS	NON-RESPONSE	OUT-OF-SCOPE	RESPONSES	QUESTIONNAIRE RESPONSE RATE	COLLECTION RATE	UNIT IMPUTATION RATE	WEIGHTED RESPONSE RATE
Business	581	571	308	67	263	52.2%	70.2%	10.9%	68.7%
Not-for-profit	115	56	27	3	29	54.7%	62.5%	15.1%	94.6%
Government	164	94	48	5	46	51.7%	68.1%	6.7%	93.0%
Science councils	11	11	0	0	11	100.0%	100.0%	0.0%	100.0%
Higher education	30	30	9	0	21	70.0%	70.0%	26.7%	87.0%
HE: Public	24	24	6	0	18	75.0%	75.0%	25.0%	86.9%
HE: Private	6	6	3	0	3	50.0%	50.0%	33.3%	93.8%
<b>Total</b>	<b>901</b>	<b>762</b>	<b>392</b>	<b>75</b>	<b>370</b>	<b>53.9%</b>	<b>69.8%</b>	<b>11.2%</b>	<b>84.3%</b>

**Table D.3: Quality indicators of survey coverage by sector (2018/19)**

SECTOR	NUMBER OF UNITS INVESTIGATED	NUMBER OF UNITS SELECTED TO COMPILE STATISTICS	NON-RESPONSE	OUT-OF-SCOPE	RESPONSES	QUESTIONNAIRE RESPONSE RATE	COLLECTION RATE	UNIT IMPUTATION RATE	WEIGHTED RESPONSE RATE
Business	689	546	305	52	241	48.8%	59.3%	15.6%	54.9%
Not-for-profit	345	69	36	14	33	60.0%	71.0%	9.1%	98.2%
Government	164	96	56	1	40	42.1%	57.3%	8.4%	90.8%
Science councils	13	12	1	0	10	90.9%	90.9%	9.1%	97.2%
Higher education	31	31	9	0	22	71.0%	74.2%	25.8%	86.5%
HE: Public	24	24	7	0	17	70.8%	70.8%	29.2%	86.5%
HE: Private	7	7	2	0	5	71.4%	85.7%	14.3%	95.9%
<b>Total</b>	<b>1 242</b>	<b>754</b>	<b>407</b>	<b>67</b>	<b>346</b>	<b>50.4%</b>	<b>61.2%</b>	<b>14.4%</b>	<b>76.4%</b>

An improvement in the questionnaire response and data collection rates between 2018/19 and 2019/20 was evident and largely influenced by the adaptation of fieldwork strategies in response to the COVID-19 pandemic and more relaxed lockdown levels during the data collection (see D.2).

The 2019/20 R&D Survey still experienced impact of the pandemic as is evident in the high non-responses and out-of-scope units reported (see D.2 and D.3). Sectoral analysis shows the unit imputation rate increased for the not-for-profit and private higher education sectors. The business, government, science councils and public higher education sectors all reported a lower imputation rate compared to those obtained in the 2018/19 R&D Survey.

Considered revised fieldwork strategies were implemented to ensure that optimal number of returns were collected, with the aim to improve on the level of imputation that had to be implemented in the 2018/19 R&D Survey because of the effect the pandemic had on data collection.

## D.6. Imputation

Imputation is a procedure for entering a value for a specific data item where the response is missing or unusable. The R&D Survey strives to keep the rate of imputation as low as possible, while striving to include all likely sources of R&D activity in the final estimates. Since 2012/13, the rates of imputation employed have been reported, along with the age of the data used to impute (Table D.4). The 2019/20 survey consisted of 447 in-scope units of measure (comprising of 370 responses and 77 imputes). The RDSMS reports 457 in-scope units, the difference is accounted for by 2 universities that provided data per faculty. These entities' data are aggregated and reported as one unit of measure per university.

Imputations are only used upon verification from respondents or where available information confirms continued R&D activity within a specific unit of measure. The survey mostly employs a commutation procedure which is data based on a previous return and adjusted by a statistically produced GDP inflation factor. A unit is selected for imputation only if sector leaders have convinced themselves of the existence of R&D activity in those units. Where it was not possible to obtain company confirmation, individual fieldworkers were responsible for providing evidence of ongoing R&D activity to qualify units for imputation. The survey employed varying degrees of imputation. In some cases, a total R&D expenditure figure reported by the respondent (by email or telephone) was used to impute the remaining data items using a model employing available sector R&D profiles. In other cases, publicly available data was used. Lastly, a R&D profile for a unit was generated based on its known historical R&D profile adjusted by an inflation factor. In the latter case, financial data on R&D were increased by a GDP inflation value of 4.180% in 2019/20.

**Table D.4: Number of units and age of data used in the imputation models by sector**

AGE OF DATA	BUSINESS	NPO	GOVERNMENT	SCIENCE COUNCILS	HIGHER EDUCATION
Imputed (data from current reference period)	0	0	0	0	0
Imputed (data from previous year)	0	0	0	0	0
Imputed (data more than one year old)	0	0	0	0	0
Commuted (data from previous year)	19	7	6	0	2
Commuted (data more than one year old)	36	1	0	0	6
<b>Total</b>	<b>55</b>	<b>8</b>	<b>6</b>	<b>0</b>	<b>8</b>

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

Details of the imputation methods are available on request.

## D.7. Data processing and analysis

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

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

Tables on the state-owned enterprises (SOEs) were produced by selecting known SOEs from the enterprises in the business sector. The list of SOEs was developed by CeSTII over several years as part of the register-building process in the business sector and was checked against the National Treasury list (National Treasury, 2015).

## D.8. Dissemination

The 2019/20 R&D Survey reports will be disseminated to all respondents as well as to other users of the R&D statistics.

This report is available on request from HSRC-CeSTII and the DSI.

The report can be downloaded from the HSRC-CeSTII website (<http://www.hsrc.ac.za/en/departments/CeSTii/reports-cestii>) or the DSI website (<http://www.dst.gov.za/index.php/resource-center/rad-reports>).

Care is taken to ensure the confidentiality of respondent information, and the data presented in the report are therefore anonymised.

## D.9. Storage and archiving

The data from the R&D Survey series is 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.

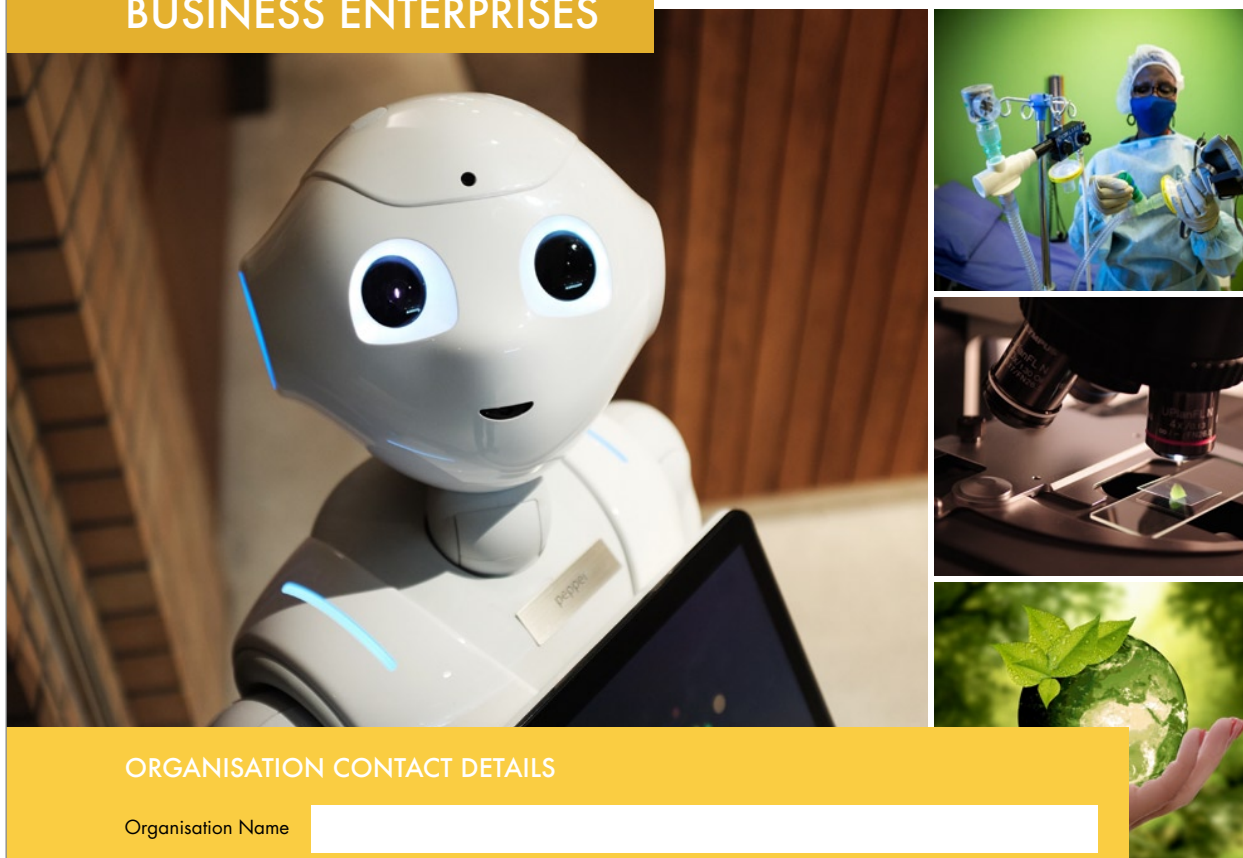
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# F. R&D SURVEY QUESTIONNAIRE

(BUSINESS SECTOR)

## NATIONAL SURVEY OF RESEARCH & EXPERIMENTAL DEVELOPMENT (R&D) INPUTS 2019/20 FINANCIAL YEAR

### BUSINESS ENTERPRISES



#### ORGANISATION CONTACT DETAILS

Organisation Name

Address line 1

Address line 2

Province

Postal Code

STRICTLY CONFIDENTIAL





## MANDATE

The Centre for Science, Technology and Innovation Indicators (CeSTII), within the Human Sciences Research Council (HSRC), conducts the National Survey of Research & Experimental Development (R&D) Inputs 2019/20 Financial Year for the Department of Science and Innovation (DSI). **The Survey is conducted in terms of the Statistics Act No. 6 of 1999.** Organisations are therefore legally required to respond by providing accurate data on R&D performance. All data gathered for this survey are confidential. Only the survey team have access to individual organisation data. The HSRC and DSI will not disseminate any information identifiable with an organisation without their consent.

## PURPOSE AND SCOPE

The R&D survey collects data on the inputs into **INTRAMURAL** R&D activities performed in South Africa by all organisations (including Business, Government, Science Councils, Not-for-Profit and Higher Education). The data is used for planning and monitoring purposes and to support decisions about strengthening South Africa's competitiveness. Previous survey results may be viewed at <http://www.hsrc.ac.za/en/departments/cestii>. This survey covers the Financial Year 1 March 2019 to 28 February 2020 (or your nearest complete financial year).

## DUE DATE

Kindly complete and return this questionnaire by \_\_\_\_\_ to:  
R&D Survey, Private Office Box 15200, Vlaeberg, 8018.

## RECORD KEEPING

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

## ASSISTANCE

If you need assistance please contact one of the survey managers:

Name	Contact Number	E-mail
Dr Kgabo Ramoroka	021 466 8004	khramoroka@hsrc.ac.za
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Mr Anele Slater	021 466 7848	aslater@hsrc.ac.za
Ms Luthando Zondi	021 466 7900	lzondi@hsrc.ac.za
Mr Sintu Mavi	021 466 7898	smavi@hsrc.ac.za
Ms Audrey Mahlaela	021 466 7925	amahlaela@hsrc.ac.za
Mr Viwe Sigenu	021 466 7898	vsigenu@hsrc.ac.za

A feedback section is located on the back page of this questionnaire. We welcome your comments and suggestions.



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

KEY:



Definition



Instruction

Cover image credit: CSIR

## DETAILS OF PERSON COMPLETING THE QUESTIONNAIRE: (Please print)

Name (with title)	<input type="text"/>	Tel	( ) <input type="text"/>
Designation	<input type="text"/>	Cell	( ) <input type="text"/>
Date	<input type="text"/>	E-mail	<input type="text"/>
Sign	<input type="text"/>		



## THE FOLLOWING DEFINITIONS ARE IMPORTANT IN THE COMPLETION OF THE SURVEY QUESTIONNAIRE:

### WHAT IS R&D?

#### DEFINITION

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

**“Creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.”**

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

The R&D activity must be:

- Novel
- Creative
- Uncertain
- Systematic
- Transferable and/or reproducible.

All five criteria are to be met, at least in principle, every time an R&D activity is undertaken whether on a continuous or occasional basis.

#### Examples:

- Investigating electrical conduction in crystals is basic research; application of crystallography to the properties of alloys is applied research.
- New chip designs involve development.
- Investigating the limiting factors in chip element placement lies at the border between basic and applied research, and increasingly involves nanotechnology.
- Much services R&D involves software development where the completion of the project is dependent on a scientific or technological advance and the aim of the project is the systematic resolution of a scientific or technological uncertainty.

#### Scope of survey

- The survey requests data on INTRAMURAL R&D performed by your organisation on the national territory of South Africa.
- Intramural R&D expenditures are all current expenditures

(including labour and other costs) plus gross fixed capital expenditures (such as for land, buildings, machinery and equipment) for R&D performed within a statistical unit during a specific reference period, whatever the source of funds.

- Part five asks some questions on “EXTRAMURAL R&D”.

#### R&D includes – but is not limited to:

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

#### R&D excludes:

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

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

## PART 1: GENERAL INFORMATION

1a. Registered name of company

1b. Trading as (if applicable)

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

--

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

Activities	SIC	Company Income Obtained (%)
<input type="text"/>	<input type="text"/>	<input type="text"/> %
<input type="text"/>	<input type="text"/>	<input type="text"/> %
<input type="text"/>	<input type="text"/>	<input type="text"/> %
		Must sum to 100% <input type="text"/> %

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

Affiliate Company Name	% Ownership
<input type="text"/>	<input type="text"/> %

3b. Indicate country where Parent Company is located and % ownership

Affiliate Company Name	% Ownership
<input type="text"/>	<input type="text"/> %

4. Is this company a state-owned enterprise (SOE)? Yes  No



Definition: SOE are public corporations owned by the South African government mainly engaged in market production and sale of the kind of goods and services often produced by private enterprises.



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

From

To

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

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

**8a. Did the company claim for the R&D tax incentive allowance?**

Yes

No

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

Continue to Question 8b

**8b. Did the company perform any INTRAMURAL R&D in South Africa during the financial year?**



- Intramural R&D refers to R&D performed by the reporting unit on its own behalf or on behalf of the others.
- Intramural R&D expenditures are all current expenditures (including labour and other costs) plus gross fixed capital expenditures (such as for land, buildings, machinery and equipment) for R&D performed within a statistical unit during a specific reference period, whatever the source of funds.
- It excludes R&D projects funded by this organisation but carried out by others using their own facilities.

Please tick as appropriate

Yes  No

**Do you think your organisation will perform intramural R&D in the future?**

Please tick	2020/21	2021/22	2022/23
Yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**8c. Did your company have extramural (outsourced) R&D expenditures during the financial year?**

Yes  No



- If you have conducted R&D in the financial year please continue to Part 2.
- If you have indicated NO INTRAMURAL or EXTRAMURAL R&D in Questions 8b and 8c, please tick below and return the questionnaire via post or email.

No INTRAMURAL or EXTRAMURAL R&D – NIL return

## PART 2: INTRAMURAL R&D PERSONNEL



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

### **Researchers**

Researchers are professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques, instrumentation, software or operational methods. This category must include **Research Managers** and other **Research Executives**.

### **Technicians directly supporting R&D**

Technicians and equivalent staff are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, the physical and life sciences, or the social sciences, humanities and the arts. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods and the use of research equipment, normally under the supervision of researchers.

### **Other personnel directly supporting R&D**

Other supporting staff includes skilled and unskilled craftsmen, and administrative, secretarial and clerical staff participating in R&D projects or directly associated with such projects.

**NOTE: ALL FOREIGN HEADCOUNTS SHOULD BE RECORDED IN THE NON-SOUTH AFRICAN CATEGORY**

### **Do not include personnel indirectly supporting R&D:**

Typical examples are transportation, storage, cleaning, repair, maintenance and security activities, as well as administration and clerical activities undertaken not exclusively for R&D (such as the activities of central finance and personnel departments). Allowance for these should be made under overheads in R&D expenditure (**Other Current expenditure – Question 11D**) but such persons should not be included as R&D Personnel.



## 9. HEADCOUNT OF R&D PERSONNEL

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

### Researchers (incl. Research Executives & Research Managers)

Personnel Categories and Highest Qualification	African		Coloured		Indian/Asian		White		Non-SA		Subtotal		TOTAL
	M	F	M	F	M	F	M	F	M	F	M	F	
Doctorates													
Master's/Hons/Bachelors or equivalent													
Diplomas and other qualifications													
<b>RESEARCHER TOTAL</b>													

### Technicians / Technologists directly supporting R&D

Personnel Categories and Highest Qualification	African		Coloured		Indian/Asian		White		Non-SA		Subtotal		TOTAL
	M	F	M	F	M	F	M	F	M	F	M	F	
Doctorates													
Master's/Hons/Bachelors or equivalent													
Diplomas and other qualifications													
<b>TECHNICIAN TOTAL</b>													

### Other personnel directly supporting R&D

Personnel Categories and Highest Qualification	African		Coloured		Indian/Asian		White		Non-SA		Subtotal		TOTAL
	M	F	M	F	M	F	M	F	M	F	M	F	
Doctorates													
Master's/Hons/Bachelors or equivalent													
Diplomas and other qualifications													
<b>OTHER PERSONNEL TOTAL</b>													

Carry subtotals  
over to Q10 ↓

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

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



### CALCULATING FULL-TIME EQUIVALENT (FTE)

**NOTE:** For the purpose of this survey, an employee can work a maximum of 1 FTE in a year.

The following equation can be used to calculate FTE / effort on R&D:  
 (Person/s employed) x (Portion of their job spent on R&D) x (Portion of the year employed) = FTE on R&D

#### For example:

- a full-time employee who devotes 100% of their time to R&D  
 $1 \times 1 \times 1 = 1 \text{ FTE on R\&D}$
- a full-time employee spending 40% of their time on R&D during half of the survey year:  
 $1 \times 0.4 \text{ persons} \times 0.5 \text{ years} = 0.2 \text{ FTE on R\&D}$
- a part-time employee working 40% of a full time year doing only R&D  
 $1 \times 0.4 \times 1 = 0.4 \text{ FTE on R\&D}$
- 20 full-time researchers spending 40% of their time on R&D during the survey year:  
 $20 \times 0.4 \times 1 = 8 \text{ FTE on R\&D}$

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

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

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



## PART 3: INTRAMURAL R&D EXPENDITURE

### 11. ALLOCATE INTRAMURAL R&D EXPENDITURE AS FOLLOWS

#### CAPITAL EXPENDITURE ON R&D



- Capital R&D expenditures are the annual gross amount paid for the acquisition of fixed assets that are used repeatedly or continuously in the performance of R&D for more than one year.
- The full value of capital expenditure must be reported in the year of purchase (do not depreciate).
- If the asset has been/will be used for more than one activity, include an estimate of the portion used for R&D.

#### Including - but not limited to:

- Expenditure on fixed assets used in the R&D projects of your business.
- Capitalised software includes acquisition of software for R&D, including fees, rights and licences expected to be used for more than one year. It includes long-term licences or the acquisition of separately identifiable computer software, including program descriptions and supporting materials for both systems and applications software.
- Purchase of databases expected to be used for more than one year.
- Major repairs and improvements on land and buildings used for R&D.

#### Excluding:

- Other repairs and maintenance expenses not used for R&D.
- Depreciation provisions.
- Proceeds from the sale of R&D assets.

	R'000 (excl. VAT)
Vehicles, plant, machinery and equipment	<input type="text"/>
Capitalised computer software	<input type="text"/>
<b>TOTAL: Vehicles, plant, machinery and equipment and software</b>	<b>A</b> <input type="text"/>
Land, buildings and other structures	<b>B</b> <input type="text"/>

#### LABOUR COSTS OF R&D

	R'000 (excl. VAT)
Labour Costs of R&D (to match Question 10)	<b>C</b> <input type="text"/>

#### OTHER CURRENT EXPENDITURE ON R&D



- Current expenditures are composed of labour costs of R&D personnel and other current costs used in R&D.
- Services and items (including equipment) used and consumed within one year are current expenditures.
- Annual fees or rents for the use of fixed assets should be included in current expenditures.

#### Including - but not limited to:

- Materials, fuels and other inputs (including all running costs).
- Water, electricity and other overhead expenses.
- Repair and maintenance expenses.
- Payments to outside organisations for use of specialised testing facilities.
- Rents for research facilities: all fees and rents associated with R&D should be included.
- Payments to outside organisations for analytical work, engineering or other specialised services in support of R&D projects carried out by your business.
- Commission/consultant expenses for research projects carried out by your business.
- Other R&D expenses and indirect costs not specified in 11 A, B or C.

#### Excluding:

- R&D activities where the research project is carried out elsewhere (outsourced) by others on behalf of your business.
- Payments for purchases of technical know-how.
- Payments for patent searches.
- Depreciation provisions.

	R'000 (excl. VAT)
Other Current Expenditure	<b>D</b> <input type="text"/>
<b>TOTAL R&amp;D EXPENDITURE (A + B + C + D = E)</b>	<b>E</b> <input type="text"/>



## 12. SOURCES OF FUNDS OF INTRAMURAL R&D

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

### INTERNAL SOURCE OF FUNDS

<b>Company</b>	<b>R'000 (excl. VAT)</b>
Own funds	<input type="text"/>

### EXTERNAL SOURCE OF FUNDS

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

Government Support Programmes for R&D (including: Grants; Tax incentive; SPLI; Innovation Fund; etc)	<input type="text"/>
Contracts to perform R&D	<input type="text"/>

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

Contracts to perform R&D	<input type="text"/>
--------------------------	----------------------

#### **Other South African Sources**

Not For Profit Organisations* / NGOs/Trusts/Foundations (contracts for research)	<input type="text"/>
Individual Donations /NGOs/Trusts/Foundations (donations for research without the obligation for a product or service)	<input type="text"/>
Higher Education	<input type="text"/>

#### **Rest of the world**

All sources (Complete Question 13)	<input type="text"/>
------------------------------------	----------------------

**R'000 (excl. VAT)**

<b>TOTAL R&amp;D EXPENDITURE</b> (to equal Question 11)	<input type="text"/>
---------------------------------------------------------	----------------------

\*Not-for-profit organisations primarily serving households. Funding from non-profit organisations primarily serving Business, Higher Education or Government should be allocated to these sectors.

### 13. SOURCES OF FUNDS FROM THE REST OF THE WORLD (in R000's) FOR INTRAMURAL R&D

If your organisation received R&D funding from the rest of the world, provide % contribution by sector and region.

Funding of R&D from the rest of the world	PERCENTAGE OF EXPENDITURE								
	DATA CHECK	Africa (outside SA)	Middle East	Europe	USA / Canada	Central & South America	China	Rest of Asia	Other
Business*	%	%	%	%	%	%	%	%	%
Not-for-Profit Organisations**	%	%	%	%	%	%	%	%	%
Foundations	%	%	%	%	%	%	%	%	%
Government	%	%	%	%	%	%	%	%	%
Higher Education	%	%	%	%	%	%	%	%	%
<b>TOTAL</b>	%	<b>TOTAL must sum to 100% (of total funding from the rest of the world Q12)</b>							

\* Including affiliated company, trade associations (affiliated denotes parent or subsidiary organisation)

\*\* NPO's serving households only. Funding from non-profit organisations primarily serving Business, Higher Education or Government should be allocated to these sectors. Donations from individuals should be recorded under this category.

### 14. PROVINCIAL EXPENDITURE ON R&D

Please state the location where your company carried out R&D activities and the percentage of the total R&D expenditure.



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

Eastern Cape	<input type="text"/>	%	Mpumalanga	<input type="text"/>	%	
Free State	<input type="text"/>	%	Northern Cape	<input type="text"/>	%	
Gauteng	<input type="text"/>	%	North West	<input type="text"/>	%	
KwaZulu-Natal	<input type="text"/>	%	Western Cape	<input type="text"/>	%	
Limpopo	<input type="text"/>	%	<b>TOTAL</b>	(must sum to 100%)	<input type="text"/>	%

## PART 4: CATEGORIES OF INTRAMURAL R&D EXPENDITURE

### 15. INTRAMURAL R&D EXPENDITURE BY TYPE OF R&D

Specify the percentage of total INTRAMURAL R&D EXPENDITURE by TYPE OF R&D.

#### Basic Research



- Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.
- The analysis of properties, structures and relationships with a view to formulating and testing hypotheses, theories or laws.
- The results of basic research are usually published in peer-reviewed scientific journals.

Percentage

%

#### Applied Research



- Applied research is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective.
- Activities that determine the possible uses for the findings of basic research.
- The results of applied research are intended primarily to be valid for a single or limited number of products, operations, methods or systems.
- Applied research develops ideas into operational form and may be published in peer reviewed journals or subjected to other forms of intellectual property protection.

Percentage

%

#### Experimental Development



- Experimental development is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.

Percentage

%

**TOTAL**

(must sum to 100%)

%

**16. Classify R&D according to Standard Industrial Classification (SIC)**

(See Appendix A in the codes book) with associated % expenditure.



SIC's indicate the classification that best describes the company's R&D according to the intended **use** of the product.

SIC Codes		Percentage	SIC Codes		Percentage
SIC	<input type="text"/>	<input type="text"/> %	SIC	<input type="text"/>	<input type="text"/> %
SIC	<input type="text"/>	<input type="text"/> %	SIC	<input type="text"/>	<input type="text"/> %
SIC	<input type="text"/>	<input type="text"/> %	SIC	<input type="text"/>	<input type="text"/> %
SIC	<input type="text"/>	<input type="text"/> %	SIC	<input type="text"/>	<input type="text"/> %
SIC	<input type="text"/>	<input type="text"/> %	SIC	<input type="text"/>	<input type="text"/> %
<b>TOTAL</b>					(must sum to 100%) <input type="text"/> %

**17. RESEARCH FIELD (RF)**

Classify R&D according to Research Fields (RF) with associated % expenditure.

(See Appendix B in the codes book.)



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

RF Codes		Percentage	RF Codes		Percentage
RF	<input type="text"/>	<input type="text"/> %	RF	<input type="text"/>	<input type="text"/> %
RF	<input type="text"/>	<input type="text"/> %	RF	<input type="text"/>	<input type="text"/> %
RF	<input type="text"/>	<input type="text"/> %	RF	<input type="text"/>	<input type="text"/> %
RF	<input type="text"/>	<input type="text"/> %	RF	<input type="text"/>	<input type="text"/> %
RF	<input type="text"/>	<input type="text"/> %	RF	<input type="text"/>	<input type="text"/> %
<b>TOTAL</b>					(must sum to 100%) <input type="text"/> %

### 18a. MULTIDISCIPLINARY AREAS OF R&D

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



Multi-disciplinary R&D combines several research fields or disciplines. If your organisation performs R&D, as described below, please provide the applicable % of total R&D Expenditure.

Note that the percentages will most likely not total 100%.



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

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

Multidisciplinary Area of R&D	% of R&D expenditure
-------------------------------	----------------------

Biotechnology	<input type="text"/> %
---------------	------------------------

Nanotechnology	<input type="text"/> %
----------------	------------------------

No R&D in these areas  ← TICK if no such R&D is done

### 18b. R&D IN SPECIFIC AREAS OF INTEREST

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



**Open source software** – computer software with its source code made in which the copyright holder provides the rights to study, change, and distribute the software to anyone and for any purpose

**Space science** – Any of several scientific disciplines, such as communications, transport, engineering or health that specifically studies phenomena occurring in the upper atmosphere, in space, or on celestial bodies other than Earth

**Environment / sustainability R&D** – any of several fields wherein research focuses on human, economic and societal impact on the environment investigating its contemporary and future impact on society

**New materials** - Materials science and engineering, involves the discovery and design of new materials, with an emphasis on solids.

Specific Areas of Interest	% of R&D expenditure
----------------------------	----------------------

Open source software	<input type="text"/> %
----------------------	------------------------

Space science	<input type="text"/> %
---------------	------------------------

Tuberculosis (TB), HIV/AIDS, Malaria	<input type="text"/> %
--------------------------------------	------------------------

Environment and sustainability R&D	<input type="text"/> %
------------------------------------	------------------------

New materials	<input type="text"/> %
---------------	------------------------

No R&D in these areas  ← TICK if no such R&D is done



**19. Classify R&D according to Socio-Economic Objectives with percentage expenditure**  
 (See Appendix C in codes book.)



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

	SEO Codes	Percentage		SEO Codes	Percentage
S	<input type="text"/>	<input type="text"/> %	S	<input type="text"/>	<input type="text"/> %
S	<input type="text"/>	<input type="text"/> %	S	<input type="text"/>	<input type="text"/> %
S	<input type="text"/>	<input type="text"/> %	S	<input type="text"/>	<input type="text"/> %
S	<input type="text"/>	<input type="text"/> %	S	<input type="text"/>	<input type="text"/> %
S	<input type="text"/>	<input type="text"/> %	S	<input type="text"/>	<input type="text"/> %
<b>TOTAL</b>		(must sum to 100%)			<input type="text"/> %

**20. COLLABORATIVE R&D**

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

Yes  Continue with Question 20b      No  Go to Question 21

**20b. With whom is R&D conducted in partnerships, alliances or collaboration?**



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

Tick as appropriate	South Africa	Foreign	Rest of the world consisting of... (tick as appropriate)							
			Africa (outside SA)	Middle East	Europe	USA / Canada	Central & South America	China	Rest of Asia	Other
Higher Education Institutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Science Councils (e.g. CSIR, Mintek, MRC, ARC etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government Research Institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Members of own organisation / Affiliated* organisations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Companies (including specialist consultants, business and trade associations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not-for-Profit Organisations**	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\* Affiliated denotes parent or subsidiary organisation.

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

## PART 5: EXTRAMURAL R&D (OUTSOURCED/CONTRACTED OUT)



### Extramural R&D refers to:

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

R'000 (excl. VAT)

21a. State value of extramural R&D inside South Africa.

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

Outsourced to:	Approximate Value R'000s (excl. VAT)
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

R'000 (excl. VAT)

22a. State value of extramural R&D outside South Africa.

22b. If you have indicated extramural R&D outside South Africa in Question 22, kindly provide the approximate percentage by sector and geographic location.

PERCENTAGE EXTRAMURAL R&D OUTSIDE SOUTH AFRICA									
Category	DATA CHECK	Africa (outside SA)	Middle East	Europe	USA / Canada	Central & South America	China	Rest of Asia	Other
Business*	%	%	%	%	%	%	%	%	%
Not-for-Profit Organisations**	%	%	%	%	%	%	%	%	%
Foundations	%	%	%	%	%	%	%	%	%
Government	%	%	%	%	%	%	%	%	%
Higher Education	%	%	%	%	%	%	%	%	%
<b>TOTAL</b>	%	TOTAL must sum to 100% (of total extramural R&D outside SA funding Q22)							

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



# YOUR FEEDBACK MATTERS

PLEASE USE THIS SECTION TO PROVIDE GENERAL FEEDBACK OR DATA NOTES TO THE SURVEY TEAM

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THANK YOU FOR YOUR TIME AND EFFORT



# G. USER SATISFACTION SURVEY

## SOUTH AFRICAN NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT: STATISTICAL REPORT 2019/20

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 email to [innovation@hsrc.ac.za](mailto:innovation@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.

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9. What did you like best about the publication?

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

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Lined area for writing responses, consisting of 35 horizontal lines.

**Thank you for completing the survey.**

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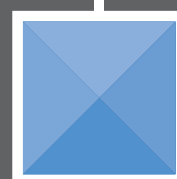
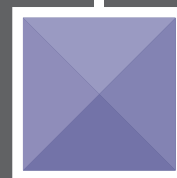
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