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# National Survey of Research & Experimental Development

## Main Results 2008/09



science  
& technology

Department:  
Science and Technology  
REPUBLIC OF SOUTH AFRICA



HSRC  
Human Sciences  
Research Council





## Notifications

### Revisions

The Department of Science and Technology (DST), Statistics South Africa (Stats SA), the Human Sciences Research Council (HSRC) and the project team jointly reserve the right to revise data, indicators and analysis, if deemed necessary, to improve the quality of this product. Revisions to this document may result from changes in external data such as Stats SA revisions of national data series in relation to the gross domestic product (GDP). Revisions of data may also originate from both internal and external data quality and consistency checks or amendments in response to queries from the Organisation for Economic Co-operation and Development (OECD) which conducts quality checks through global comparative analysis, time series analyses and other methods.

*Note: Any revisions concerning the data presented in this report will be noted and can be accessed on the DST and HSRC websites as indicated below under “dissemination”.*

### User Satisfaction Survey

A user satisfaction survey is included in **Annexure II** of this report. It will be highly appreciated if users can complete the questionnaire and return it by fax to +27 (0)21 461 1255 or email it to [wblankley@hsrc.ac.za](mailto:wblankley@hsrc.ac.za).

Input from various participants is included through an ongoing feedback process following each survey to ensure improved accuracy of future surveys.

### Dissemination

This report is published for wider dissemination by both the HSRC and the DST and may be downloaded free of charge from:

[www.dst.gov.za/publications-policies/r-d-reports](http://www.dst.gov.za/publications-policies/r-d-reports)  
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Data extractions that CeSTII may perform for users are governed by the National Survey of Research & Experimental Development (R&D) Access Protocol and are generally provided free of charge unless fairly substantial analytical work is required to meet the request for data.

### Endorsement by Stats SA

The methodology and data provided in this report have been approved by Statistics South Africa (Stats SA) and awarded the seal of approval by the Statistician General.

### Project team

The annual National Survey of Research & Experimental Development (R&D) is conducted on behalf of the Department of Science & Technology (DST) by the Centre for Science, Technology and Innovation Indicators (CeSTII) at the Human Sciences Research Council (HSRC).

The CeSTII project team for the 2008/09 R&D Survey comprised: Demetre Labadarios, William Blankley, Neo Molotja, Julien Rumbelow, Moses Sithole, Natalie Vlotman, Weziwe Sikaka, Saahier Parker, Irma Booyens, Hangwelani Magidimisha, Karen Heath, Vaughan Leiberum, Natasha Saunders, Prudence Sotashe, Mtembukazi Sibindlana, Aeysha Semaar, Mamela Siwendu and Lezaan Muller.

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Interaction with, and feedback from, the Organisation for Economic Co-operation and Development (OECD) and the Working Party of National Experts on Science and Technology Indicators (NESTI) have provided invaluable assistance in improving quality and standards in the implementation of the South African R&D Surveys and in analysing the results.

We are grateful for and acknowledge the co-operation of the respondents, especially those that attended to the questionnaire under time pressures and outside of working hours. This survey was carried out in parallel with the second official Innovation Survey, also undertaken by CeSTII, which compounded the pressures on staff and respondents.

We acknowledge all the staff that contributed to the successful implementation of the survey, especially the CeSTII administration staff Valda West, Sumaya Abdullatief and the IT help desk operated by Noor Fakier.



# FOREWORD

Since my appointment as Statistician-General (SG) of the Republic of South Africa in 2000, it remained my aim to increase the stock of official statistics beyond statistics producing agencies such as Statistics South Africa (Stats SA), and to raise the profile and promote the use of official statistics. The creation of the Planning Commission, and the Performance Monitoring and Evaluation Departments in the Presidency demonstrates the importance of statistics in planning state programmes, monitoring their progress and evaluating their performance. With regard to statistical production, the Statistics Act (No. 6 of 1999) requires of the SG to coordinate statistical production beyond the confines of Stats SA. The National Statistical System (NSS) system was adopted with the express purpose of transforming the undesirable state of statistical production to:

1. meet user needs;
2. inform planning and decision-making; and
3. monitor the implementation of government programmes and projects.

To date, the Department of Science and Technology (DST) remains the only partner in the NSS who has managed to produce statistics following the prescripts of official statistics. As such, the DST has become a model for the type of relationship required to assist other NSS members to also contribute to the body of official statistics. In this regard, the DST continues to play a leading role in influencing the nature of the relationship between Stats SA and its partners in the NSS.

Furthermore, the DST has demonstrated that it recognises the significance of the Statistics Act in the national effort to provide credible numbers for the nation. In compliance with the provisions of the Statistics Act, the DST subjected the R&D Survey to an independent assessment utilising the quality framework developed by Stats SA, namely "The South African Statistical Quality Assessment Framework" (SASQAF) that I gazetted in 2009. While the report on the quality assessment has yet to be published, the DST and its service provider, the HSRC, complied fully with the assessment procedure as specified in the "Procedure for designating statistics from organs of state as official statistics" and retained its status as official statistics. In

support of the NSS objective to strengthen the capacity for producing official statistics, I intend deploying resources from Stats SA to strengthen and support the quality improvement initiatives at the DST.

Given the strength of the relationship with the DST and the quality improvement initiatives supporting the R&D Survey, I unequivocally endorse the 2008/09 R&D Survey results and encourage its use by stakeholders.

**Pali J Lehohla**  
**STATISTICIAN-GENERAL**  
**REPUBLIC OF SOUTH AFRICA**



## Preface

The National R&D survey has become a regular feature of South Africa's science and technology landscape. The Survey is conducted annually by the Human Sciences Research Council's Centre for Science, Technology and Innovation Indicators (CeSTII) on behalf of the Department of Science and Technology (DST).

The South African R&D Survey collects data under strict conditions of confidentiality from institutions in the country that perform research and experimental development (R&D). The data is then aggregated at sector level and provides essential information for planning at system and institutional level and also provides key indicators of national competitiveness. The R&D Surveys involve the collection of primary data from the public and private sectors. The public sector includes universities, science councils and government department-based research institutes, while the private sector includes firms and non-profit organisations.

The R&D Survey is carried out in accordance with international best practice as recommended by the guidelines of the Organisation for Economic Cooperation and Development (OECD) Frascati Manual 2002. The results are submitted to the OECD and published in the authoritative biannual OECD Main Science and Technology Indicators (MSTI) series. They are also a component of South African official statistics as defined in the Statistics Act, 1999.

The 2008/09 R&D survey recorded on R&D Gross Expenditure on Research and Development (GERD) of R21,0 billion, which was a nominal increase of R2,4 billion from the R18,6 billion recorded for 2007/08. The 2008/09 expenditure represents a 13,0% nominal increase over that of the previous year, but was insufficient to keep up with the increase in the nominal Gross Domestic Product (GDP) of 14,2% over the corresponding period. As a consequence, R&D expenditure, expressed as a percentage of GDP, dropped slightly from 0,93% in 2007/08 to 0,92% in 2008/09. This means the increase in national R&D expenditure for 2008/09 was not enough to reach the target of 1% of GDP set for this year.

The survey revealed some encouraging signs. Both the business and higher education sectors had real (after inflation) R&D expenditure increases of 3,0% and 3,7%

respectively. However, R&D expenditure increases in the government sector (including the science councils) and non-profit sector were below the inflation rate. Nevertheless, in real terms, total R&D expenditure in the country increased by 1,3% between 2007/08 and 2008/09.

In view of government's commitment to greatly increase R&D expenditure in the country this presents a challenge particularly in the current global economic climate. The number of full-time equivalent (FTE) researchers increased only very slightly from 19 320 in 2007/08 to 19 384 in 2008/09. However, because of the increase in total employment in South Africa the number of researchers per 1 000 total employment is down from 1,5 in 2007/8 to 1,4 in 2008/09 and total R&D personnel per 1000 total employment is down from 2,4 in 2007/08 to 2,2 in 2008/09.

We extend our appreciation to the CeSTII project team for their efforts in conducting this extensive survey each year. A special word of thanks goes to all the survey respondents in the higher education sector, science councils, and the government and non-profit sectors. The business sector plays a crucial role in South African R&D and the many senior executives from this sector who give their time so readily to make this survey a success are sincerely thanked.

*G. N. M. Pandor*

**Mrs GNM Pandor, MP  
MINISTER OF  
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TECHNOLOGY**





## List of Abbreviations

<b>AISA</b>	Africa Institute of South Africa
<b>ARC</b>	Agricultural Research Council
<b>BERD</b>	Business Expenditure on R&D
<b>BUS</b>	Business
<b>CEO</b>	Chief Executive Officer
<b>CeSTII</b>	Centre for Science, Technology and Innovation Indicators
<b>CSIR</b>	Council for Scientific and Industrial Research
<b>DST</b>	Department of Science and Technology
<b>DQAT</b>	Data Quality Assessment Team
<b>FTE</b>	Full-time Equivalent
<b>GDP</b>	Gross Domestic Product
<b>GERD</b>	Gross Expenditure on Research and Development
<b>GOV</b>	Government
<b>GOVERD</b>	Government Expenditure on Research and Experimental Development
<b>HE</b>	Higher Education
<b>HEI</b>	Higher Education Institution
<b>HEMIS</b>	Higher Education Management Information System
<b>HERD</b>	Higher Education Expenditure on R&D
<b>HSRC</b>	Human Sciences Research Council
<b>ICT</b>	Information and Communication Technology
<b>IT</b>	Information Technology
<b>Mintek</b>	Council for Mineral Technology
<b>MRC</b>	Medical Research Council
<b>MSTI</b>	Main Science and Technology Indicators
<b>NESTI</b>	National Experts on Science and Technology Indicators
<b>NGO</b>	Non-governmental Organisation
<b>NPO</b>	Not-for-profit Organisation
<b>NRF</b>	National Research Foundation
<b>NSS</b>	National Statistics System
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PBMR</b>	Pebble Bed Modular Reactor
<b>R</b>	Rand (South African currency)
<b>R&amp;D</b>	Research and Experimental Development
<b>RF</b>	Research Field
<b>S&amp;T</b>	Science and Technology
<b>SA</b>	South Africa
<b>SABS</b>	South African Bureau of Standards
<b>SASQAF</b>	South African Statistics Quality Assessment Framework
<b>SEO</b>	Socio-economic Objective
<b>SIC</b>	Standard Industrial Classification
<b>SMRS</b>	Survey Management and Results System
<b>SOE</b>	State-owned Enterprise
<b>SPII</b>	Support Programme for Industrial Innovation
<b>SG</b>	Statistician General
<b>Stats SA</b>	Statistics South Africa
<b>THRIP</b>	Technology and Human Resources for Industry Programme

# Table of Contents

<b>Chapter 1 Introduction to the Survey</b>	<b>12</b>
1.1 Background to the Survey	12
1.2 Methodology	12
1.3 Key Indicators	13
<b>Chapter 2 Business Sector</b>	<b>21</b>
2.1 Introduction	21
2.2 Survey Methods	21
2.3 Detailed Results	22
2.3.1 Key Results	22
2.3.2 Financial Data	23
2.3.3 Orientation of BERD	26
2.3.4 R&D Personnel	29
2.3.5 Collaboration	31
2.3.6 R&D in multidisciplinary and other specific areas	31
2.3.6.1 <i>Multidisciplinary R&amp;D</i>	31
2.3.6.2 <i>Business sector R&amp;D expenditure by specific areas of national interest</i>	32
<b>Chapter 3 Government Sector</b>	<b>33</b>
3.1 Introduction	33
3.2 Survey Methods	33
3.3 Detailed Results	34
3.3.1 Key Results	34
3.3.2 Financial Data	35
3.3.3 Orientation of GOVERD	38
3.3.4 R&D Personnel	41
3.3.5 R&D in multidisciplinary and other specific areas	43
3.3.5.1 <i>Multidisciplinary R&amp;D</i>	43
3.3.5.2 <i>Government sector R&amp;D expenditure by specific areas of national interest</i>	43
<b>Chapter 4 Higher Education Sector</b>	<b>44</b>
4.1 Introduction	44
4.2 Survey Methods	44
4.3 Detailed Results	44
4.3.1 Key Results	44
4.3.2 Financial Data	47
4.3.3 Orientation of HERD	49
4.3.4 R&D Personnel	52
4.3.5 R&D in multidisciplinary and other specific areas	55
4.3.5.1 <i>Multidisciplinary R&amp;D</i>	55
4.3.5.2 <i>Higher education sector R&amp;D expenditure by specific areas of national interest</i>	55



<b>Chapter 5 Not-for-profit Sector</b>	<b>56</b>
5.1 Introduction	56
5.2 Survey Methods	56
5.3 Detailed Results	56
5.3.1 Key Results	56
5.3.2 Financial Data	58
5.3.3 NPO R&D Orientation	60
5.3.4 R&D Personnel	62
5.3.5 R&D in multidisciplinary and other specific areas	64
5.3.5.1 <i>Multidisciplinary R&amp;D</i>	64
5.3.5.2 <i>NPO sector R&amp;D expenditure by specific areas of national interest</i>	64
<b>Chapter 6 Science Council Sector</b>	<b>65</b>
6.1 Introduction	65
6.2 Survey Methods	65
6.3 Detailed Results	65
6.3.1 Key Results	65
6.3.2 Financial Data	67
6.3.3 R&D Orientation	70
6.3.4 R&D Personnel	72
6.3.5 R&D in multidisciplinary and other specific areas of national interest	74
6.3.5.1 <i>Multidisciplinary R&amp;D</i>	74
6.3.5.2 <i>Science councils sector R&amp;D expenditure by specific areas of national interest</i>	74
<b>Annexure I R&amp;D Survey Questionnaire</b>	<b>75</b>
<b>Annexure II User Satisfaction Survey</b>	<b>88</b>



## List of Figures

Figure 2.1:	Provincial distribution of business sector R&D activity (2008/09 and 2007/08)	25
Figure 3.1:	Provincial distribution of government R&D activity (2008/09 and 2007/08)	38
Figure 4.1:	Provincial distribution of higher education R&D activity (2008/09 and 2007/08)	49
Figure 5.1:	Provincial distribution of R&D activity (2008/09 and 2007/08)	59
Figure 6.1:	Provincial distribution of R&D activity (2008/09 and 2007/08)	69

## List of Tables

Table E1:	Total in-house R&D expenditure by sector (2008/09 and 2007/08)	10
Table E2:	Headcount of R&D personnel by sector (2008/09)	11
Table 1.1:	Economic indicators for 2008/09 and 2007/08	14
Table 1.2:	Key R&D indicators (2008/09 and 2007/08)	14
Table 1.3:	R&D expenditure by sector 2008/09 (current prices, R'000)	15
Table 1.4:	GERD by type of research (2008/09, 2007/08 and 2006/07)	15
Table 1.5:	R&D expenditure by accounting category (2008/09)	15
Table 1.6:	R&D expenditure by source of funds (2008/09)	16
Table 1.7:	Provincial split of R&D (2008/09)	16
Table 1.8:	R&D expenditure by research field (2008/09)	17
Table 1.9:	R&D expenditure by socio-economic objective (2008/09)	17
Table 1.10:	R&D personnel headcount by sector (2008/09)	18
Table 1.11:	R&D personnel full-time equivalents (FTEs) by sector (2008/09)	19
Table 1.12:	Expenditure on multidisciplinary areas of R&D (2008/09)	19
Table 1.13:	Expenditure on R&D in specific areas of interest (2008/09)	19
Table 1.14:	R&D personnel headcount by sector, personnel category, race and gender (2008/09)	20
Table 2.1:	Business sector fieldwork samples (2008/09, 2007/08 and 2006/07)	21
Table 2.2:	In-house R&D expenditure by sector (2008/09, 2007/08 and 2006/07)	22
Table 2.3:	Main indicators of business sector (Rand current) (2008/09, 2007/08, 2006/07)	22
Table 2.4:	Headcount of R&D personnel by sector (2008/09 and 2007/08)	23
Table 2.5:	BERD by accounting category (2008/09, 2007/08 and 2006/07)	23
Table 2.6:	BERD by type of research (2008/09, 2007/08 and 2006/07)	24
Table 2.7:	BERD by source of funds (2008/09, 2007/08 and 2006/07)	24
Table 2.8:	BERD by research field (2008/09, 2007/08 and 2006/07)	26
Table 2.9:	BERD by socio-economic objective (2008/09, 2007/08 and 2006/07)	27
Table 2.10:	BERD by Standard Industrial Classification (SIC) codes (2008/09, 2007/08 and 2006/07)	28
Table 2.11:	Business R&D personnel headcount and full-time equivalent (2008/09, 2007/08 and 2006/07)	29
Table 2.12.1:	Business R&D personnel headcount by race, qualification and gender (2008/09)	30
Table 2.12.2:	Business R&D personnel headcount by race, qualification and gender (2007/08)	30
Table 2.13:	Number of R&D collaborative projects (2007/08 and 2006/07)	31
Table 2.14:	Business sector expenditure on multidisciplinary R&D (2008/09 and 2007/08)	31
Table 2.15:	Business sector expenditure on R&D in specific areas of national interest (2008/09 and 2007/08)	32
Table 3.1:	In-house R&D expenditure by sector (2008/09, 2007/08 and 2006/07)	34
Table 3.2:	Main indicators of the government sector (2008/09, 2007/08 and 2006/07)	34
Table 3.3:	Headcounts R&D personnel by sector (2008/09 and 2007/08)	35
Table 3.4:	GOVERD by accounting category (2008/09, 2007/08 and 2006/07)	35
Table 3.5:	GOVERD by type of research (2008/09, 2007/08 and 2006/07)	37
Table 3.6:	GOVERD by sources of funds (2008/09, 2007/08 and 2006/07)	37
Table 3.7:	GOVERD by research field (2008/09, 2007/08 and 2006/07)	39



Table 3.8:	GOVERD by socioeconomic objective (2008/09, 2007/08 and 2006/07)	40
Table 3.9:	Government R&D personnel headcount and full-time equivalent (2008/09, 2007/08 and 2006/07)	41
Table 3.10.1:	Government sector R&D personnel headcounts by race, qualifications and gender (2008/09)	42
Table 3.10.2:	Government sector R&D personnel headcounts by race, qualifications and gender (2007/08)	42
Table 3.11:	GOVERD by multidisciplinary R&D (2008/09 and 2007/08)	43
Table 3.12:	GOVERD by specific areas of national interest (2008/09 and 2007/08)	43
Table 4.1:	Higher Education overview (2008/09)	45
Table 4.2:	In-house R&D expenditure per sector (2008/09, 2007/08 and 2006/07)	46
Table 4.3:	Main indicators of the Higher Education Sector (2008/09, 2007/08 and 2006/07)	46
Table 4.4:	Headcount of R&D personnel by sector (2008/09 and 2007/08)	47
Table 4.5:	HERD by accounting category (2008/09, 2007/08 and 2006/07)	47
Table 4.6:	HERD by type of research (2008/09, 2007/08 and 2006/07)	48
Table 4.7:	HERD by source of funds (2008/09, 2007/08 and 2006/07)	48
Table 4.8:	HERD by research field (2008/09, 2007/08 and 2006/07)	50
Table 4.9:	HERD by socioeconomic objective (2008/09, 2007/08 and 2006/07)	51
Table 4.10:	HE R&D personnel headcount and full-time equivalents (2008/09, 2007/08 and 2006/07)	52
Table 4.11:	HE postgraduate student headcount and FTEs by gender and qualification (2008/09, 2007/08, 2006/07)	53
Table 4.12.1:	HE R&D personnel headcount by gender, population group and qualification (2008/09)	54
Table 4.12.2:	HE R&D personnel headcount by gender, population group and qualification (2007/08)	54
Table 4.13:	HERD By multidisciplinary R&D (2008/09 and 2008/07)	55
Table 4.14:	HERD by specific areas of national interest (2008/09 and 2007/08)	55
Table 5.1:	In-house R&D expenditure by sector (2008/09, 2007/08 and 2006/07)	57
Table 5.2:	Main indicators of the NPO sector (2008/09, 2007/08 and 2006/07)	57
Table 5.3:	Headcount of R&D personnel by sector (2008/09 and 2007/08)	57
Table 5.4:	NPO R&D by accounting category (2008/09, 2007/08 and 2006/07)	58
Table 5.5:	NPO R&D expenditure by type of research (2008/09, 2007/08 and 2006/07)	58
Table 5.6:	NPO R&D expenditure by sources of funds (2008/09, 2007/08 and 2006/07)	59
Table 5.7:	NPO R&D expenditure by research fields (2008/09, 2007/08 and 2006/07)	60
Table 5.8:	NPO R&D expenditure by socio-economic objective (2008/09, 2007/08 and 2006/07)	61
Table 5.9:	NPO R&D personnel headcount and full-time equivalent (2008/09, 2007/08 and 2006/07)	62
Table 5.10.1:	NPO R&D personnel headcount by gender, population group and qualification level (2008/09)	63
Table 5.10.2:	NPO R&D personnel headcount by gender, population group and qualification level (2007/08)	63
Table 5.11:	NPO expenditure by multidisciplinary R&D (2008/09 and 2007/08)	64
Table 5.12:	NPO expenditure by specific areas of national interest of R&D (2008/09 and 2007/08)	64
Table 6.1:	In-house R&D expenditure by sector (2008/09, 2007/08 and 2006/07)	65
Table 6.2:	Main indicators of the science council sector (2008/09, 2007/08 and 2006/07)	66
Table 6.3:	R&D personnel headcount by sector (2008/09 and 2007/08)	66
Table 6.4:	Science council overview 2008/09	67
Table 6.5:	R&D expenditure by accounting category (2008/09, 2007/08 and 2006/07)	67
Table 6.6:	Science council R&D expenditure by type of research (2008/09, 2007/08 and 2006/07)	68
Table 6.7:	Science council R&D expenditure by sources of funds (2008/09, 2007/08 and 2006/07)	68
Table 6.8:	Science Council R&D expenditure by research field (2008/09, 2007/08 and 2006/07)	70
Table 6.9:	Science council expenditure by socio-economic objective (2008/09, 2007/08 and 2006/07)	71
Table 6.10:	Science Council R&D personnel headcount and FTEs (2008/09, 2007/08 and 2006/07)	72
Table 6.11.1:	Science council R&D personnel headcount by gender, population group & qualification level (2008/09)	73
Table 6.11.2:	Science council R&D personnel headcount by gender, population group & qualification level (2007/08)	73
Table 6.12:	Science council expenditure by multidisciplinary R&D (2008/09 and 2007/08)	74
Table 6.13:	Science council expenditure by specific areas of national interest (2008/09 and 2007/08)	74

## Executive Summary

This section provides a brief summary of the key findings from the National Survey of Research and Experimental Development (R&D), for the financial year 2008/09. It also includes data from the 2007/08 and 2006/07 surveys for comparison purposes.

Gross domestic expenditure on R&D (GERD) amounted to R21.0 billion in 2008/09; an increase from R18.6 billion in 2007/08. This represented a nominal annual increase of 12.9% compared to the 12.7% increase between 2006/07 and 2007/08 and the 16.8% increase between 2005/06 and 2006/07. In real terms (at constant 2008 prices) GERD increased by 1.3% from 2007/08 to 2008/09. GERD expressed as a percentage of the gross domestic product (GDP), provides an indication of the concentration or intensity of R&D in an economy – GERD as a percentage of the GDP decreased marginally from 0.93% in 2007/08 to 0.92% in 2008/09.

Table E1 provides a by-sector analysis of national in-house or intramural R&D which totalled R21.0 billion in 2008/09.

The contribution of government to GERD decreased from 6.2% in 2007/08 to 5.4% in 2008/09. The contribution of science councils also decreased from 15.5% to 14.9% during the same period, while the contribution of the business sector increased from 57.7% to 58.6%. The contribution of the higher education and not-for-profit organisations (NPO) sectors stayed relatively stable between the survey reference periods. The business sector expenditure on R&D (BERD) amounted to R12.3 billion in 2008/09. This was followed by expenditure by higher education at R4.2 billion; science councils at R3.1 billion; government at R1.1 billion and NPOs at R240.6 million.

**TABLE E1: TOTAL IN-HOUSE R&D EXPENDITURE BY SECTOR (2008/09 AND 2007/08)\***

SECTOR	2008/09		2007/08	
	R'000	%	R'000	%
Business enterprise	12 332 012	58.6	10 738 456	57.7
Government	1 139 676	5.4	1 154 399	6.2
Higher education	4 191 366	19.9	3 621 862	19.4
NPOs	240 649	1.1	223 202	1.2
Science councils	3 137 343	14.9	2 886 094	15.5
<b>Total GERD</b>	<b>21 041 046</b>	<b>100</b>	<b>18 624 013</b>	<b>100</b>

\*Subject to rounding error

The higher education sector employed the largest portion of R&D personnel (headcounts) in 2008/09 at 53.0% (Table E2). This was followed by the business sector (31.6%), science councils (9.5%), government (5.0%) and NPOs (0.9%). South Africa had a total of 1.4 full-time equivalents (FTEs) researchers per 1 000 total employment in 2008/09 and 1.5 FTEs in 2007/08. Compared to other countries this

key indicator remains at a relatively low level. The indicator needs to be monitored given the importance of the goal of increasing the number of science and engineering graduates in the country. The number of women researchers as a percentage of total researchers in South Africa has decreased marginally from 40.3% in 2007/08 to 39.7% in 2008/09; the same as the 2006/07 figure (39.7%).



**TABLE E2: HEADCOUNT OF R&D PERSONNEL BY SECTOR (2008/09)\***

SECTOR	RESEARCHERS	TECHNICIANS	OTHER PERSONNEL DIRECTLY SUPPORTING R&D	TOTAL	PERCENTAGE
Business	8 560	5 584	4 451	18 595	31.6
Government	1 169	744	1 050	2 963	5.0
Higher education*	27 316	2 054	1 856	31 226	53.0
NPOs	262	77	163	502	0.9
Science councils	2 648	1 302	1 659	5 609	9.5
<b>Total</b>	<b>39 955</b>	<b>9 761</b>	<b>9 179</b>	<b>58 895</b>	<b>100</b>

\*Including doctoral and postdoctoral students

Engineering sciences was the research field with the highest proportion of R&D expenditure. R&D expenditure in this field increased from 22.5% of total R&D expenditure in 2007/08 to 24.4% in 2008/09. Engineering sciences was followed by medical sciences which accounted for 14.9% of expenditure and computer and communication technologies which accounted for 13.1%. Social sciences and the humanities collectively captured 12.5% of expenditure at the level recorded for 2007/08 (12.4%).

Detailed findings are outlined in the chapters as follows:

- Chapter 1: Introduction to the Survey
- Chapter 2: Business Sector
- Chapter 3: Government Sector
- Chapter 4: Higher Education Sector
- Chapter 5: Not-for-profit Sector
- Chapter 6: Science Council Sector

## Chapter 1

# Introduction to the Survey

### 1.1 Background to the Survey

The National Survey of Research and Experimental Development (R&D) is conducted annually by the Centre for Science, Technology and Innovation Indicators (CeSTII) and the results are submitted to the Department of Science and Technology (DST) and Statistics South Africa (Stats SA) for approval. The results of this survey have been endorsed by the Statistician General (SG) as official statistics.

The survey measures inputs into R&D. The indicators and data tables provided in this report comprise i) the main subset of the science and technology (S&T) indicators and ii) data tables specified for R&D Surveys by the Organisation for Economic Co-operation and Development (OECD). The main results of the survey are annually submitted to the OECD for inclusion in publications such as the OECD Main S&T Indicators (MSTI) and the accompanying OECD Science, Technology and Industry Scoreboard. The Directorate for Science, Technology and Industry of the OECD provides ongoing advice on the R&D Survey and related work at CeSTII. Through this process, the South African R&D Survey results have become compliant with international best practice, as recommended by the OECD, and are comparable to the R&D Survey results of other OECD countries.

### 1.2 Methodology

The survey methodology follows the Frascati Manual guidelines. The manual defines R&D as follows:

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

Following the Frascati Manual, the survey covered the following sectors:

- The **business enterprise sector**, comprising large, medium and small enterprises, including state-owned enterprises. Note that in accordance with OECD methodology, state-owned enterprises (SOEs) were also included.
- The **government sector**, comprising departments in the three tiers of national, provincial and local government with an R&D component, government research institutions and museums.
- The **higher education sector**, comprising all public higher education institutions and one private higher education institution with an R&D component.
- The **not-for-profit sector**, comprising non-governmental and other organisations formally registered as not-for-profit organisations.
- The **science council sector**, comprising the nine science councils established through Acts of Parliament.

The survey data was collected using a questionnaire that was largely common across the five sectors. The work of the survey relied on appropriate sector sampling methodologies, sector-specific questionnaires and the database in which the data was captured, namely the Survey Management and Results System (SMRS).

The sectors were surveyed during the period October 2009 to March 2010. The survey covered expenditure in the year beginning 1 April 2008 and ending 31 March 2009 for science councils and all government departments. The business enterprise and NPO sectors collected data for the financial year ending 28 February 2009 (or the closest complete financial year). For higher education, this was the academic (calendar) year 2008. The bulk of R&D activities recorded for all sectors thus occurred during 2008 or in the 2008/09 fiscal year.

Questionnaires were administered and returned either by post, in face-to-face interviews, electronically or telephonically. Telephone calls were used for follow-ups and verification of information recorded in the questionnaires when required. Where necessary, organisations were also assisted in completing and returning their questionnaires.

As in previous R&D Surveys, the lists of research fields (RF) and socio-economic objectives (SEO) were compatible with the systems used by OECD countries. The standard industrial classification (SIC) codes that were used are those provided by Stats SA.



The sampling methods of the various sectors are briefly outlined below:

- For the **business sector** a purposive sample was drawn from the business register, developed and maintained by CeSTII since 2002. A variety of sources was used to update and build the business register on a regular basis. All known and likely R&D performers were included in the sample.
- **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 accordingly included in the government sector sample.
- **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 sample. All public higher education institutions were sampled through a census survey, while one private institution was surveyed purposively.
- Non-governmental and other organisations formally registered as **not-for-profit organisations** were surveyed through purposive sampling.
- The nine statutory **science councils**, as established through Acts of Parliament, were surveyed following the census approach – all science councils were thus surveyed.

The R&D survey is currently undergoing a SASQAF review process which requires compliance with the

following criteria for data quality on official statistics:

1. Statistics collected must go beyond the needs of the producer and be of value to other users.
2. The data series must be sustainable.
3. The producing agency must be a member of the National Statistics System (NSS).

Thereafter a Data Quality Assessment Team (DQAT) will assess the relevant documentation (including metadata) submitted to them for review. The DQAT will review the statistics against quality criteria contained in SASQAF namely, prerequisites of quality, relevance, accuracy, timeliness, accessibility, interpretability, coherence, methodological soundness, and integrity. Once assessed the DQAT compiles a report to inform the SG on the quality of the statistics. The SG then produces a quality statement pronouncing on whether the statistics are classified as official.

### 1.3 Key Indicators

The data tables and indicators provided in this section comprise the main subset of S&T indicators used for R&D Surveys by the OECD. Standard economic and key R&D indicators are provided in Tables 1.1 and 1.2, which are followed by summary tables that combine the data for all the five sectors surveyed. Individual sector reports follow in subsequent chapters.

South Africa's gross domestic product (GDP) increased by R285 billion from 2007/08 to 2008/09 in nominal terms (Table 1.1). Slight increases were recorded in total employment and industrial employment.

# Introduction to the Survey continued

**TABLE 1.1: ECONOMIC INDICATORS FOR 2008/09 AND 2007/08**

INDICATOR	VALUE 2008/09	VALUE 2007/08
GDP: Current prices (Rand million)*	2 283 822	1 999 086
Purchasing power parity (Rands per US\$)	4.64	4.27
Value added in industry (Rand million)	2 053 487	1 774 972
Implicit GDP price index (base year 2000 = 1.00)	1.796	1.620
National population (thousands)	49 668	49 173
Total employment (thousands)	13 713	13 234
Industrial employment (thousands)	10 409	10 024

\*For 2008/09 Stats SA P0441. Gross Domestic Product (GDP), 2nd Quarter 2010.

\*For 2007/08 Stats SA P0441. Gross Domestic Product (GDP), 2nd Quarter 2009.

Source for all other economic indicators: OECD Main Science and Technology Indicators (2009/2).

Table 1.2 sets out the latest key R&D figures and indicators for South Africa and indicates that gross domestic expenditure on R&D (GERD) amounted to R21 041 million in 2008/09. This was an increase of

R2 417 million from the previous survey round. GERD as a percentage of GDP was 0.92% in 2008/09, slightly down from the 0.93% recorded in 2007/08.

**TABLE 1.2: KEY R&D INDICATORS (2008/09 AND 2007/08)**

INDICATOR	VALUE 2008/09	VALUE 2007/08
Gross domestic expenditure on R&D (GERD) (Rand million)	21 041.0	18 624.0
GERD as a percentage of GDP	0.92	0.93
Total R&D personnel (FTEs) <sup>a</sup>	30 802	31 352
Total researchers (FTEs) <sup>b</sup>	19 384	19 320
Total researchers per 1000 total employment (FTEs)	1.4	1.5
Total R&D personnel per 1000 total employment (FTEs)	2.2	2.4
Civil GERD as a percentage of GDP	0.87	0.87
Total researchers (headcount)	39 955	40 084
Women researchers as a percentage of total researchers	39.7	40.3

<sup>a</sup> FTEs = Full-time equivalents.

<sup>b</sup> Following OECD practice, doctoral students and post-doctoral fellows are included as researchers.



Tables 1.3 and 1.4 show R&D expenditure by sector and types of research. The following tables (1.5 to 1.9) give detailed results for expenditure across a range of

areas for each sector. Tables 1.10 to 1.14 provide a breakdown of R&D personnel.

**TABLE 1.3: R&D EXPENDITURE BY SECTOR 2008/09 (CURRENT PRICES, R'000)**

EXPENDITURE	BUSINESS ENTERPRISE	GOVERNMENT	HIGHER EDUCATION	NOT-FOR-PROFIT	SCIENCE COUNCILS	GERD
Current (R' 000)	12 332 012	1 139 676	4 191 366	240 649	3 137 343	21 041 046
Percentage	58.6	5.4	19.9	1.1	14.9	100

**TABLE 1.4: GERD BY TYPE OF RESEARCH (2008/09, 2007/08 AND 2006/07)**

TYPE OF RESEARCH	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
Basic research	4 243 156	20.2	3 830 806	20.6	3 075 263	18.6
Applied research	7 013 082	33.3	6 373 681	34.2	5 794 785	35.1
Experimental development	9 784 808	46.5	8 419 526	45.2	7 650 680	46.3
<b>Total</b>	<b>21 041 046</b>	<b>100</b>	<b>18 624 013</b>	<b>100</b>	<b>16 520 729</b>	<b>100</b>

**TABLE 1.5: R&D EXPENDITURE BY ACCOUNTING CATEGORY (2008/09)**

TYPE OF EXPENDITURE	BUSINESS ENTERPRISE		GOVERNMENT		HIGHER EDUCATION		NOT-FOR-PROFIT		SCIENCE COUNCILS		TOTAL	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
<b>Capital expenditure on R&amp;D</b>	<b>2 658 738</b>	<b>21.6</b>	<b>86 936</b>	<b>7.6</b>	<b>281 193</b>	<b>6.7</b>	<b>7 249</b>	<b>3.0</b>	<b>383 927</b>	<b>12.2</b>	<b>3 418 043</b>	<b>16.2</b>
Land: buildings and other structures	207 473	1.7	15 908	1.4	38 564	0.9	3 137	1.3	61 063	1.9	326 145	1.6
Vehicles, plant, machinery, equipment	2 451 265	19.9	71 028	6.2	242 629	5.8	4 112	1.7	322 864	10.3	3 091 898	14.7
<b>Current expenditure</b>	<b>9 673 274</b>	<b>78.4</b>	<b>1 052 740</b>	<b>92.4</b>	<b>3 910 173</b>	<b>93.3</b>	<b>233 400</b>	<b>97.0</b>	<b>2 753 416</b>	<b>87.8</b>	<b>17 623 003</b>	<b>83.8</b>
Labour costs	5 279 507	42.8	479 810	42.1	1 504 542	35.9	114 292	47.5	1 283 210	40.9	8 661 361	41.2
Total cost of R&D postgraduate students	0	0.0	0	0.0	532 883	12.7	0	0.0	0	0.0	532 883	2.5
Other current expenditure	4 393 767	35.6	572 930	50.3	1 872 748	44.7	119 108	49.5	1 470 206	46.9	8 428 759	40.1
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>1 139 676</b>	<b>100</b>	<b>4 191 366</b>	<b>100</b>	<b>240 649</b>	<b>100</b>	<b>3 137 343</b>	<b>100</b>	<b>21 041 046</b>	<b>100</b>



# Introduction to the Survey continued

**TABLE 1.6: R&D EXPENDITURE BY SOURCE OF FUNDS (2008/09)\***

SOURCE OF FUNDS	BUSINESS ENTERPRISE		GOVERNMENT		HIGHER EDUCATION		NOT-FOR-PROFIT		SCIENCE COUNCILS		TOTAL	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
<b>Own funds</b>	8 130 033	65.9	742 954	65.2	1 983 683	47.3	9 650	4.0	381 137	12.1	11 247 457	53.5
Internal resources	8 130 033	65.9	742 954	65.2	1 983 683	47.3	9 650	4.0	381 137	12.1	11 247 457	53.5
<b>Government</b>	2 567 140	20.8	325 573	28.6	1 242 991	29.7	32 711	13.6	2 221 321	70.8	6 389 736	30.4
Grants	1 979 423	16.1	323 932	28.4	N/A	N/A	21 724	9.0	1 316 975	42.0	3 642 054	17.3
Contracts	587 717	4.8	1 641	0.1	N/A	N/A	10 987	4.6	904 346	28.8	1 504 691	7.2
All government, research agencies, agency funding and science councils	N/A	N/A	N/A	N/A	1 242 991	29.7	N/A	N/A	N/A	N/A	1 242 991	5.9
<b>Business</b>	209 346	1.7	15 980	1.4	454 184	10.8	26 591	11.0	137 356	4.4	843 457	4.0
Local business	209 346	1.7	15 980	1.4	454 184	10.8	26 591	11.0	137 356	4.4	843 457	4.0
<b>Other South African sources</b>	29 460	0.2	1 821	0.2	100 470	2.4	28 297	11.8	5 521	0.2	165 569	0.8
Higher education	2 120	0.0	86	0.0	16 704	0.4	3 442	1.4	677	0.0	23 029	0.1
Not for profit organisations	19 160	0.2	278	0.0	36 593	0.9	19 473	8.1	2 463	0.1	77 967	0.4
Individual donations	8 180	0.1	1 457	0.1	47 173	1.1	5 382	2.2	2 381	0.1	64 573	0.3
<b>Foreign</b>	1 396 033	11.3	53 348	4.7	410 038	9.8	143 400	59.6	392 008	12.5	2 394 827	11.4
Parent company	566 111	4.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	566 111	2.7
Foundations	7 015	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7 015	0.0
All sources	822 907	6.7	53 348	4.7	410 038	9.8	143 400	59.6	392 008	12.5	1 821 701	8.7
<b>Total</b>	12 332 012	100	1 139 676	100	4 191 366	100	240 649	100	3 137 343	100	21 041 046	100

\* N/A entered where specific source of funds was not asked of the relevant sector

**TABLE 1.7: PROVINCIAL SPLIT OF R&D (2008/09)\***

PROVINCE	BUSINESS ENTERPRISE		GOVERNMENT		HIGHER EDUCATION		NOT-FOR-PROFIT		SCIENCE COUNCILS		TOTAL	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
Eastern Cape	316 089	2.6	107 929	9.5	286 605	6.8	6 790	2.8	171 669	5.5	889 081	4.2
Free State	1 213 808	9.8	58 697	5.2	226 892	5.4	4 763	2.0	58 561	1.9	1 562 720	7.4
Gauteng	7 131 411	57.8	264 273	23.2	1 467 914	35.0	126 136	52.4	1 991 853	63.5	10 981 587	52.2
KwaZulu-Natal	1 255 509	10.2	115 302	10.1	567 999	13.6	40 492	16.8	231 033	7.4	2 210 336	10.5
Limpopo	75 675	0.6	55 252	4.8	86 635	2.1	5 138	2.1	63 455	2.0	286 157	1.4
Mpumalanga	201 550	1.6	39 103	3.4	72 590	1.7	10 332	4.3	55 547	1.8	379 123	1.8
North-West	7 319	0.1	52 907	4.6	68 443	1.6	2 159	0.9	43 624	1.4	174 453	0.8
Northern Cape	222 630	1.8	70 741	6.2	150 125	3.6	2 339	1.0	41 541	1.3	487 376	2.3
Western Cape	1 908 020	15.5	375 473	32.9	1 264 162	30.2	42 500	17.7	480 059	15.3	4 070 214	19.3
<b>Total</b>	12 332 012	100	1 139 676	100	4 191 366	100	240 649	100	3 137 343	100	21 041 046	100

\*Subject to rounding error



**TABLE 1.8: R&D EXPENDITURE BY RESEARCH FIELD (2008/09)**

MAIN RESEARCH FIELD	BUSINESS ENTERPRISE		GOVERNMENT		HIGHER EDUCATION		NOT-FOR-PROFIT		SCIENCE COUNCILS		TOTAL	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
<b>Division 1: Natural sciences, technology &amp; engineering</b>	<b>11 902 551</b>	<b>96.5</b>	<b>824 394</b>	<b>75.7</b>	<b>2 703 975</b>	<b>65.9</b>	<b>72 019</b>	<b>27.6</b>	<b>2 916 350</b>	<b>90.9</b>	<b>18 419 290</b>	<b>87.5</b>
Mathematical sciences	183 255	1.5	20 704	1.8	151 880	3.6	1 041	0.4	40 632	1.3	397 512	1.9
Physical sciences	655 898	5.3	45 804	4.0	135 002	3.2	0	0.0	115 737	3.7	952 441	4.5
Chemical sciences	859 041	7.0	17 009	1.5	136 528	3.3	0	0.0	44 271	1.4	1 056 848	5.0
Earth sciences	95 034	0.8	163 156	14.3	136 955	3.3	1 012	0.4	167 463	5.3	563 619	2.7
Information, computer and communication	2 412 430	19.6	22 191	1.9	125 413	3.0	1 555	0.6	201 731	6.4	2 763 320	13.1
Applied sciences and technologies	1 671 375	13.6	15 852	1.4	78 904	1.9	0	0.0	139 267	4.4	1 905 397	9.1
Engineering sciences	3 908 347	31.7	11 487	1.0	352 114	8.4	0	0.0	863 084	27.5	5 135 032	24.4
Biological sciences	162 776	1.3	125 152	11.0	282 280	6.7	2 126	0.9	171 810	5.5	744 144	3.5
Agricultural sciences	293 357	2.4	200 598	17.6	192 265	4.6	19 426	8.1	442 060	14.1	1 147 706	5.5
Medical and health sciences	1 509 109	12.2	180 260	15.8	966 365	23.1	36 032	15.0	447 479	14.3	3 139 245	14.9
Environmental sciences	57 764	0.5	11 675	1.0	68 869	1.6	8 396	3.5	101 920	3.2	248 624	1.2
Material sciences	82 192	0.7	640	0.1	68 467	1.6	0	0.0	155 529	5.0	306 828	1.5
Marine sciences	11 975	0.1	9 866	0.9	8 933	0.2	2 431	1.0	25 368	0.8	58 574	0.3
<b>Division 2: Social sciences and humanities</b>	<b>429 461</b>	<b>3.5</b>	<b>315 282</b>	<b>24.3</b>	<b>1 487 391</b>	<b>34.0</b>	<b>168 631</b>	<b>72.4</b>	<b>220 993</b>	<b>9.1</b>	<b>2 621 757</b>	<b>12.5</b>
Social sciences	428 969	3.5	268 058	23.5	967 204	23.1	165 924	68.9	194 646	6.2	2 024 801	9.6
Humanities	491	0.0	47 225	4.1	520 187	12.4	2 707	1.1	26 347	0.8	596 956	2.8
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>1 139 676</b>	<b>100</b>	<b>4 191 366</b>	<b>100</b>	<b>240 650</b>	<b>100</b>	<b>3 137 343</b>	<b>100</b>	<b>21 041 047</b>	<b>100</b>

**TABLE 1.9: R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2008/09)**

SOCIO-ECONOMIC OBJECTIVE	BUSINESS ENTERPRISE		GOVERNMENT		HIGHER EDUCATION		NOT-FOR-PROFIT		SCIENCE COUNCILS		TOTAL	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
<b>Division 1: Defence</b>	<b>908 781</b>	<b>7.4</b>	<b>0</b>	<b>0.0</b>	<b>5 150</b>	<b>0.1</b>	<b>2 050</b>	<b>0.9</b>	<b>280 219</b>	<b>8.9</b>	<b>1 196 200</b>	<b>5.7</b>
Defence	908 781	7.4	0	0.0	5 150	0.1	2 050	0.9	280 219	8.9	1 196 200	5.7
<b>Division 2: Economic development</b>	<b>9 737 338</b>	<b>79.0</b>	<b>373 251</b>	<b>32.8</b>	<b>1 539 535</b>	<b>36.7</b>	<b>69 809</b>	<b>29.0</b>	<b>1 592 110</b>	<b>50.7</b>	<b>13 312 043</b>	<b>63.3</b>
Economic development unclassified	0	0.0	0	0.0	209 400	5.0	0	0.0	0	0.0	209 400	1.0
Plant production and plant primary products	266 259	2.2	66 503	5.8	153 054	3.7	17 520	7.3	349 907	11.2	853 243	4.1
Animal production and animal primary products	74 302	0.6	78 619	6.9	117 255	2.8	972	0.4	18 760	0.6	289 908	1.4
Mineral resources (excluding energy)	839 558	6.8	0	0.0	88 576	2.1	0	0.0	67 418	2.1	995 552	4.7
Energy resources	732 188	5.9	0	0.0	71 648	1.7	1 760	0.7	379 859	12.1	1 185 455	5.6

Introduction to the Survey *continued***TABLE 1.9: R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2008/09)** *continued*

SOCIO-ECONOMIC OBJECTIVE	BUSINESS ENTERPRISE		GOVERNMENT		HIGHER EDUCATION		NOT-FOR-PROFIT		SCIENCE COUNCILS		TOTAL	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
Energy supply	393 798	3.2	12 387	1.1	106 457	2.5	2 575	1.1	0	0.0	515 217	2.4
Manufacturing	2 562 745	20.8	320	0.0	210 009	5.0	0	0.0	225 227	7.2	2 998 301	14.2
Construction	1 295 717	10.5	2 484	0.2	46 175	1.1	0	0.0	116 781	3.7	1 461 157	6.9
Transport	621 479	5.0	12 073	1.1	29 517	0.7	74	0.0	41 260	1.3	704 403	3.3
Information and communication services	1 151 637	9.3	11 965	1.0	87 013	2.1	0	0.0	24 146	0.8	1 274 761	6.1
Commercial services	1 422 123	11.5	2 405	0.2	54 604	1.3	827	0.3	19 536	0.6	1 499 495	7.1
Economic framework	160 562	1.3	105 080	9.2	193 599	4.6	39 059	16.2	106 105	3.4	604 405	2.9
Natural resources	216 971	1.8	81 415	7.1	172 228	4.1	7 022	2.9	243 111	7.7	720 747	3.4
<b>Division 3: Society</b>	<b>1 019 848</b>	<b>8.3</b>	<b>285 961</b>	<b>25.1</b>	<b>1 359 797</b>	<b>32.4</b>	<b>141 189</b>	<b>58.7</b>	<b>418 385</b>	<b>13.3</b>	<b>3 225 180</b>	<b>15.3</b>
Society unclassified	0	0.0	0	0.0	209 400	5.0	0	0.0	0	0.0	209 400	1.0
Health	930 645	7.5	74 784	6.6	644 763	15.4	37 461	15.6	326 340	10.4	2 013 993	9.6
Education and training	27 232	0.2	127 907	11.2	227 502	5.4	32 308	13.4	50 525	1.6	465 474	2.2
Social development and community services	61 971	0.5	83 270	7.3	278 132	6.6	71 420	29.7	41 520	1.3	536 313	2.5
<b>Division 4: Environment</b>	<b>221 747</b>	<b>1.8</b>	<b>99 985</b>	<b>8.8</b>	<b>339 148</b>	<b>8.1</b>	<b>6 937</b>	<b>2.9</b>	<b>338 290</b>	<b>10.8</b>	<b>1 006 107</b>	<b>4.8</b>
Environment unclassified	0	0.0	0	0.0	69 800	1.7	0	0.0	0	0.0	69 800	0.3
Environmental knowledge	91 953	0.7	83 429	7.3	135 472	3.2	3 406	1.4	173 945	5.5	488 205	2.3
Environmental aspects of development	31 493	0.3	12 424	1.1	72 050	1.7	593	0.2	59 943	1.9	176 503	0.8
Environmental and other aspects	98 301	0.8	4 132	0.4	61 826	1.5	2 938	1.2	104 402	3.3	271 599	1.3
<b>Division 5: Advancement of knowledge</b>	<b>444 298</b>	<b>3.6</b>	<b>380 480</b>	<b>33.4</b>	<b>947 737</b>	<b>22.6</b>	<b>20 663</b>	<b>8.6</b>	<b>508 339</b>	<b>16.2</b>	<b>2 301 517</b>	<b>10.9</b>
Advancement of knowledge unclassified	0	0.0	0	0.0	209 400	5.0	0	0.0	0	0.0	209 400	1.0
Natural sciences, technologies and engineering	439 330	3.6	333 561	29.3	423 469	10.1	486	0.2	407 189	13.0	1 604 035	7.6
Social sciences and humanities	4 968	0.0	46 919	4.1	314 868	7.5	20 177	8.4	101 150	3.2	488 082	2.3
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>1 139 677</b>	<b>100</b>	<b>4 191 367</b>	<b>100</b>	<b>240 648</b>	<b>100</b>	<b>3 137 343</b>	<b>100</b>	<b>21 041 047</b>	<b>100</b>

**TABLE 1.10: R&D PERSONNEL HEADCOUNT BY SECTOR (2008/09)\***

OCCUPATION	BUSINESS ENTERPRISE	GOVERNMENT	HIGHER EDUCATION*	NOT-FOR-PROFIT	SCIENCE COUNCILS	TOTAL	%
Researchers	8 560	1 169	27 316	262	2 648	39 955	67.8
Technicians	5 584	744	2 054	77	1 302	9 761	16.6
Other personnel directly supporting R&D	4 451	1 050	1 856	163	1 659	9 179	15.6
<b>Total</b>	<b>18 595</b>	<b>2 963</b>	<b>31 226</b>	<b>502</b>	<b>5 609</b>	<b>58 895</b>	<b>100</b>
<b>Percentage</b>	<b>31.6</b>	<b>5.0</b>	<b>53.0</b>	<b>0.9</b>	<b>9.5</b>	<b>100</b>	

\*Including doctoral and post-doctoral students



**TABLE 1.11: R&D PERSONNEL FULL-TIME EQUIVALENTS (FTEs) BY SECTOR (2008/09)\***

OCCUPATION	BUSINESS ENTERPRISE	GOVERNMENT	HIGHER EDUCATION	NOT-FOR-PROFIT	SCIENCE COUNCILS	TOTAL	%
Researchers	6 172.0	805.0	9,953.1	207.6	2 246.7	19 384.3	62.9
Technicians	3 809.9	495.2	541.7	56.5	1 119.1	6 022.4	19.6
Other personnel directly supporting R&D	2 510.6	773.7	674.2	102.3	1 334.0	5 394.8	17.5
<b>Total</b>	<b>12 492</b>	<b>2 074</b>	<b>11 169</b>	<b>366</b>	<b>4 700</b>	<b>30 802</b>	<b>100</b>
<b>Percentage</b>	<b>40.6</b>	<b>6.7</b>	<b>36.3</b>	<b>1.2</b>	<b>15.3</b>	<b>100</b>	

\*Including doctoral and post-doctoral students

**TABLE 1.12: EXPENDITURE ON MULTIDISCIPLINARY AREAS OF R&D (2008/09)**

MULTIDISCIPLINARY AREA OF R&D	BUSINESS ENTERPRISE		GOVERNMENT		HIGHER EDUCATION		NOT-FOR-PROFIT		SCIENCE COUNCILS		TOTAL	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
Biotechnology	268 923	2.2	21 729	1.9	303 483	7.2	255	0.1	207 250	6.6	801 640	3.8
Nanotechnology	56 881	0.5	4 652	0.4	153 013	3.7	0	0.0	173 834	5.5	388 380	1.8
<b>Total</b>	<b>325 804</b>	<b>2.6</b>	<b>26 381</b>	<b>2.3</b>	<b>456 496</b>	<b>10.9</b>	<b>255</b>	<b>0.1</b>	<b>381 084</b>	<b>12.1</b>	<b>1 190 020</b>	<b>5.7</b>
<b>Total R&amp;D expenditure</b>	<b>12 332 012</b>	<b>100</b>	<b>1 139 676</b>	<b>100</b>	<b>4 191 366</b>	<b>100</b>	<b>240 649</b>	<b>100</b>	<b>3 137 343</b>	<b>100</b>	<b>21 041 046</b>	<b>100</b>

**TABLE 1.13: EXPENDITURE ON R&D IN SPECIFIC AREAS OF INTEREST (2008/09)\***

AREA OF INTEREST	BUSINESS ENTERPRISE		GOVERNMENT		HIGHER EDUCATION		NOT-FOR-PROFIT		SCIENCE COUNCILS		TOTAL	
	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%	R'000	%
Open source software	96 266	0.8	4 658	0.4	49 532	1.2	0	0.0	67 833	2.2	218 289	1.0
New materials	154 140	1.2	726	0.1	202 242	4.8	0	0.0	157 134	5.0	514 242	2.4
Tuberculosis (TB), HIV/AIDS, malaria	466 161	3.8	2	0.0	650 502	15.5	8 763	3.6	490 982	15.6	1 616 410	7.7
<b>Total</b>	<b>716 567</b>	<b>5.8</b>	<b>5 386</b>	<b>0.5</b>	<b>902 276</b>	<b>21.5</b>	<b>8 763</b>	<b>3.6</b>	<b>715 949</b>	<b>22.8</b>	<b>2 348 941</b>	<b>11.2</b>
<b>Total R&amp;D expenditure</b>	<b>12 332 012</b>	<b>100</b>	<b>1 139 676</b>	<b>100</b>	<b>4 191 366</b>	<b>100</b>	<b>240 649</b>	<b>100</b>	<b>3 137 343</b>	<b>100</b>	<b>21 041 046</b>	<b>100</b>

\*Subject to rounding error

# Introduction to the Survey continued

**TABLE 1.14: R&D PERSONNEL HEADCOUNT BY SECTOR, PERSONNEL CATEGORY, RACE AND GENDER (2008/09)\***

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	851	361	215	143	337	179	4 054	2 004	5 457	2 686	8 143
Masters, honours, bachelor or equivalent	2 341	1 590	432	361	775	647	5 611	3 729	9 158	6 327	15 485
Diplomas	826	626	195	160	353	297	1 705	1 161	3 079	2 245	5 324
<b>Subtotal</b>	<b>4 017</b>	<b>2 578</b>	<b>842</b>	<b>663</b>	<b>1 465</b>	<b>1 123</b>	<b>11 370</b>	<b>6 895</b>	<b>17 694</b>	<b>11 258</b>	<b>28 952</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	20	16	5	6	13	11	114	66	152	98	250
Masters, honours, bachelor or equivalent	543	509	71	59	126	125	910	631	1 649	1 325	2 974
Diplomas	1 482	856	433	230	331	207	2 129	869	4 375	2 161	6 536
<b>Subtotal</b>	<b>2 045</b>	<b>1 381</b>	<b>509</b>	<b>295</b>	<b>470</b>	<b>343</b>	<b>3 153</b>	<b>1 566</b>	<b>6 177</b>	<b>3 584</b>	<b>9 761</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	44	23	10	4	105	3	110	76	269	106	376
Masters, honours, bachelor or equivalent	325	337	43	59	84	79	424	473	877	948	1 825
Diplomas	2 031	1 097	539	573	155	179	886	1 519	3 611	3 368	6 979
<b>Subtotal</b>	<b>2 399</b>	<b>1 457</b>	<b>593</b>	<b>636</b>	<b>345</b>	<b>261</b>	<b>1 421</b>	<b>2 068</b>	<b>4 757</b>	<b>4 422</b>	<b>9 179</b>
<b>Total</b>	<b>8 461</b>	<b>5 416</b>	<b>1 944</b>	<b>1 593</b>	<b>2 279</b>	<b>1 727</b>	<b>15 944</b>	<b>10 529</b>	<b>28 628</b>	<b>19 264</b>	<b>47 892</b>

\* Excluding doctoral and post-doctoral students



## Chapter 2

# Business Sector

### 2.1 Introduction

Information and management systems for the R&D Surveys are continually updated and improved on the basis of ongoing research and survey processes. The business sector has surveyed an increasing number of firms over the last few survey rounds as more companies become known as R&D performers. This results in wider coverage and a more complete picture of R&D in the sector. It should, however, be mentioned that a small number of large R&D performing firms are still responsible for the majority of R&D expenditure as was found in previous surveys. It is suggested that successful and accurate surveys of these firms would provide a good indication of total R&D spending in the business sector. The primary goal of the business sector survey is to obtain accurate data from these large companies as the basis for robust indicators for the sector.

### 2.2 Survey Methods

The business register that has been developed and maintained by CeSTII since 2002 was used to draw a purposive sample for the survey. The purposive sample aims to cover all known or likely R&D performers. The business register is continually maintained, updated and amended and new contacts potentially involved in R&D are added systematically. The techniques applied in

maintaining the register and frame of R&D performers include obtaining new contacts through systematic intelligence-gathering by considering business rankings such as the Technology Top 100 and the JSE 100, as well as other available information (namely THRIP, SPII, Innovation Fund lists, media, trade publications, referrals, etc).

Enterprises are systematically interrogated with varying degrees of emphasis according to their R&D expenditure and known historic data. The research effort focused on surveying the largest R&D performers which account for the majority of expenditure, as well as smaller companies with R&D activity, in order to determine total business expenditure on R&D. A purposive sample was drawn from the register including all known and likely R&D performers surveyed in the previous survey round, as well as any new contacts obtained through the process described above. In accordance with OECD methodology, state-owned enterprises (SOEs) were also included in the business sector sample. After all expired or non-traceable companies and companies which were purposively not surveyed had been removed from the sample, the business sector sample amounted to 1 813 companies with 762 companies performing R&D as indicated in Table 2.1.

**TABLE 2.1: BUSINESS SECTOR FIELDWORK SAMPLES (2008/09, 2007/08 AND 2006/07)**

NUMBER OF FIRMS	2008/09		2007/08		2006/07	
Sample	1 813	100%	1 767	100%	1 699	100%
Response	1 082	59.7%	1 116	63.2%	1 055	61.1%
No R&D	320	17.7%	393	22.2%	360	21.2%
R&D performed	762	42.0%	723	40.9%	677	39.8%
No Response	731	40.3%	651	36.8%	622	39.0%

## Business Sector continued

### 2.3 Detailed Results

#### 2.3.1 Key Results

The business sector is the largest contributor to GERD. Business sector expenditure on research and development (BERD) comprised 58.6% of GERD in 2008/9, an increase from 57.7% in 2007/08. BERD increased from R9.2 billion in 2006/07 to R12.3 billion in 2008/09 (Table 2.2).

**TABLE 2.2: IN-HOUSE R&D EXPENDITURE BY SECTOR (2008/09, 2007/08 AND 2006/07)**

SECTOR	2008/09		2007/08		2006/07	
	R'000S	%	R'000S	%	R'000S	%
Business enterprise	12 332 012	58.6	10 738 456	57.7	9 243 165	55.9
Government	1 139 676	5.4	1 154 399	6.2	1 021 355	6.2
Higher education	4 191 366	19.9	3 621 862	19.4	3 298 808	20.0
Not-for-profit	240 649	1.1	223 202	1.2	212 538	1.3
Science councils	3 137 343	14.9	2 886 094	15.5	2 744 718	16.6
<b>Grand Total</b>	<b>21 041 046</b>	<b>100</b>	<b>18 624 013</b>	<b>100</b>	<b>16 520 584</b>	<b>100</b>

BERD has increased by R1.6 billion from 2007/08 (Tables 2.2 and 2.3). BERD as a percentage of GDP remained stable at 0.54% for the last two survey rounds. BERD financed by industry increased slightly from 66.4% in 2007/08 to 67.6% in 2008/09, while financial support for BERD activities by government has decreased from 21.7% in 2007/08 to 20.8% in

2008/09. The percentage of BERD financed from other national sources decreased from 0.9% to 0.2% during the same period. BERD financed from abroad remained in the region of 11%. The total business sector FTE R&D personnel and FTE researchers increased by 31 and 125 respectively from the previous year.

**TABLE 2.3: MAIN INDICATORS OF BUSINESS SECTOR (RAND CURRENT) (2008/09, 2007/08, 2006/07)**

MAIN INDICATORS	2008/09	2007/08	2006/07
BERD (Rand million)	12 332	10 738	9 243
BERD as % of GDP	0.54%	0.54%	0.53%
% of BERD financed by industry	67.6%	66.4%	69.4%
% of BERD financed by government	20.8%	21.7%	19.1%
% of BERD financed by other national sources	0.2%	0.9%	0.9%
% of BERD financed from abroad	11.3%	11.0%	10.6%
Total business sector R&D personnel (FTEs)	12 492	12 461	12 595
Total business sector researchers (FTEs)	6 172	6 047	6 111

Table 2.4 indicates that the total number of R&D personnel headcounts declined slightly from 59 344 in the previous year to 58 895 in the current year. The business sector employed 38.8% of R&D personnel in 2008/09 (excluding doctoral and post-doctoral

students); an increase from 36.9% in 2007/08. The business sector employs the second largest number of R&D personnel, after the higher education sector, according to the data presented in Table 2.4.



**TABLE 2.4: HEADCOUNT OF R&D PERSONNEL BY SECTOR (2008/09 AND 2007/08)**

SECTORS	RESEARCHERS		TECHNICIANS DIRECTLY SUPPORTING R&D		OTHER PERSONNEL DIRECTLY SUPPORTING R&D		GRAND TOTAL		PERCENTAGE	
	08/09	07/08	08/09	07/08	08/09	07/08	08/09	07/08	08/09	07/08
Business enterprise	8 560	8 336	5 584	5 303	4 451	4 312	18 595	17 951	38.8	36.9
Government	1 169	1 138	744	739	1 050	917	2 963	2 794	6.2	5.7
Higher education	16 313	17 008	2 054	2 006	1 856	2 351	20 223	21 365	42.2	44.0
Not-for-profit	262	264	77	77	163	161	502	502	1.0	1.0
Science councils	2 648	2 594	1 302	1 351	1 659	2 043	5 609	5 988	11.7	12.3
<b>Grand total</b>	<b>28 952</b>	<b>29 340</b>	<b>9 761</b>	<b>9 476</b>	<b>9 179</b>	<b>9 784</b>	<b>47 892</b>	<b>48 600</b>	<b>100</b>	<b>100</b>
Higher education doctoral and postdoctoral students	11 003	10 744	-	-	-	-	11 003	10 744	-	-
<b>Total</b>	<b>39 955</b>	<b>40 084</b>	<b>9 761</b>	<b>9 476</b>	<b>9 179</b>	<b>9 784</b>	<b>58 895</b>	<b>59 344</b>	<b>100</b>	<b>100</b>

### 2.3.2 Financial Data

Capital, as well as current R&D expenditure increased from 2007/08 by R1 213 million and R380 million respectively (Table 2.5). The proportion of R&D expenditure devoted to capital expenditure increased from 13.5% to 21.6%, while the proportion devoted to current expenditure, which includes labour costs, decreased from 86.5% to 78.4%.

**TABLE 2.5: BERD BY ACCOUNTING CATEGORY (2008/09, 2007/08 AND 2006/07)**

TYPE OF EXPENDITURE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
Capital expenditure on R&D	2 658 738	21.6	1 445 305	13.5	1 120 589	12.1
Land: buildings and other structures	207 473	1.7	262 994	2.4	154 129	1.7
Vehicles, plant, machinery, equipment	2 451 265	19.9	1 182 311	11.0	966 460	10.5
Current expenditure	9 673 274	78.4	9 293 151	86.5	8 122 576	87.9
Labour costs	5 279 507	42.8	4 881 074	45.5	4 461 218	48.3
Other current expenditure	4 393 767	35.6	4 412 077	41.1	3 661 358	39.6
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>10 738 456</b>	<b>100</b>	<b>9 243 165</b>	<b>100</b>



## Business Sector continued

Experimental development comprises the largest portion of expenditure at R7 832 million (or 63.5%) in 2008/09; this was followed by applied research at R3 427 million and basic research at R1 073 million.

The percentage distribution of expenditure on these research types has remained relatively stable over the last three years (Table 2.6).

**TABLE 2.6: BERD BY TYPE OF RESEARCH (2008/09, 2007/08 AND 2006/07)**

TYPE OF RESEARCH	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
Basic research	1 073 117	8.7	929 134	8.7	800 085	8.7
Applied research	3 426 651	27.8	3 077 341	28.7	2 550 483	27.6
Experimental development	7 832 244	63.5	6 731 981	62.7	5 892 597	63.8
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>10 738 456</b>	<b>100</b>	<b>9 243 165</b>	<b>100</b>

The business sector funds most of its R&D activities (67.6%, Table 2.3). However, internal resources, excluding funding from other local businesses, make up the bulk of such funding. This funding increased slightly from 64.4% of total funding in 2007/08 to 65.9% in 2008/09 (Table 2.7). The contribution of government

dropped slightly from 21.7% in 2007/08 to 20.8 in 2008/09. During the latter period the contribution of other local businesses and other South African sources decreased. The contribution from foreign sources increased by 0.3% between 2007/08 and 2008/09.

**TABLE 2.7: BERD BY SOURCE OF FUNDS (2008/09, 2007/08 AND 2006/07)**

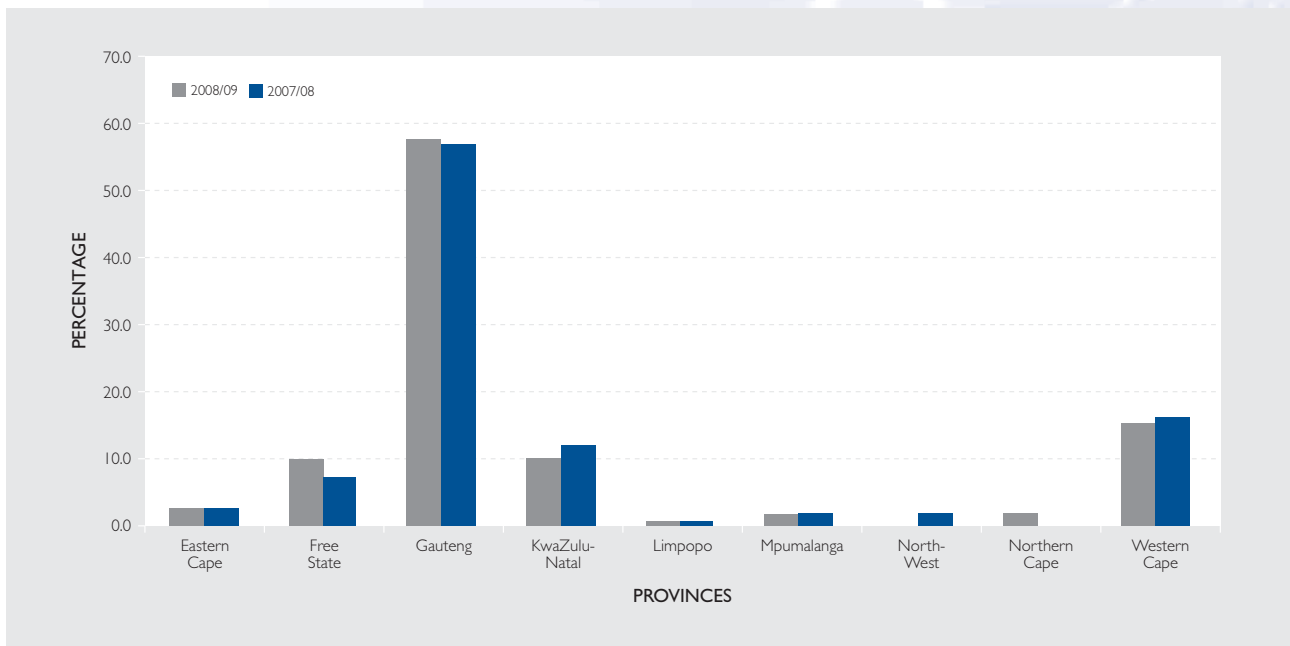
SOURCE OF FUNDS	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Own Funds</b>	<b>8 130 033</b>	<b>65.9</b>	<b>6 916 974</b>	<b>64.4</b>	<b>6 185 887</b>	<b>66.9</b>
Internal Resources	8 130 033	65.9	6 916 974	64.4	6 185 887	66.9
<b>Government</b>	<b>2 567 140</b>	<b>20.8</b>	<b>2 326 728</b>	<b>21.7</b>	<b>1 764 448</b>	<b>19.1</b>
Grants	1 979 423	16.1	1 829 489	17.0	1 299 208	14.1
Contracts	587 717	4.8	497 239	4.6	465 240	5.0
<b>Other Local Business</b>	<b>209 346</b>	<b>1.7</b>	<b>216 939</b>	<b>2.0</b>	<b>228 432</b>	<b>2.5</b>
Contracts	209 346	1.7	216 939	2.0	228 432	2.5
<b>Other South African Sources</b>	<b>29 460</b>	<b>0.2</b>	<b>97 622</b>	<b>0.9</b>	<b>87 311</b>	<b>0.9</b>
Higher Education	2 120	0.0	1 816	0.0	1 657	0.0
Not For Profit Organisations	19 160	0.2	18 900	0.2	18 239	0.2
Individual Donations	8 180	0.1	76 906	0.7	67 415	0.7
<b>Foreign</b>	<b>1 396 033</b>	<b>11.3</b>	<b>1 180 193</b>	<b>11.0</b>	<b>977 087</b>	<b>10.6</b>
Parent Company	566 111	4.6	424 409	4.0	337 919	3.7
Foundations	7 015	0.1	5	0.0	4	0.0
All Sources	822 907	6.7	755 779	7.0	639 164	6.9
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>10 738 456</b>	<b>100</b>	<b>9 243 165</b>	<b>100</b>



The provincial distribution of R&D remained relatively stable from the previous reference period (Figure 2.1). The largest proportion of business sector R&D occurred in Gauteng (57.8%) in 2008/09, followed by the Western Cape (15.5%) and KwaZulu-Natal (10.2%).

There was a slight increase in the proportion of R&D conducted in the Free State and the Northern Cape between 2007/08 and 2008/09. The Free State share of R&D grew from 7.3% to 9.8% and the Northern Cape's share from 0.1% to 1.8% in this period.

**FIGURE 2.1: PROVINCIAL DISTRIBUTION OF BUSINESS SECTOR R&D ACTIVITY (2008/09 AND 2007/08)**



## Business Sector continued

### 2.3.3 Orientation of BERD

The share of business expenditure on R&D increased in the physical sciences, chemical sciences, earth sciences and engineering sciences since 2006/07 (Table 2.8).

Declines in the share of expenditure on R&D since 2006/07 were observed in the mathematical sciences, information sciences, applied science and technologies, biological sciences, agricultural sciences, medical and

health sciences, material sciences and social sciences.

The shares of the environmental and marine sciences remained relatively unchanged. In most cases the increases or decreases in spending were fairly small.

The largest component of BERD was spent in the field of engineering sciences (31.7%) in 2008/09, followed by information, computer and communication sciences (19.6%), applied sciences and technologies (13.6%) and medical and health sciences (12.2%).

**TABLE 2.8: BERD BY RESEARCH FIELD (2008/09, 2007/08 AND 2006/07)**

MAIN RESEARCH FIELD	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Natural sciences, technology and engineering</b>	<b>11 902 551</b>	<b>96.5</b>	<b>10 357 433</b>	<b>96.5</b>	<b>8 881 904</b>	<b>96.1</b>
Mathematical sciences	183 255	1.5	176 077	1.6	159 496	1.7
Physical sciences	655 898	5.3	507 646	4.7	382 551	4.1
Chemical sciences	859 041	7.0	580 146	5.4	438 969	4.7
Earth sciences	95 034	0.8	93 014	0.9	66 244	0.7
Information, computer and communication	2 412 430	19.6	2 182 253	20.3	1 980 630	21.4
Applied sciences and technologies	1 671 375	13.6	1 581 438	14.7	1 551 885	16.8
Engineering sciences	3 908 347	31.7	3 237 265	30.1	2 439 092	26.4
Biological sciences	162 776	1.3	161 058	1.5	160 584	1.7
Agricultural sciences	293 357	2.4	311 287	2.9	277 889	3.0
Medical and health sciences	1 509 109	12.2	1 268 551	11.8	1 225 114	13.3
Environmental sciences	57 764	0.5	62 355	0.6	42 315	0.5
Material sciences	82 192	0.7	184 625	1.7	146 588	1.6
Marine sciences	11 975	0.1	11 719	0.1	10 547	0.1
<b>Division 2: Social Sciences and Humanities</b>	<b>429 461</b>	<b>3.5</b>	<b>381 023</b>	<b>3.5</b>	<b>361 261</b>	<b>3.9</b>
Social sciences	428 969	3.5	380 554	3.5	360 856	3.9
Humanities	491	0.0	469	0.0	405	0.0
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>10 738 456</b>	<b>100</b>	<b>9 243 165</b>	<b>100</b>

Economic development continued to absorb the vast majority of BERD at 79.0% in 2008/09 (Table 2.9). The proportions of expenditure in the defence and the society divisions have declined since 2006/07, while the proportions of expenditure have increased in the economic development, environment and advancement

of knowledge divisions. Within the sub-divisions decreases worth mentioning, in the share of BERD since 2006/07, were in mineral resources and commercial services; and increases in energy supply, construction, economic framework, natural resources and in natural sciences, technologies and engineering.



**TABLE 2.9: BERD BY SOCIO-ECONOMIC OBJECTIVE (2008/09, 2007/08 AND 2006/07)\***

SOCIO-ECONOMIC OBJECTIVE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Defence</b>	<b>908 781</b>	<b>7.4</b>	<b>900 909</b>	<b>8.4</b>	<b>777 139</b>	<b>8.4</b>
<b>Division 2: Economic development</b>	<b>9 737 338</b>	<b>79.0</b>	<b>8 399 187</b>	<b>78.2</b>	<b>7 233 003</b>	<b>78.3</b>
Plant production and plant primary products	266 259	2.2	279 437	2.6	279 937	3.0
Animal production and animal primary products	74 302	0.6	78 657	0.7	67 619	0.7
Mineral resources (excluding energy)	839 558	6.8	937 628	8.7	779 765	8.4
Energy resources	732 188	5.9	585 453	5.5	470 735	5.1
Energy supply	393 798	3.2	252 064	2.3	239 018	2.6
Manufacturing	2 562 745	20.8	2 117 823	19.7	1 846 199	20.0
Construction	1 295 717	10.5	1 017 969	9.5	756 166	8.2
Transport	621 479	5.0	523 022	4.9	446 162	4.8
Information and communication services	1 151 637	9.3	1 087 198	10.1	895 714	9.7
Commercial services	1 422 123	11.5	1 347 470	12.5	1 329 972	14.4
Economic framework	160 562	1.3	41 756	0.4	16 243	0.2
Natural resources	216 971	1.8	130 711	1.2	105 475	1.1
<b>Division 3: Society</b>	<b>1 019 848</b>	<b>8.3</b>	<b>915 567</b>	<b>8.5</b>	<b>839 908</b>	<b>9.1</b>
Society unclassified	0	0.0	0	0.0	0	0.0
Health	930 645	7.5	857 364	8.0	799 201	8.6
Education and training	27 232	0.2	12 204	0.1	12 913	0.1
Social development and community services	61 971	0.5	45 999	0.4	27 794	0.3
<b>Division 4: Environment</b>	<b>221 747</b>	<b>1.8</b>	<b>164 552</b>	<b>1.5</b>	<b>113 821</b>	<b>1.2</b>
Environment unclassified	0	0.0	0	0.0	0	0.0
Environmental knowledge	91 953	0.7	62 551	0.6	39 233	0.4
Environmental aspects of development	31 493	0.3	33 901	0.3	28 327	0.3
Environmental and other aspects	98 301	0.8	68 100	0.6	46 261	0.5
<b>Division 5: Advancement of knowledge</b>	<b>444 298</b>	<b>3.6</b>	<b>358 242</b>	<b>3.3</b>	<b>279 295</b>	<b>3.0</b>
Advancement of knowledge unclassified	0	0.0	0	0.0	0	0.0
Natural sciences, technologies and engineering	439 330	3.6	353 694	3.3	275 446	3.0
Social sciences and humanities	4 968	0.0	4 548	0.0	3 848	0.0
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>10 738 457</b>	<b>100</b>	<b>9 243 165</b>	<b>100</b>

\*Subject to rounding to nearest R'000

## Business Sector continued

Proportional increases, worth noting, regarding BERD by Standard Industrial Classification (SIC) codes were observed in the following classifications (Table 2.10): the manufacture of refined petroleum, coke and nuclear fuel; financial and other business services; electricity, gas and water supply; and financial and business services. Proportional decreases

were observed in the manufacture of basic metals, other metal machinery and equipment and office machinery; electrical machinery and apparatus; transport equipment; furniture and recycling; as well as in transport, storage and communication; and in community and social services.

**TABLE 2.10: BERD BY STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES (2008/09 AND 2007/08)**

SIC CLASSIFICATION	2008/09		2007/08	
	R'000	%	R'000	%
10000 Agriculture, Hunting, Forestry and Fishing	220 757	1.8	213 808	2.0
20000 Mining and Quarrying	578 825	4.7	559 332	5.2
<b>30000 Manufacturing</b>	<b>4 787 581</b>	<b>38.8</b>	<b>4 222 127</b>	<b>39.3</b>
Manufacture of food products, beverages and tobacco products	215 876	1.8	196 238	1.8
Manufacture of textiles, clothing and leather goods	13 755	0.1	17 888	0.2
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	118 016	1.0	118 535	1.1
Manufacture of refined petroleum, coke and nuclear fuel; manufacture of chemicals and chemical products (incl. Pharmaceuticals); manufacture of Rubber and Plastic Products	2 267 063	18.4	1 579 382	14.7
Manufacture of non-metallic mineral products	134 638	1.1	183 758	1.7
Manufacture of basic metals, fabricated metal products, machinery & equipment, manufacture of office, accounting and computing Machinery	315 295	2.6	500 715	4.7
Manufacture of electrical machinery and apparatus	166 498	1.4	187 612	1.7
Manufacture of radio, television and communication equipment & apparatus; manufacture of medical, precision and optical Instruments, watches & clocks	511 356	4.1	506 497	4.7
Manufacture of transport equipment	984 235	8.0	924 053	8.6
Manufacture of furniture, recycling, manufacturing not elsewhere classified	60 849	0.5	7 449	0.1
<b>40000 Electricity, Gas and Water Supply</b>	<b>2 306 297</b>	<b>18.7</b>	<b>1 737 511</b>	<b>16.2</b>
50000 Construction	6 105	0.0	6 043	0.1
60000 Wholesale and Retail	334 131	2.7	317 780	3.0
70000 Transport, Storage and Communication	425 235	3.4	490 138	4.6
80000 Financial Intermediation, Real Estate and Business Services	3 377 896	27.4	2 759 550	25.7
90000 Community, Social and Personal Services	295 185	2.4	432 167	4.0
<b>Total</b>	<b>12 332 012</b>	<b>100</b>	<b>10 738 456</b>	<b>100</b>



### 2.3.4 R&D Personnel

The total headcount of R&D personnel in the business sector amounted to 18 595 in 2008/09, an increase of 3.6% from the headcount of 17 951 in 2007/08 (Table

2.11). FTEs amounted to 12 492.5 in 2008/09. The data indicate that female employees comprised 33.8% of the business sector R&D headcount in 2008/09; an increase from 33.2% in 2007/08 and 32.6% in 2006/07.

**TABLE 2.11: BUSINESS R&D PERSONNEL HEADCOUNT AND FULL-TIME EQUIVALENT (2008/09, 2007/08 AND 2006/07)**

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
	MALE	FEMALE	TOTAL	FTEs	FTEs AS % OF HEADCOUNT
<b>2008/09</b>					
Researchers	6 033	2 527	8 560	6 172.0	72.1
Technicians	3 833	1 751	5 584	3 809.9	68.2
Other personnel: executive and management*	2 443	2 008	4 451	2 510.6	56.4
<b>Total</b>	<b>12 309</b>	<b>6 286</b>	<b>18 595</b>	<b>12 492.5</b>	<b>67.2</b>
<b>2007/08</b>					
Researchers	5 924	2 412	8 336	6 047.5	72.5
Technicians directly supporting R&D	3 615	1 688	5 303	3 796.4	71.6
Other personnel directly supporting R&D	2 458	1 854	4 312	2 617.4	60.7
<b>Total</b>	<b>11 997</b>	<b>5 954</b>	<b>17 951</b>	<b>12 461.3</b>	<b>69.4</b>
<b>2006/07</b>					
Researchers	5 857	2 370	8 227	6 110.9	74.3
Technicians directly supporting R&D	3 517	1 596	5 113	3 735.0	73.0
Other personnel directly supporting R&D	2 398	1 729	4 127	2 749.4	66.6
<b>Total</b>	<b>11 772</b>	<b>5 695</b>	<b>17 467</b>	<b>12 595.3</b>	<b>72.1</b>

\* 'Other personnel' was split into 'executive and management' and 'administrative' support staff in the 2006/07, 2007/08 and 2008/09 surveys

Further analysis of the data on personnel by race, gender and qualifications (Tables 2.12.1 and 2.12.2) indicates that of the 18 595 R&D personnel headcount employed by the business sector in 2008/09, 46.0% were researchers; 30.0% were technicians directly supporting R&D and 23.9% were other personnel supporting

R&D. Of the researchers 16.0% had PhDs in 2008/09 compared to 12.4% in 2007/08. Female researchers made up 26.0% of the researchers holding PhD degrees in 2008/09. Of the total R&D personnel headcount in the business sector, 57.7% were White; 26.4% were African; 9.3% were Indian and 6.7% were Coloured.

# Business Sector

 continued**TABLE 2.12.1: BUSINESS R&D PERSONNEL HEADCOUNT BY RACE, QUALIFICATION AND GENDER (2008/09)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	100	31	10	15	42	25	860	285	1 012	356	1 368
Masters, honours, bachelor or equivalent	495	369	137	46	368	235	2 698	929	3 698	1 579	5 277
Diplomas	255	192	108	84	100	46	860	269	1 323	591	1 915
<b>Subtotal</b>	<b>850</b>	<b>591</b>	<b>255</b>	<b>146</b>	<b>510</b>	<b>307</b>	<b>4 418</b>	<b>1 483</b>	<b>6 033</b>	<b>2 527</b>	<b>8 560</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	10	12	5	6	13	9	96	56	124	82	206
Masters, honours, bachelor or equivalent	226	231	23	18	74	64	632	348	954	662	1 616
Diplomas	861	375	185	114	223	138	1 485	381	2 754	1 007	3 761
<b>Subtotal</b>	<b>1 097</b>	<b>618</b>	<b>213</b>	<b>138</b>	<b>310</b>	<b>211</b>	<b>2 213</b>	<b>785</b>	<b>3 833</b>	<b>1 751</b>	<b>5 584</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	11	9	0	0	101	0	44	25	156	34	190
Masters, honours, bachelor or equivalent	137	121	21	6	40	37	257	205	456	370	826
Diplomas	1 011	455	162	302	101	109	557	738	1 831	1 603	3 434
<b>Subtotal</b>	<b>1 158</b>	<b>585</b>	<b>184</b>	<b>308</b>	<b>243</b>	<b>146</b>	<b>859</b>	<b>968</b>	<b>2 443</b>	<b>2 008</b>	<b>4 451</b>
<b>Total</b>	<b>3 105</b>	<b>1 795</b>	<b>652</b>	<b>591</b>	<b>1 062</b>	<b>664</b>	<b>7 490</b>	<b>3 236</b>	<b>12 309</b>	<b>6 286</b>	<b>18 595</b>

**TABLE 2.12.2: BUSINESS R&D PERSONNEL HEADCOUNT BY RACE, QUALIFICATION AND GENDER (2007/08)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	63	57	19	5	28	26	253	181	763	269	1 032
Masters, honours, bachelor or equivalent	440	299	126	40	284	169	3 157	1 255	4 007	1 763	5 770
Diplomas	165	128	102	19	89	55	799	178	1 154	380	1 534
<b>Subtotal</b>	<b>667</b>	<b>485</b>	<b>247</b>	<b>64</b>	<b>401</b>	<b>250</b>	<b>4 609</b>	<b>1 614</b>	<b>5 924</b>	<b>2 412</b>	<b>8 336</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	0	13	0	0	0	0	40	30	40	43	83
Masters, honours, bachelor or equivalent	152	178	89	45	103	49	868	513	1 212	786	1 998
Diplomas	690	322	237	77	184	122	1 252	337	2 363	859	3 222
<b>Subtotal</b>	<b>842</b>	<b>513</b>	<b>327</b>	<b>122</b>	<b>287</b>	<b>172</b>	<b>2 160</b>	<b>881</b>	<b>3 615</b>	<b>1 688</b>	<b>5 303</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	28	26	0	0	5	21	33	31	66	77	143
Masters, honours, bachelor or equivalent	74	159	8	9	23	14	218	173	323	354	677
Diplomas	1 269	567	115	121	137	77	547	658	2 069	1 423	3 492
<b>Subtotal</b>	<b>1 372</b>	<b>752</b>	<b>124</b>	<b>130</b>	<b>165</b>	<b>111</b>	<b>798</b>	<b>861</b>	<b>2 458</b>	<b>1 854</b>	<b>4 312</b>
<b>Total</b>	<b>2 880</b>	<b>1 750</b>	<b>697</b>	<b>316</b>	<b>853</b>	<b>532</b>	<b>7 567</b>	<b>3 355</b>	<b>11 997</b>	<b>5 954</b>	<b>17 951</b>



### 2.3.5 Collaboration

R&D collaboration is based on the reporting firm's record of the number of R&D projects undertaken in collaboration with other entities. The total number of collaborative R&D projects increased both within South Africa and with foreign partners (Table 2.13). In 2008/09 most of the collaboration occurred between

R&D performing firms and other companies, which included specialist consultants, in 2008/09. This was followed by collaboration with higher education institutions. Higher education institutions were, however, the preferred partners in 2007/08. Collaboration with government research institutes increased slightly from 2007/08.

**TABLE 2.13: NUMBER OF R&D COLLABORATIVE PROJECTS (2007/08 AND 2006/07)**

PARTNER	2008/09		2007/08	
	SA	FOREIGN	SA	FOREIGN
Higher education institutions	139	12	92	23
Science councils (e.g. CSIR, Mintek, MRC, ARC etc)	21	1	18	5
Government research institutes	32	5	24	17
Members of own company / affiliated companies	79	26	38	12
Other companies (including specialist consultants)	170	59	80	35
Not-for-profit organisations	16	6	17	2
<b>Total</b>	<b>457</b>	<b>109</b>	<b>269</b>	<b>94</b>

### 2.3.6 R&D in multidisciplinary and other specific areas

#### 2.3.6.1 Multidisciplinary R&D

This section reports on the multidisciplinary R&D and other specific areas of national interest namely, biotechnology, nanotechnology, open source software, new materials, and tuberculosis, HIV/AIDS and malaria. Thirty-seven companies reported that they conducted

R&D in biotechnology in 2008/09 (Table 2.14), while nine companies reported involvement in nanotechnology research in 2008/09. These figures are up slightly from 2007/08. R268.9 million was spent on biotechnology R&D and R56.9 million on nanotechnology R&D by the business sector in 2008/09.

**TABLE 2.14: BUSINESS SECTOR EXPENDITURE ON MULTIDISCIPLINARY R&D (2008/09 AND 2007/08)**

MULTIDISCIPLINARY R&D AREA	2008/09			2007/08		
	R'000	%	NUMBER OF COMPANIES	R'000	%	NUMBER OF COMPANIES
Biotechnology	268 923	2.2	37	169 410	1.6	35
Nanotechnology	56 881	0.5	9	30 314	0.3	7
<b>Total</b>	<b>325 804</b>	<b>2.6</b>	<b>46</b>	<b>199 724</b>	<b>1.9</b>	<b>42</b>
<b>Total R&amp;D expenditure</b>	<b>12 332 012</b>	<b>100</b>	<b>n/a</b>	<b>10 738 456</b>	<b>100</b>	<b>n/a</b>



## Business Sector continued

### 2.3.6.2. Business sector R&D expenditure by specific areas of national interest

The number of companies doing research in the areas of open source software, new materials, tuberculosis, HIV/AIDS and malaria increased from 63 in 2007/08

to 67 in 2008/09, while R&D expenditure on these areas increased from R489 million to R717 million (Table 2.15). Business sector R&D expenditure on new materials and TB, HIV/AIDS and malaria increased while expenditure on open source software decreased.

**TABLE 2.15: BUSINESS SECTOR EXPENDITURE ON R&D IN SPECIFIC AREAS OF NATIONAL INTEREST (2008/09 AND 2007/08)**

SPECIFIC AREAS OF INTEREST	2008/09			2007/08		
	R'000	%	NUMBER OF COMPANIES	R'000	%	NUMBER OF COMPANIES
Open source software	96 266	0.8	24	114 195	1.1	26
New Materials	154 140	1.2	22	72 992	0.7	18
Tuberculosis (TB), HIV/AIDS, malaria	466 161	3.8	21	302 122	2.8	19
<b>Total</b>	<b>716 567</b>	<b>5.8</b>	<b>67</b>	<b>489 309</b>	<b>4.6</b>	<b>63</b>
<b>Total R&amp;D expenditure</b>	<b>12 332 012</b>	<b>100</b>	<b>n/a</b>	<b>10 738 456</b>	<b>100</b>	<b>n/a</b>



## Chapter 3

# Government Sector

### 3.1 Introduction

The government sector comprises national, provincial and local departments; government research institutes; and museums. It excludes science councils and institutions owned by central government. State owned enterprises form part of the business sector and are surveyed and presented under that sector (see Chapter 2) while science councils are surveyed and presented separately (see Chapter 6).

The government sector is surveyed through a census covering all national and provincial government departments. Most government departments at both the national and provincial levels and some research institutes indicate that they outsource most or some of their R&D activities to other agencies or service providers. However, they often do not provide detailed information on which agencies or service providers they outsource to as prompted in the survey instrument. This limits the usefulness of the question in uncovering new R&D performers.

Furthermore, the reporting systems of various departments within the sector differ, particularly with respect to finances, as they do not always report according to the format of the survey instrument. In most instances, it seems that the R&D budget is not separated from the budget for scientific and technological services. This might lead to respondents returning a questionnaire as a 'nil' even though the institution concerned performs R&D. The nil-returns and non-responses are usually from smaller departments or organisations which suggest that they may lack capacity and/or funding to undertake research.

### 3.2 Survey Methods

Whilst the survey instrument was checked and updated during the questionnaire design phase for the current survey, no major changes were made in the 2008/09 survey instrument. A brief overview of the 2008/09 fieldwork in the various sub-sectors of the government sector follows.

The 2007/08 registers of the various sub-sectors of the government sector were updated telephonically for

the current survey. Contact details of the respondents were updated using the contact information in the 2007/08 registers and, when not available, the department or organisation's website was utilised. The reporting units (units of measure) in the government sector differ across departments. Some departments have directorates dedicated to R&D, while others have these activities spread across different sections within the same department. The preferred contact at national level was a director-general (DG) and within the provincial departments, a head of department (HoD).

Hard copies of questionnaires were posted to all departments; followed up by emails with electronic copies. In the 2008/09 survey, 141 questionnaires in total were sent out to respondents in the various government sub-sectors namely: national departments, provincial departments, research institutes and museums. The response rate for the government sector in 2008/09 was 43.3% with 61 returned questionnaires received.

The following measures to improve return rates and obtain valid information were used:

- Instructions and definitions accompanying the questionnaire were drawn up using understandable and user-friendly content and layout.
- Constant follow-up queries were made by email and telephone to remind respondents and offer support.
- Where necessary, questionnaires were completed over the telephone for respondents.
- Parent departments were engaged to co-ordinate the survey within their provincial departments where and when required.

Some questionnaires were returned incomplete or were incorrectly completed. In such cases respondents were contacted by telephone to prompt for missing data. Information obtained in this way, and previous survey data adjusted for inflation, was used to compile commuted responses for likely R&D performers who did not return a questionnaire for the current survey. Once the verification process was completed, all questionnaires including the nil-returns were captured in the Survey Management and Results System (SMRS).

## Government Sector continued

### 3.3 Detailed Results

This section presents the key results and indicators; financial data; the orientation of government sector R&D expenditure (GOVERD); R&D personnel and national R&D priority areas.

#### 3.3.1 Key Results

Table 3.1 presents in-house R&D expenditure by sector. The 2008/09 survey results indicate that GOVERD dropped slightly by about 1.3% between

2007/08 and 2008/09. The government sector contribution to national R&D expenditure has also dropped to 5.4% (R1.14 billion) in the 2008/09 survey from 6.2% in the 2007/08 survey. This was due to a 42.4% drop in R&D expenditure by national departments, plus an 8.4% decrease in provincial departments. The research institutes and museums' R&D expenditures increased by 58.5% and 12.2% respectively in the 2008/09 survey.

**TABLE 3.1: IN-HOUSE R&D EXPENDITURE BY SECTOR (2008/09, 2007/08 AND 2006/07)**

SECTOR	2008/09			2007/08			2006/07		
	SUBTOTAL	TOTAL	%	SUBTOTAL	TOTAL	%	SUBTOTAL	TOTAL	%
	R'000	R'000		R'000	R'000		R'000	R'000	
<b>Business enterprise</b>		12 332 012	58.6		10 738 456	57.7		9 243 165	55.9
<b>Government</b>		1 139 676	5.4		1 154 399	6.2		1 021 355	6.2
National departments	287 333		1.4	499 085		2.7	489 971		2.9
Provincial departments	232 062		1.1	253 418		1.3	174 860		1.1
Research institutes	579 395		2.8	365 468		2.0	327 065		2.0
Museums	40 886		0.2	36 428		0.2	29 459		0.2
<b>Higher education</b>		4 191 366	19.9		3 621 862	19.4		3 298 808	20.0
<b>Not-for-profit</b>		240 649	1.1		223 202	1.2		212 538	1.3
<b>Science councils</b>		3 137 343	14.9		2 886 094	15.5		2 744 718	16.6
<b>Grand total</b>		21 041 046	100		18 624 013	100		16 520 584	100

Table 3.2 presents the main indicators for the government sector. The 2008/09 R&D Survey results indicate that the government sector as a whole spent R1.14 billion on R&D. Compared to the 2007/08

results this represents a decrease of 1.2%, while R&D expressed as a percentage of GDP stood at 0.06% in 2008/09, compared to 0.07% in 2007/08.

**TABLE 3.2: MAIN INDICATORS OF THE GOVERNMENT SECTOR (2008/09, 2007/08 AND 2006/07)**

MAIN INDICATORS	2008/09	2007/08	2006/07
Expenditure on R&D (Rand million)	1 140	1 154	1 024
Expenditure on R&D as % of GDP	0.06%	0.07%	0.07%
Total Government Sector R&D personnel (FTEs)	805.0	1950.0	784.6
Total government R&D researchers (FTEs)	2073.9	757.6	2068.3
% Expenditure financed by local industry	1.4	0.5	1.3
% Expenditure financed by government	28.6	31.4	37.9



The government sector employed a total of 2 963 R&D personnel headcounts in 2008/09 (Table 3.3). This is an increase of approximately 6.0% compared to the 2 794 headcounts recorded in the 2007/08 survey. The total number of researchers within the national departments dropped by 22.3% between 2007/08 and 2008/09, while the provincial departments

and research institutes increased their numbers of researchers by 17.6% and 9.0% respectively. Museums' total number of researchers remained constant at 106 between 2007/08 and 2008/09. The government sector as a whole contributed 6.3% towards the total R&D personnel within South Africa, an increase from 5.8% in 2007/08 R&D.

**TABLE 3.3: HEADCOUNT OF R&D PERSONNEL BY SECTOR (2008/09 AND 2007/08)**

SECTOR	RESEARCHERS		TECHNICIANS DIRECTLY SUPPORTING R&D		TOTAL OTHER PERSONNEL		GRAND TOTAL		PERCENTAGE	
	2008/09	2007/08	2008/09	2007/08	2008/09	2007/08	2008/09	2007/08	2008/09	2007/08
Business enterprise	8 560	8 336	5 584	5 303	4 451	4 312	18 595	17 951	38.8	36.9
Government	1 169	1 138	744	739	1 050	917	2 963	2 794	6.3	5.8
National departments	206	265	298	344	53	49	557	658	1.2	1.4
Provincial departments	287	244	126	117	719	631	1 132	992	2.4	2.0
Government research institutes	570	523	237	191	242	202	1 049	916	2.2	1.9
Museums	106	106	83	87	36	35	225	228	0.5	0.5
Higher education	16 313	17 008	2 054	2 006	1 856	2 351	20 223	21 365	42.2	44.0
Not-for-profit	262	264	77	77	163	161	502	502	1.0	1.0
Science councils	2 648	2 594	1 302	1 351	1 659	2 043	5 609	5 988	11.7	12.3
Grand total	28 952	29 340	9 761	9 476	9 179	9 784	47 892	48 600	100	100
Higher education doctoral and postdoctoral students	11 003	10 744	-	-	-	-	11 003	10 744	-	-
Total	39 955	40 084	9 761	9 476	9 179	9 784	58 895	59 344	100	100

### 3.3.2 Financial Data

The government sector's expenditure on R&D infrastructure dropped in 2008/09. About 7.6% was spent on capital goods in 2008/09 compared to 8.7% in 2007/08 and 11.8% in 2006/07 (Table 3.4).

**TABLE 3.4: GOVERNMENT BY ACCOUNTING CATEGORY (2008/09, 2007/08 AND 2006/07)**

TYPE OF EXPENDITURE	2008/09		2007/08		2006/07		
	R'000	%	R'000	%	R'000	%	
<b>National departments</b>							
Capital expenditure on R&D	9 340	3.3	22 507	4.5	48 920	10.0	
Land: buildings and other structures		1 107	0.4	0	0.0	3 701	0.8
Vehicles, plant, machinery, equipment		8 233	2.9	22 507	4.5	45 219	9.2
Current expenditure	277 993	96.7	476 578	95.5	441 051	90.0	
Labour costs		98 791	34.4	120 257	24.1	158 890	32.4
Other current expenditure		179 202	62.4	356 321	71.4	282 161	57.6
Total	287 333	100	499 085	100	489 971	100	

# Government Sector continued

TYPE OF EXPENDITURE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Provincial departments</b>						
Capital expenditure on R&D	24 249	10.4	37 336	14.7	12 706	7.3
Land: buildings and other structures	2 515	1.1	8 681	3.4	4 495	2.6
Vehicles, plant, machinery, equipment	21 734	9.4	28 655	11.3	8 211	4.7
<b>Current expenditure</b>	<b>207 813</b>	<b>89.6</b>	<b>216 082</b>	<b>85.3</b>	<b>162 154</b>	<b>92.7</b>
Labour costs	129 187	55.7	135 695	53.5	100 676	57.6
Other current expenditure	78 626	33.9	80 387	31.7	61 478	35.2
<b>Total</b>	<b>232 062</b>	<b>100</b>	<b>253 418</b>	<b>100</b>	<b>174 860</b>	<b>100</b>
<b>Government research institutes</b>						
Capital expenditure on R&D	49 345	8.5	38 837	10.6	57 343	17.5
Land: buildings and other structures	9 955	1.7	10 225	2.8	31 602	9.7
Vehicles, plant, machinery, equipment	39 390	6.8	28 612	7.8	25 741	7.9
<b>Current expenditure</b>	<b>530 050</b>	<b>91.5</b>	<b>326 631</b>	<b>89.4</b>	<b>269 722</b>	<b>82.5</b>
Labour costs	224 691	38.8	183 167	50.1	148 117	45.3
Other current expenditure	305 359	52.7	143 464	39.3	121 605	37.2
<b>Total</b>	<b>579 395</b>	<b>100</b>	<b>365 468</b>	<b>100</b>	<b>327 065</b>	<b>100</b>
<b>Museums</b>						
Capital expenditure on R&D	4 002	9.8	1 644	4.5	1 908	6.5
Land: buildings and other structures	2 331	5.7	460	1.3	481	1.6
Vehicles, plant, machinery, equipment	1 671	4.1	1 184	3.3	1 427	4.8
<b>Current expenditure</b>	<b>36 884</b>	<b>90.2</b>	<b>34 784</b>	<b>95.5</b>	<b>27 551</b>	<b>93.5</b>
Labour costs	27 141	66.4	25 041	68.7	20 197	68.6
Other current expenditure	9 743	23.8	9 743	26.7	7 354	25.0
<b>Total</b>	<b>40 886</b>	<b>100</b>	<b>36 428</b>	<b>100</b>	<b>29 459</b>	<b>100</b>
<b>All Government Sectors</b>						
Capital expenditure on R&D	86 936	7.6	100 324	8.7	120 877	11.8
Land: buildings and other structures	15 908	1.4	19 366	1.7	40 279	3.9
Vehicles, plant, machinery, equipment	71 028	6.2	80 958	7.0	80 598	7.9
<b>Current expenditure</b>	<b>1 052 740</b>	<b>92.4</b>	<b>1 054 075</b>	<b>91.3</b>	<b>900 478</b>	<b>88.2</b>
Labour costs	479 810	42.1	464 160	40.2	427 880	41.9
Other current expenditure	572 930	50.3	589 915	51.1	472 598	46.3
<b>Total</b>	<b>1 139 676</b>	<b>100</b>	<b>1 154 399</b>	<b>100</b>	<b>1 021 355</b>	<b>100</b>



A steady increase in basic research as a proportion of government investment in R&D was observed in the three consecutive survey reference periods. Basic research increased from 22.0% in 2006/07 to 27.9% in 2007/08 and to 31.4% in 2008/09 (Table 4.5). Applied research accounted for 52.8% of the total

expenditure on R&D in 2008/09 compared to 51.9% in 2007/08. There has been a steady increase in expenditure on applied research since 2006/07. Experimental development accounted for 15.8% of total R&D expenditure in 2008/09 compared to 20.2% of total expenditure in 2007/08 and 26.9% in 2006/07.

**TABLE 3.5: GOVERD BY TYPE OF RESEARCH (2008/09, 2007/08 AND 2006/07)**

TYPE OF RESEARCH	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
Basic research	357 786	31.4	322 270	27.9	224 774	22.0
Applied research	601 688	52.8	599 162	51.9	521 845	51.1
Experimental development	180 202	15.8	232 967	20.2	274 736	26.9
<b>Total</b>	<b>1 139 676</b>	<b>100</b>	<b>1 154 399</b>	<b>100</b>	<b>1 021 355</b>	<b>100</b>

Table 3.6 indicates GOVERD by source of funds. The government sector funds most of its own R&D activities. In 2008/09 the contribution of government towards funding its own R&D (including own funds, grants and contracts) amounted to R1.07 billion compared to R1.1 billion in 2007/08. This is a decrease of 2.1%

since the previous year. Funding from the domestic business sector rose from R5.3 million in 2007/08 to R15.9 million in 2008/09, while funding from other South African sources remained steady at R1.8 million. Funding from foreign sources dropped slightly from 4.9% in 2007/08 to 4.7% in 2008/09.

**TABLE 3.6: GOVERD BY SOURCES OF FUNDS (2008/09, 2007/08 AND 2006/07)**

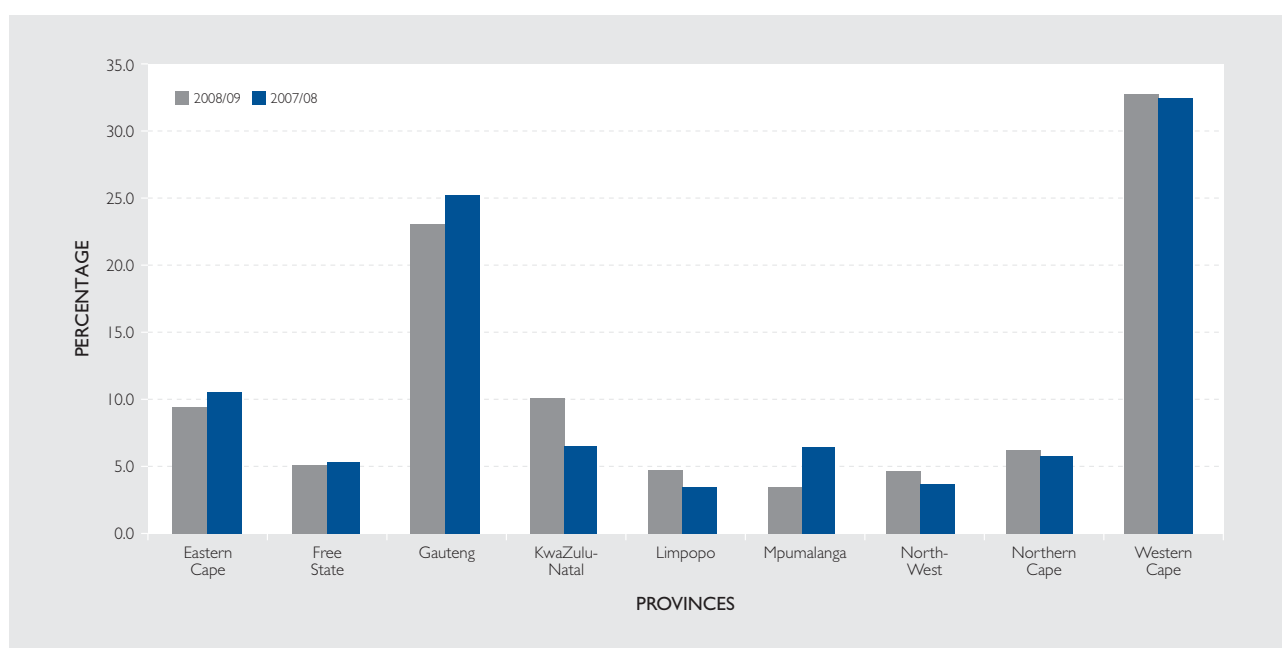
SOURCE OF FUNDS	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Organisation</b>	<b>742 954</b>	<b>65.2</b>	<b>727 996</b>	<b>63.1</b>	<b>549 896</b>	<b>53.8</b>
Own funds	742 954	65.2	727 996	63.1	549 896	53.8
<b>Government</b>	<b>325 573</b>	<b>28.6</b>	<b>363 053</b>	<b>31.4</b>	<b>387 109</b>	<b>37.9</b>
Grants	323 932	28.4	361 416	31.3	356 130	34.9
Contracts	1 641	0.1	1 637	0.1	30 979	3.0
<b>Business</b>	<b>15 980</b>	<b>1.4</b>	<b>5 343</b>	<b>0.5</b>	<b>13 067</b>	<b>1.3</b>
Business (domestic)	15 980	1.4	5 343	0.5	13 067	1.3
<b>Other South African sources</b>	<b>1 821</b>	<b>0.2</b>	<b>1 835</b>	<b>0.2</b>	<b>19 623</b>	<b>1.9</b>
Higher education	86	0.0	0	0.0	9 351	0.9
Not for profit organisations	278	0.0	278	0.0	260	0.0
Individual donations	1 457	0.1	1 557	0.1	10 012	1.0
<b>Foreign</b>	<b>53 348</b>	<b>4.7</b>	<b>56 172</b>	<b>4.9</b>	<b>51 660</b>	<b>5.1</b>
All sources	53 348	4.7	56 172	4.9	51 660	5.1
<b>Total</b>	<b>1 139 676</b>	<b>100</b>	<b>1 154 399</b>	<b>100</b>	<b>1 021 355</b>	<b>100</b>

## Government Sector continued

Figure 3.1 presents provincial distribution of R&D activity. As compared to other provinces, the Western Cape accounts for a greater proportion of government R&D expenditure with 32.9%, followed by Gauteng province with 23.2% in 2008/09. The 2008/09 survey results indicate that this represented a 2.2% drop in Gauteng's GOVERD from 25.4% in the 2007/08

survey. GOVERD in KwaZulu-Natal and the Northern Cape provinces rose from 6.6% and 5.8% respectively in 2007/08 to 10.1% and 6.2% in 2008/09. Whilst Limpopo and North West also recorded slight increases between 2007/08 and 2008/09, the rest of the provinces recorded declines in GOVERD for the 2008/09 period.

**FIGURE 3.1: PROVINCIAL DISTRIBUTION OF GOVERNMENT R&D ACTIVITY (2008/09 AND 2007/08)**



### 3.3.3 Orientation of GOVERD

Table 3.7 provides a breakdown of GOVERD by research fields (RFs). Total R&D expenditure in the government sector was highest in the social sciences, which accounted for 23.5% of total expenditure in 2008/09. A percentage increase in total R&D expenditure was observed in the medical and health sciences (3.6%), the earth sciences (0.8%), the

humanities (5.7%), and the environmental sciences (35.9%) between 2008/09 and 2007/08. Proportions of R&D expenditure dropped between 2007/08 and 2008/09 in the following research fields: information, computer and communication (72.9%), chemical science (24.9%), the engineering sciences (18.9%) and the agricultural sciences (3.8%).



**TABLE 3.7: GOVERD BY RESEARCH FIELD (2008/09, 2007/08 AND 2006/07)**

MAIN RESEARCH FIELD	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Natural sciences, technology &amp; engineering</b>	<b>824 394</b>	<b>72.3</b>	<b>874 425</b>	<b>75.7</b>	<b>808 404</b>	<b>79.2</b>
Mathematical sciences	20 704	1.8	20 643	1.8	24 823	2.4
Physical sciences	45 804	4.0	45 052	3.9	24 726	2.4
Chemical sciences	17 009	1.5	22 672	2.0	16 622	1.6
Earth sciences	163 156	14.3	161 815	14.0	109 959	10.8
Information, computer & communication	22 191	1.9	82 123	7.1	56 323	5.5
Applied sciences and technologies	15 852	1.4	15 286	1.3	31 603	3.1
Engineering sciences	11 487	1.0	14 164	1.2	26 008	2.5
Biological sciences	125 152	11.0	113 409	9.8	99 841	9.8
Agricultural sciences	200 598	17.6	208 662	18.1	170 347	16.7
Medical and Health sciences	180 260	15.8	173 929	15.1	187 741	18.4
Environmental sciences	11 675	1.0	8 589	0.7	40 851	4.0
Material sciences	640	0.1	637	0.1	158	0.0
Marine sciences	9 866	0.9	7 445	0.6	19 402	1.9
<b>Division 2: Social sciences &amp; humanities</b>	<b>315 282</b>	<b>27.7</b>	<b>279 974</b>	<b>24.3</b>	<b>212 951</b>	<b>20.8</b>
Social sciences	268 058	23.5	235 299	20.4	189 155	18.5
Humanities	47 225	4.1	44 676	3.9	23 796	2.3
<b>Total</b>	<b>1 139 676</b>	<b>100</b>	<b>1 154 399</b>	<b>100</b>	<b>1 021 355</b>	<b>100</b>

Table 3.8 provides a breakdown of GOVERD by socio-economic objectives (SEOs). The 2008/09 survey results indicate that between the 2007/08 and 2008/09 reference periods, the government sector recorded no defence-related R&D as opposed to the 4.9% of GOVERD in this area in 2006/07. The 2008/09 survey results further indicate that R&D expenditure in areas aligned to economic development amounted to R373 million. This is a decrease of 13.1% from R430 million in 2007/08. However, the R&D expenditure on society has increased by 7.5% from R266 million in 2007/08 to R285 million in 2008/09. A notable, steady increase in R&D expenditure in advancement of knowledge can

also be observed in the three survey reference periods. R&D expenditure in the advancement of knowledge rose by 7.0% in the 2008/09 compared to 2007/08. The major contributor within the advancement of knowledge division is R&D related to natural sciences, technologies and engineering. Whilst there has been a steady increase in R&D expenditure on the latter area, there has been a steady decrease in the R&D expenditure on the environment in the three consecutive survey reference periods. R&D expenditure in the area of environment has decreased by approximately 3.3% between 2007/8 and 2008/9 as compared to a 2.3% decrease between 2006/7 and 2007/8 period.



# Government Sector continued

**TABLE 3.8: GOVERNMENT BY SOCIO-ECONOMIC OBJECTIVE (2008/09, 2007/08 AND 2006/07)**

SOCIO-ECONOMIC OBJECTIVE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Defence</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>50 000</b>	<b>4.9</b>
Defence	0	0.0	0	0.0	50 000	4.9
<b>Division 2: Economic development</b>	<b>373 251</b>	<b>32.8</b>	<b>429 646</b>	<b>37.2</b>	<b>350 497</b>	<b>34.3</b>
Plant production & primary products	66 503	5.8	79 290	6.9	45 951	4.5
Animal production & primary products	78 619	6.9	79 997	6.9	66 655	6.5
Mineral resources (excluding energy)	0	0.0	0	0.0	0	0.0
Energy resources	0	0.0	0	0.0	0	0.0
Energy supply	12 387	1.1	14 290	1.2	8 905	0.9
Manufacturing	320	0.0	318	0.0	79	0.0
Construction	2 484	0.2	3 219	0.3	3 911	0.4
Transport	12 073	1.1	15 386	1.3	21 710	2.1
Information and communication services	11 965	1.0	69 318	6.0	32 858	3.2
Commercial services	2 405	0.2	6 897	0.6	4 908	0.5
Economic framework	105 080	9.2	98 537	8.5	76 965	7.5
Natural resources	81 415	7.1	62 394	5.4	88 558	8.7
<b>Division 3: Society</b>	<b>285 961</b>	<b>25.1</b>	<b>265 948</b>	<b>23.1</b>	<b>341 911</b>	<b>33.5</b>
Health	74 784	6.6	69 493	6.0	150 704	14.8
Education and training	127 907	11.2	111 407	9.7	112 042	11.0
Social development and community services	83 270	7.3	85 048	7.4	79 165	7.8
<b>Division 4: Environment</b>	<b>99 985</b>	<b>8.8</b>	<b>103 372</b>	<b>9.0</b>	<b>105 792</b>	<b>10.4</b>
Environment unclassified	0	0.0	0	0.0	0	0.0
Environmental knowledge	83 429	7.3	71 734	6.2	74 710	7.3
Environmental aspects of development	12 424	1.1	20 797	1.8	8 112	0.8
Environmental and other aspects	4 132	0.4	10 841	0.9	22 970	2.2
<b>Division 5: Advancement of knowledge</b>	<b>380 480</b>	<b>33.4</b>	<b>355 434</b>	<b>30.8</b>	<b>173 155</b>	<b>17.0</b>
Advancement of knowledge unclassified	0	0.0	0	0.0	0	0.0
Natural sciences, technologies and engineering	333 561	29.3	324 409	28.1	149 847	14.7
Social sciences and humanities	46 919	4.1	31 025	2.7	23 309	2.3
<b>Total</b>	<b>1 139 676</b>	<b>100</b>	<b>1 154 399</b>	<b>100</b>	<b>1 021 355</b>	<b>100</b>



### 3.3.4 R&D Personnel

Table 3.9 presents government R&D personnel headcounts and FTEs. The total R&D FTEs in government increased by 6.4% from 1 950.0 (2007/08) to 2 073.9 (2008/09). Whilst there was an observable decrease in R&D personnel between 2006/07 and 2007/08, there has been a notable

increase in R&D personnel in the 2008/09 survey. While other research support staff increased by 14.5% in 2008/09, technicians remained relatively constant. Time spent on research by government sector researchers increased to 68.9% in 2008/09 compared to 66.6% in the 2007/08 survey.

**TABLE 3.9: GOVERNMENT R&D PERSONNEL HEADCOUNT AND FULL-TIME EQUIVALENTS (2008/09, 2007/08 AND 2006/07)**

OCCUPATION	HEADCOUNT		FULL-TIME EQUIVALENTS		
	MALE	FEMALE	TOTAL	FTEs	FTEs AS % OF HEADCOUNT
<b>2008/09</b>					
Researchers	623	546	1 169	805.0	68.9
Technicians	405	339	744	495.2	66.6
Other personnel directly supporting R&D	752	298	1 050	773.7	73.7
<b>Total</b>	<b>1 780</b>	<b>1 183</b>	<b>2 963</b>	<b>2 073.9</b>	<b>70.0</b>
<b>2007/08</b>					
Researchers	616	522	1 138	757.6	66.6
Technicians	404	335	739	495.6	67.1
Other Personnel Directly Supporting R&D	633	284	917	696.9	76.0
<b>Total</b>	<b>1 653</b>	<b>1 141</b>	<b>2 794</b>	<b>1 950.0</b>	<b>69.8</b>
<b>2006/07</b>					
Researchers	624	487	1 111	784.6	70.6
Technicians	493	338	831	555.7	66.9
Other Personnel Directly Supporting R&D	665	317	982	728.0	74.1
<b>Total</b>	<b>1 782</b>	<b>1 142</b>	<b>2 924</b>	<b>2 068.3</b>	<b>70.7</b>

The breakdown of R&D personnel by race, gender and qualification is illustrated in Tables 3.10.1 and 3.10.2. In the 2008/09 survey, the government sector employed 2 963 R&D personnel (in headcounts), of whom 1 169 (39.5%) were researchers. Of the 1 169 researchers, 236 (20.2%) had PhD degrees in the 2008/09 survey compared to 25.0% in 2006/07.

Female researchers made up 41.1% of researchers holding PhD degrees in 2008/09; the 2007/08 figure was 38.6%. Female researchers accounted for 46.7% of total researchers in 2008/09 compared to 45.9% in 2007/08. Of the 546 female researchers in 2008/9, 43.2% were White, 42.1% were African, 7.7% Coloured and 7.0% Indian.

# Government Sector continued

**TABLE 3.10.1: GOVERNMENT SECTOR R&D PERSONNEL HEADCOUNTS BY RACE, QUALIFICATIONS AND GENDER (2008/09)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	26	24	4	1	7	8	102	64	139	97	236
Masters, honours, bachelor or equivalent	246	188	21	40	25	23	171	166	463	417	880
Diplomas	10	18	6	1	0	7	5	6	21	32	53
<b>Subtotal</b>	<b>282</b>	<b>230</b>	<b>31</b>	<b>42</b>	<b>32</b>	<b>38</b>	<b>278</b>	<b>236</b>	<b>623</b>	<b>546</b>	<b>1 169</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	0	0	0	0	0	0	2	0	2	0	2
Masters, honours, bachelor or equivalent	141	82	11	7	8	14	76	98	236	201	437
Diplomas	109	86	16	10	4	7	38	35	167	138	305
<b>Subtotal</b>	<b>250</b>	<b>168</b>	<b>27</b>	<b>17</b>	<b>12</b>	<b>21</b>	<b>116</b>	<b>133</b>	<b>405</b>	<b>339</b>	<b>744</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	5	0	0	0	0	0	1	1	6	1	7
Masters, honours, bachelor or equivalent	29	26	1	9	1	6	12	19	43	60	103
Diplomas	410	99	248	54	2	10	43	74	703	237	940
<b>Subtotal</b>	<b>444</b>	<b>125</b>	<b>249</b>	<b>63</b>	<b>3</b>	<b>16</b>	<b>56</b>	<b>94</b>	<b>752</b>	<b>298</b>	<b>1050</b>
<b>Total</b>	<b>976</b>	<b>523</b>	<b>307</b>	<b>122</b>	<b>47</b>	<b>75</b>	<b>450</b>	<b>463</b>	<b>1 780</b>	<b>1 183</b>	<b>2 963</b>

**TABLE 3.10.2: GOVERNMENT SECTOR R&D PERSONNEL HEADCOUNTS BY RACE, QUALIFICATIONS AND GENDER (2007/08)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	29	14	3	2	7	8	101	64	140	88	228
Masters, honours, bachelor or equivalent	219	165	22	38	29	26	176	161	446	390	836
Diplomas	17	26	7	2	1	8	5	8	30	44	74
<b>Subtotal</b>	<b>265</b>	<b>205</b>	<b>32</b>	<b>42</b>	<b>37</b>	<b>42</b>	<b>282</b>	<b>233</b>	<b>616</b>	<b>522</b>	<b>1 138</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	0	0	0	0	0	0	2	0	2	0	2
Masters, honours, bachelor or equivalent	137	87	11	9	8	15	74	95	230	206	436
Diplomas	109	86	19	8	5	4	39	31	172	129	301
<b>Subtotal</b>	<b>246</b>	<b>173</b>	<b>30</b>	<b>17</b>	<b>13</b>	<b>19</b>	<b>115</b>	<b>126</b>	<b>404</b>	<b>335</b>	<b>739</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	5	0	0	0	0	0	1	0	6	0	6
Masters, honours, bachelor or equivalent	27	24	2	9	1	5	10	17	40	55	95
Diplomas	325	111	233	36	2	12	27	70	587	229	816
<b>Subtotal</b>	<b>357</b>	<b>135</b>	<b>235</b>	<b>45</b>	<b>3</b>	<b>17</b>	<b>38</b>	<b>87</b>	<b>633</b>	<b>284</b>	<b>917</b>
<b>Total</b>	<b>868</b>	<b>513</b>	<b>297</b>	<b>104</b>	<b>53</b>	<b>78</b>	<b>435</b>	<b>446</b>	<b>1 653</b>	<b>1 141</b>	<b>2 794</b>



### 3.3.5 R&D in multidisciplinary and other specific areas

#### 3.3.5.1 Multidisciplinary R&D

Table 3.11 presents GOVERD by multidisciplinary R&D. The government sector reported 0.4% of total R&D performed in nanotechnology. Expenditure on R&D performed in biotechnology has increased from R8.6 million in 2007/08 to R21.7 million in 2008/09.

**TABLE 3.11: GOVERD BY MULTIDISCIPLINARY R&D (2008/09 AND 2007/08)**

MULTIDISCIPLINARY AREA OF R&D	2008/09		2007/08	
	R'000	%	R'000	%
Biotechnology	21 729	1.9	8 639	0.7
Nanotechnology	4 652	0.4	0	0.0
Total	26 381	2.3	8 639	0.7
<b>Total R&amp;D expenditure</b>	<b>1 139 676</b>	<b>100</b>	<b>1 154 399</b>	<b>100</b>

#### 3.3.5.2 Government sector R&D expenditure by specific areas of national interest

Total research and development expenditure by specific areas of national interest has dropped by R17 million in 2008/09 (75.9%) (Table 3.12). This drop in R&D expenditure was mostly observed in TB, HIV/AIDS and malaria and in open source software research areas. An increase in R&D expenditure on new materials was also observed in the 2008/09 survey.

**TABLE 3.12: GOVERD BY SPECIFIC AREAS OF NATIONAL INTEREST (2008/09 AND 2007/08)**

SPECIFIC AREAS OF INTEREST	2008/09		2007/08	
	R'000	%	R'000	%
Open source software	4 658	0.4	21 494	1.9
New materials	726	0.1	630	0.1
Tuberculosis (TB), HIV/AIDS, malaria	2	0.0	263	0.0
Total	5 386	0.5	22 387	1.9
<b>Total R&amp;D expenditure</b>	<b>1 139 676</b>	<b>100</b>	<b>1 154 399</b>	<b>100</b>

## Chapter 4

# Higher Education Sector

### 4.1 Introduction

The higher education sector is well-defined in size and scope, and is therefore surveyed as a census. The Frascati Manual (OECD, 2002) describes the higher education sector as comprising all universities, colleges of technology and other institutions of post-secondary education, whatever their source of funding or legal status. It also includes all research institutes, experimental stations and clinics operating under the direct control of, or administered by, or associated with higher education institutions.

The higher education landscape has undergone significant changes in the past due to institutional mergers. The institutions surveyed in the 2005/06 to the current 2008/09 surveys reflect the new higher education landscape in its entirety. All universities and universities of science and technology were surveyed, as well as all private higher education institutions with a research component.

### 4.2 Survey Methods

The 2008/09 survey questionnaire was the same as that used in 2007/08. All higher education institutions used the electronic questionnaire choice with most respondents preferring the Ms Excel version. The use of hard-copy questionnaires in the higher education sector was phased out during the 2006/07 survey.

The choice of unit of measure again varied across the sector. Although the majority of institutions preferred to collect data centrally, some preferred to collect data at faculty level. In total, 24 institutions were surveyed. These included eight universities of science and technology (previously seven – Mangosuthu Technikon has been officially declared a university of technology since the last survey), fifteen universities in the public

sector and one private higher education institution.

The response of the higher education sector to the survey has been generally very good. A response rate of 83% was reported for the 2008/09 survey. Respondents who usually submit a return were able to complete the questionnaire within the deadlines set. The success of this survey, it seems, is largely due to most respondents now anticipating the R&D Survey and incorporating survey specific fields into their institutional data collection mechanisms. However, four medium to low research-intensive institutions failed to return questionnaires. The primary reason for this seems to be that the data are simply not available in the form required by the survey and new respondents, who had no previous knowledge of the R&D Surveys, had to take responsibility for the survey. In these cases supplementary data sources such as HEMIS, NRF, MRC, THRIP and the Innovation Fund were used to populate questionnaires that had missing information and to populate questionnaires for institutions that did not submit a return for the 2008/09 survey. Once questionnaires for these institutions had been populated, they were sent to the research deans at the institutions concerned for signing off.

### 4.3 Detailed Results

#### 4.3.1 Key Results

Table 4.1 shows that the University of Cape Town had the highest R&D expenditure of R698 million in 2008/09 followed by the University of the Witwatersrand (R616 million) and the University of KwaZulu Natal (R554 million). The University of Cape Town also had the highest headcount of researchers (2 321) followed by the University of Pretoria (1 993) and the University of KwaZulu Natal (1 871).



**TABLE 4.1: HIGHER EDUCATION OVERVIEW (2008/09)**

2008/09 RESEARCH AND DEVELOPMENT SURVEY HIGHER EDUCATION	TOTAL R&D EXPENDITURE (R' 000)	RESEARCHER HEADCOUNT	RESEARCHER FTEs	POSTGRAD HEADCOUNT	POSTGRAD FTEs
<b>Private Universities</b>	<b>13 358</b>	<b>53</b>	<b>21.0</b>	<b>0</b>	<b>0.0</b>
Monash University	13 358	53	21.2	0	0.0
<b>Universities</b>	<b>3 885 628</b>	<b>14 086</b>	<b>3 308.0</b>	<b>10 516</b>	<b>6 007.0</b>
Nelson Mandela Metropolitan University	84 510	437	66.3	356	173.9
North West University	226 185	1 298	428.3	796	630.7
Rhodes University	99 897	291	104.0	256	256.0
University of Cape Town	698 000	2 321	545.7	1 467	744.0
University of Fort Hare	10 157	69	13.5	155	93.0
University of Johannesburg	128 455	689	147.3	622	622.0
University of KwaZulu Natal	554 273	1 871	479.6	1 168	506.0
University of Limpopo	32 193	413	65.2	136	59.7
University of Pretoria	551 344	1 993	360.1	1 563	681.5
University of South Africa	146 730	1 051	235.2	778	402.5
University of Stellenbosch	401 557	1 043	300.3	986	521.5
University of the Free State	180 874	109	37.5	587	233.5
University of the Western Cape	132 972	516	221.2	364	218.4
University of the Witwatersrand	616 702	1 754	263.0	1 131	783.0
University of Zululand	21 779	231	40.0	151	81.2
<b>Universities of (Science) and Technology</b>	<b>292 380</b>	<b>2 174</b>	<b>315.0</b>	<b>482</b>	<b>303.0</b>
Cape Peninsula University of Technology	52 321	275	45.8	106	106.0
Central University of Technology	31 174	119	26.0	68	40.3
Durban Institute of Technology	55 076	299	37.0	60	27.7
Mangosuthu Technikon	4 526	32	6.4	0	0.0
Tshwane University of Technology	89 298	455	70.5	157	74.4
University of Venda for Science and Technology	8 931	278	20.0	49	29.4
Vaal University of Technology	19 113	190	29.0	29	16.0
Walter Sisulu University of Technology and Science	31 941	526	80.0	13	9.0
<b>Total</b>	<b>4 191 366</b>	<b>16 313</b>	<b>3 643.0</b>	<b>10 998</b>	<b>6 310.0</b>

Higher education expenditure on research and experimental development (HERD) increased by 15.7% in nominal terms from the figure of R3.6 billion reported in 2007/08 to R4.2 billion in 2008/09,

compared with the 9.8% increase observed in the 2007 academic year (Table 4.2). Higher education accounted for 19.9% of GERD and was the second largest contributor to GERD in 2008/09.

# Higher Education Sector continued

**TABLE 4.2: IN-HOUSE R&D EXPENDITURE PER SECTOR (2008/09, 2007/08 AND 2006/07)**

SECTOR	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
Business enterprise	12 332 012	58.6	10 738 456	57.7	9 243 165	55.9
Government	1 139 676	5.4	1 154 399	6.2	1 021 355	6.2
Higher education	4 191 366	19.9	3 621 862	19.4	3 298 808	20.0
Universities of Technology	292 380	1.4	234 422	1.2	230 236	1.4
Universities	3 885 628	18.5	3 377 829	18.1	3 059 362	18.5
Private higher education	13 358	0.1	9 611	0.1	9 210	0.1
Not-for-profit	240 649	1.1	223 202	1.2	212 538	1.3
Science councils	3 137 343	14.9	2 886 094	15.5	2 744 718	16.6
<b>Grand Total</b>	<b>21 041 046</b>	<b>100</b>	<b>18 624 013</b>	<b>100</b>	<b>16 520 584</b>	<b>100</b>

In 2008/09 HERD as a percentage of GDP remained the same at 0.18% as in 2007/08 (Table 4.3). Total higher education (HE) R&D personnel (FTEs) decreased from 5 168.9 in 2006/07 to 4 859.3 in 2008/09. The

HE researcher FTEs (excluding postgraduate students) have remained relatively stable during the last three survey rounds.

**TABLE 4.3: MAIN INDICATORS OF THE HIGHER EDUCATION SECTOR (2008/09, 2007/08 AND 2006/07)\***

MAIN INDICATORS	2008/09	2007/08	2006/07
HERD (Rand million)	4 191	3 622	3 299
HERD as a % of GDP	0.18%	0.18%	0.19%
Total HE R&D personnel (FTEs)	4 859.3	5 178.1	5 168.9
Total HE researchers* (FTEs)	3 643.5	3 672.3	3 657.8
% HERD financed by Industry	10.8%	14.4%	20.7%

\* Excluding postgraduate students



The higher education sector, including doctoral and postdoctoral students, accounted for approximately 53% of the total R&D human resources in the country during 2008/09. Of the 39 955 researchers in South

Africa, 68.4% (including doctoral and postdoctoral students) are found in the higher education sector (Table 4.4).

**TABLE 4.4: HEADCOUNT OF R&D PERSONNEL BY SECTOR (2008/09 AND 2007/08)\***

SECTOR	RESEARCHERS		TECHNICIANS DIRECTLY SUPPORTING R&D		OTHER PERSONNEL DIRECTLY SUPPORTING R&D		GRAND TOTAL		PERCENTAGE	
	2008/09	2007/08	2008/09	2007/08	2008/09	2007/08	2008/09	2007/08	2008/09	2007/08
Business enterprise	8 560	8 336	5 584	5 303	4 451	4 312	18 595	17 951	31.6	30.2
Government	1 169	1 138	744	739	1 050	917	2 963	2 794	5.0	4.7
Higher education*	16 313	17 008	2 054	2 006	1 856	2 351	20 223	21 365	34.3	36.0
Universities of technology	2 174	2 241	310	331	295	293	2 779	2 865	4.7	4.8
Universities	14 086	14 720	1 743	1 675	1 558	2 056	17 387	18 451	29.5	31.1
Private higher education	53	47	1	0	3	2	57	49	0.1	0.1
Not-for-profit	262	264	77	77	163	161	502	502	0.9	0.8
Science councils	2 648	2 594	1 302	1 351	1 659	2 043	5 609	5 988	9.5	10.1
Grand total	28 952	29 340	9 761	9 476	9 197	9 784	47 892	48 600	81.3	81.9
Higher education doctoral and postdoctoral students	11 003	10 744	-	-	-	-	11 003	10 744	18.7	18.1
Total	39 955	40 084	9 761	9 476	9 197	9 784	58 895	59 344	100	100

\*Excluding postgraduate and postdoctoral students

#### 4.3.2 Financial Data

According to the data presented in Table 4.5 current expenditure (labour costs and other current expenditure) accounted for 93.3% of HERD, with just over 6.7%

investment in infrastructure and research equipment. This is similar to the results of previous surveys.

**TABLE 4.5: HERD BY ACCOUNTING CATEGORY (2008/09, 2007/08 AND 2006/07)**

TYPE OF EXPENDITURE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
Capital expenditure on R&D	281 193	6.7	295 813	8.2	216 037	6.5
Land: buildings and other structures	38 564	0.9	51 734	1.4	69 123	2.1
Vehicles, plant, machinery, equipment	242 629	5.8	244 079	6.7	146 914	4.5
Current expenditure	3 910 173	93.3	3 326 049	91.8	3 082 771	93.5
Labour costs	1 504 542	35.9	1 466 379	40.5	1 376 395	41.7
Total cost of R&D postgraduate students	532 883	12.7	495 128	13.7	438 486	13.3
Other current expenditure	1 872 748	44.7	1 364 542	37.7	1 267 890	38.4
Total	4 191 366	100	3 621 862	100	3 298 808	100



## Higher Education Sector continued

Basic research accounted for the largest proportion of HERD at 46.9%, followed by applied research (35.0%) and experimental research (18.1%), as indicated in Table 4.6. A decrease in basic research was evident

in 2008/09, however when comparing the figures reported in the last three surveys fluctuations in the amount spent on applied R&D are noticeable.

**TABLE 4.6: HERD BY TYPE OF RESEARCH (2008/09, 2007/08 AND 2006/07)\***

TYPE OF RESEARCH	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
Basic research	1 965 121	46.9	1 709 334	47.2	1 348 299	40.9
Applied research	1 468 624	35.0	1 262 425	34.9	1 282 627	38.9
Experimental development	757 621	18.1	650 102	17.9	667 882	20.2
<b>Total</b>	<b>4 191 366</b>	<b>100</b>	<b>3 621 861</b>	<b>100</b>	<b>3 298 808</b>	<b>100</b>

\*Subject to rounding to nearest R'000

General university funds (GUF), comprising own funds and the higher education vote, constituted the largest proportion of higher education R&D funds (47.3%), as indicated in Table 4.7. Data from the last two surveys indicated that the proportion of GUF decreased from 2007/08 until 2008/09, although actual expenditure increased over the period.

Agency funding contributed to 16.4% of higher

education expenditure, whilst 10.8% came from the domestic business sector. In 2006/07 an increase in funding from domestic business to higher education was reported for the first time. However, the 2007/08 data saw this figure drop to 14.4% and the 2008/09 data saw a further drop to 10.8%. Funding from foreign sources increased to 9.8% from 8.8% reported in the previous year.

**TABLE 4.7: HERD BY SOURCE OF FUNDS (2008/09, 2007/08 AND 2006/07)**

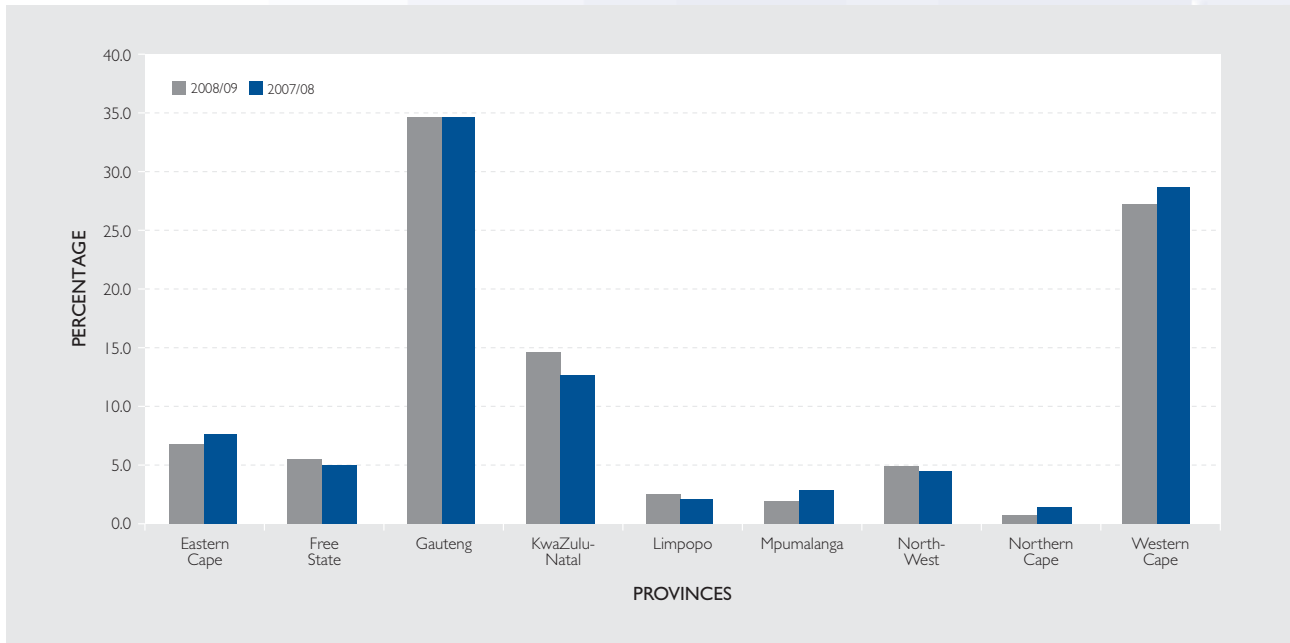
SOURCES OF FUNDS	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>General university funds</b>	<b>1 983 683</b>	<b>47.3</b>	<b>1 734 903</b>	<b>47.9</b>	<b>1 759 499</b>	<b>53.3</b>
<b>External sources</b>	<b>1 697 175</b>	<b>40.5</b>	<b>1 546 458</b>	<b>42.7</b>	<b>1 250 128</b>	<b>37.9</b>
National, provincial and local government	58 377	1.4	64 900	1.8	22 666	0.7
Government research institutes	38 609	0.9	53 150	1.5	41 483	1.3
Agency funding (e.g. NRF, MRC, ARC, etc.)	686 163	16.4	489 580	13.5	449 738	13.6
Science councils	459 842	11.0	419 024	11.6	53 748	1.6
Domestic business	454 184	10.8	519 804	14.4	682 493	20.7
<b>Other South African sources</b>	<b>100 470</b>	<b>2.4</b>	<b>20 215</b>	<b>0.6</b>	<b>10 473</b>	<b>0.3</b>
Higher education institutions	16 704	0.4	7 010	0.2	5 265	0.2
Not for profit organisations	36 593	0.9	10 171	0.3	4 378	0.1
Individual donations	47 173	1.1	3 034	0.1	830	0.0
<b>Foreign sources</b>	<b>410 038</b>	<b>9.8</b>	<b>320 286</b>	<b>8.8</b>	<b>278 708</b>	<b>8.4</b>
<b>Total</b>	<b>4 191 366</b>	<b>100</b>	<b>3 621 862</b>	<b>100</b>	<b>3 298 808</b>	<b>100</b>



The largest proportion of higher education R&D expenditure was in Gauteng (34.9%) followed by the

Western Cape (27.4%) and KwaZulu-Natal (14.7%) – see Figure 4.1.

**FIGURE 4.1: PROVINCIAL DISTRIBUTION OF HIGHER EDUCATION R&D ACTIVITY (2008/09 AND 2007/08)**



### 4.3.3 Orientation of HERD

Table 4.8 shows HERD by research field. The natural, technology and engineering sciences accounted for the largest percentage of R&D expenditure (64.5%), while the social sciences and the humanities accounted for 35.5% in 2008/09. Within Division 1, the medical and

health sciences constituted the largest component of R&D expenditure (23.1%), followed by the engineering sciences (8.4%) and the biological sciences (6.7%). The current survey data reflects consistent increases in expenditure devoted to R&D in the social sciences and humanities.

# Higher Education Sector continued

**TABLE 4.8: HERD BY RESEARCH FIELD (2008/09, 2007/08 AND 2006/07)**

MAIN RESEARCH FIELD	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Natural sciences, technology and engineering</b>	<b>2 703 975</b>	<b>64.5</b>	<b>238 9525</b>	<b>66.0</b>	<b>2 294 479</b>	<b>69.6</b>
Mathematical sciences	151 880	3.6	109 354	3.0	104 323	3.2
Physical sciences	135 002	3.2	146 726	4.1	121 559	3.7
Chemical sciences	136 528	3.3	143 897	4.0	106 214	3.2
Earth sciences	136 955	3.3	121 419	3.4	119 682	3.6
Information, computer and communication	125 413	3.0	119 600	3.3	143 037	4.3
Applied sciences and technologies	78 904	1.9	96 972	2.7	101 400	3.1
Engineering sciences	352 114	8.4	294 630	8.1	349 889	10.6
Biological sciences	282 280	6.7	271 216	7.5	230 480	7.0
Agricultural sciences	192 265	4.6	159 793	4.4	151 950	4.6
Medical and health sciences	966 365	23.1	785 630	21.7	710 386	21.5
Environmental sciences	68 869	1.6	58 793	1.6	58 256	1.8
Material sciences	68 467	1.6	72 484	2.0	86 764	2.6
Marine sciences	8 933	0.2	9 013	0.2	10 539	0.3
<b>Division 2: Social sciences and humanities</b>	<b>1 487 391</b>	<b>35.5</b>	<b>1 232 337</b>	<b>34.0</b>	<b>1 004 329</b>	<b>30.4</b>
Social sciences	967 204	23.1	796 281	22.0	658 419	20.0
Humanities	520 187	12.4	436 056	12.0	345 910	10.5
<b>Total</b>	<b>4 191 366</b>	<b>100</b>	<b>3 621 862</b>	<b>100</b>	<b>3 298 808</b>	<b>100</b>



Table 4.9 reflects HERD by socio-economic objectives (SEOs). The largest proportion of HERD was devoted

to economic development (36.7%), followed by society (32.4%) and the advancement of knowledge (22.6%).

**TABLE 4.9: HERD BY SOCIO-ECONOMIC OBJECTIVE (2008/09, 2007/08 AND 2006/07)**

SOCIO-ECONOMIC OBJECTIVE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Defence</b>	<b>5150</b>	<b>0.1</b>	<b>4328</b>	<b>0.1</b>	<b>2 711</b>	<b>0.1</b>
<b>Division 2: Economic development</b>	<b>1 539 534</b>	<b>36.7</b>	<b>1 271 620</b>	<b>35.1</b>	<b>1 199 956</b>	<b>36.4</b>
Economic development unclassified	209 400	5.0	171 520	4.7	150 668	4.6
Plant production and plant primary products	153 054	3.7	123 126	3.4	119 949	3.6
Animal production & primary products	117 255	2.8	95 219	2.6	85 256	2.6
Mineral resources (excluding energy)	88 576	2.1	74 725	2.1	89 559	2.7
Energy resources	71 648	1.7	84 459	2.3	51 923	1.6
Energy supply	106 457	2.5	96 209	2.7	90 365	2.7
Manufacturing	210 009	5.0	172 947	4.8	210 910	6.4
Construction	46 175	1.1	28 313	0.8	27 521	0.8
Transport	29 517	0.7	22 770	0.6	16 447	0.5
Information and communication services	87 013	2.1	67 026	1.9	80 322	2.4
Commercial services	54 604	1.3	93 285	2.6	41 037	1.2
Economic framework	193 599	4.6	164 759	4.5	133 600	4.0
Natural resources	172 228	4.1	77 260	2.1	102 399	3.1
<b>Division 3: Society</b>	<b>1 359 797</b>	<b>32.4</b>	<b>1 149 091</b>	<b>31.7</b>	<b>1 062 182</b>	<b>32.2</b>
Society unclassified	209 400	5.0	171 520	4.7	150 668	4.6
Health	644 763	15.4	556 914	15.4	507 767	15.4
Education and training	227 502	5.4	195 917	5.4	199 056	6.0
Social development and community services	278 132	6.6	224 740	6.2	204 691	6.2
<b>Division 4: Environment</b>	<b>339 148</b>	<b>8.1</b>	<b>317 863</b>	<b>8.8</b>	<b>261 464</b>	<b>7.9</b>
Environment unclassified	69 800	1.7	57 173	1.6	50 223	1.5
Environmental knowledge	135 472	3.2	108 189	3.0	112 319	3.4
Environmental aspects of development	72 050	1.7	93 853	2.6	42 619	1.3
Environmental and other aspects	61 826	1.5	58 648	1.6	56 303	1.7
<b>Division 5: Advancement of knowledge</b>	<b>947 737</b>	<b>22.6</b>	<b>878 959</b>	<b>24.3</b>	<b>772 495</b>	<b>23.4</b>
Advancement of knowledge unclassified	209 400	5.0	171 520	4.7	150 668	4.6
Natural sciences, technologies and engineering	423 469	10.1	416 081	11.5	329 497	10.0
Social sciences and humanities	314 868	7.5	291 359	8.0	292 330	8.9
<b>Total</b>	<b>4 191 366</b>	<b>100</b>	<b>3 621 862</b>	<b>100</b>	<b>3 298 808</b>	<b>100</b>

## Higher Education Sector continued

### 4.3.4 R&D Personnel

The number of researchers, excluding post-graduate students, employed in the higher education sector has decreased by 4.1% since the last survey (Table 4.10). Time spent on research by researchers in the sector has increased to 22.3% in 2008/09 compared to the 21.6%

reported in 2007/08. The representation of women researchers in the sector has remained fairly static during the last three surveys at 43.3% in 2006/07; 42.7% in 2007/08 and 43.1% in 2008/09. Note that post-graduate students are not included in these proportions.

**TABLE 4.10: HE R&D PERSONNEL HEADCOUNT AND FULL-TIME EQUIVALENTS (2008/09, 2007/08 AND 2006/07)\***

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
	MALE	FEMALE	TOTAL	FTEs	FTEs AS % OF HEADCOUNT
<b>2008/09</b>					
Researchers	9 283	7 030	16 313	3 643.5	22.3
Technicians	1 214	840	2 054	541.7	26.4
Other personnel	692	1 164	1 856	674.2	36.3
<b>Total</b>	<b>11 189</b>	<b>9 034</b>	<b>20 223</b>	<b>4 859.3</b>	<b>24.0</b>
<b>2007/08</b>					
Researchers	9 754	7 254	17 008	3 672.3	21.6
Technicians	1 231	775	2 006	612.8	30.5
Other personnel	791	1 560	2 351	893.0	38.0
<b>Total</b>	<b>11 776</b>	<b>9 589</b>	<b>21 365</b>	<b>5 178.1</b>	<b>24.2</b>
<b>2006/07</b>					
Researchers	9 900	7 559	17 459	3 657.8	21.0
Technicians	1 356	814	2 170	643.8	29.7
Other personnel	725	1 392	2 117	867.3	41.0
<b>Total</b>	<b>11 981</b>	<b>9 765</b>	<b>21 746</b>	<b>5 168.9</b>	<b>23.8</b>

\*Excluding post-graduates



Table 4.11 indicates an increase in the headcounts of post-doctoral students and a slight decrease in post doctoral FTEs in 2008/09. An increase was also noted in the doctoral headcounts and FTEs. Post-doctoral fellows spend 85.9% of their time on research, while doctoral students spend 55.6% of their time on research. This trend appears to have been consistent for the last three years. However, it is important to note that an agreed FTE standard for PhD students must be used, as any inconsistencies in this large group may

introduce distortions. Masters students with a research component have indicated that they spend 43.4% of their time doing research, which is also consistent for the last three surveys. An FTE must also take into account that many students study on a part-time basis. According to the OECD guidelines masters students are not counted as researchers. Just over 53.4% of postgraduate students were male. About 40.7% of post-doctoral fellows and 41.7% of doctoral students were female In 2008/09.

**TABLE 4.11: HE POSTGRADUATE STUDENT HEADCOUNT AND FTE BY GENDER AND QUALIFICATION (2008/09, 2007/08, 2006/07)**

QUALIFICATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
	MALE	FEMALE	TOTAL	FTEs	FTEs AS % OF HEADCOUNT
<b>2008/09</b>					
Post-doctoral fellows	372	255	627	538.9	85.9
Doctoral students	6 045	4 331	10 376	5 770.8	55.6
Masters students	13 100	12 424	25 524	11 074.1	43.4
<b>Total</b>	<b>19 517</b>	<b>17 010</b>	<b>36 527</b>	<b>17 383.7</b>	<b>47.6</b>
<b>2007/08</b>					
Post-doctoral fellows	346	269	615	599.2	97.4
Doctoral students	5 554	4 575	10 129	5 728.0	56.6
Masters students	13 113	11 898	25 011	11 154.8	44.6
<b>Total</b>	<b>19 013</b>	<b>16 742</b>	<b>35 755</b>	<b>17 481.9</b>	<b>48.9</b>
<b>2006/07</b>					
Post-doctoral fellows	323	219	542	501.3	92.5
Doctoral students	5 621	4 124	9 745	5 331.8	54.7
Masters students	13 036	11 955	24 991	11 039.8	44.2
<b>Total</b>	<b>18 980</b>	<b>16 298</b>	<b>35 278</b>	<b>16 873.0</b>	<b>47.8</b>

Tables 4.12.1 and 4.12.2 provide a breakdown of total R&D personnel by race, gender and qualification within the higher education sector. The breakdown of researcher personnel by race in the higher education sector in 2008/09 was as follows: Whites represented the majority of researchers in the sector (63.5%), followed by Africans (22.0%), Indians (8.9%) and Coloureds (5.5%).

In 2007/08 the breakdown was: Whites (62.8%), Africans (23.4%), Indians 8.6% and Coloureds (5.2%). Researchers holding doctoral degrees were still predominantly White (74.0%) in the higher education sector during 2008/09. Approximately 43% of researchers in the sector were women. This percentage split has remained largely the same for the last three surveys.

# Higher Education Sector continued

**TABLE 4.12.1: HE R&D PERSONNEL HEADCOUNT BY GENDER, POPULATION GROUP AND QUALIFICATION (2008/09)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	600	230	183	116	251	120	2 762	1 503	3 796	1 969	5 765
Masters, honours, bachelor or equivalent	1 205	736	226	240	305	293	2 216	2 250	3 952	3 519	7 471
Diplomas	464	361	70	69	244	239	757	873	1 535	1 542	3 077
<b>Subtotal</b>	<b>2 269</b>	<b>1 327</b>	<b>479</b>	<b>425</b>	<b>800</b>	<b>652</b>	<b>5 735</b>	<b>4 626</b>	<b>9 283</b>	<b>7 030</b>	<b>16 313</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	1	2	0	0	0	2	4	8	5	12	17
Masters, honours, bachelor or equivalent	71	53	16	16	32	16	88	114	207	199	406
Diplomas	267	168	180	84	96	49	459	328	1 002	629	1 631
<b>Subtotal</b>	<b>339</b>	<b>223</b>	<b>196</b>	<b>100</b>	<b>128</b>	<b>67</b>	<b>551</b>	<b>450</b>	<b>1 214</b>	<b>840</b>	<b>2 054</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	19	10	9	4	3	2	49	43	80	59	139
Masters, honours, bachelor or equivalent	73	65	10	17	28	23	90	164	201	269	470
Diplomas	150	184	63	112	29	36	169	504	411	836	1 247
<b>Subtotal</b>	<b>242</b>	<b>259</b>	<b>82</b>	<b>133</b>	<b>60</b>	<b>61</b>	<b>308</b>	<b>711</b>	<b>692</b>	<b>1 164</b>	<b>1 856</b>
<b>Total</b>	<b>2 850</b>	<b>1 809</b>	<b>757</b>	<b>658</b>	<b>988</b>	<b>780</b>	<b>6 594</b>	<b>5 787</b>	<b>11 189</b>	<b>9 034</b>	<b>20 223</b>

**TABLE 4.12.2: HE R&D PERSONNEL HEADCOUNT BY GENDER, POPULATION GROUP AND QUALIFICATION (2007/08)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	632	271	183	117	263	124	2 790	1 404	3 868	1 916	5 784
Masters, honours, bachelor or equivalent	1 373	932	216	233	382	331	2 483	2 454	4 454	3 950	8 404
Diplomas	387	388	66	63	178	193	801	744	1 432	1 388	2 820
<b>Subtotal</b>	<b>2 392</b>	<b>1 591</b>	<b>465</b>	<b>413</b>	<b>823</b>	<b>648</b>	<b>6 074</b>	<b>4 602</b>	<b>9 754</b>	<b>7 254</b>	<b>17 008</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	1	1	0	1	0	1	8	15	9	18	27
Masters, honours, bachelor or equivalent	62	42	18	18	17	13	75	100	172	173	345
Diplomas	320	175	195	75	71	37	464	297	1 050	584	1 634
<b>Subtotal</b>	<b>383</b>	<b>218</b>	<b>213</b>	<b>94</b>	<b>88</b>	<b>51</b>	<b>547</b>	<b>412</b>	<b>1 231</b>	<b>775</b>	<b>2 006</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	29	18	9	4	3	5	60	55	101	82	183
Masters, honours, bachelor or equivalent	83	88	24	45	10	17	96	229	213	379	592
Diplomas	208	266	84	179	33	42	152	612	477	1 099	1 576
<b>Subtotal</b>	<b>320</b>	<b>372</b>	<b>117</b>	<b>228</b>	<b>46</b>	<b>64</b>	<b>308</b>	<b>896</b>	<b>791</b>	<b>1 560</b>	<b>2 351</b>
<b>Total</b>	<b>3 095</b>	<b>2 181</b>	<b>795</b>	<b>735</b>	<b>957</b>	<b>763</b>	<b>6 929</b>	<b>5 910</b>	<b>11 776</b>	<b>9 589</b>	<b>21365</b>



### 4.3.5 R&D in multidisciplinary and other specific areas

#### 4.3.5.1 Multidisciplinary R&D

R&D expenditure by national priority areas is shown in Table 4.13. About 10.9% of HERD was dedicated to the multidisciplinary R&D areas of biotechnology

and nanotechnology, with 7.2% of this dedicated to biotechnology and 3.7% to nanotechnology.

**TABLE 4.13: HERD BY MULTIDISCIPLINARY R&D (2008/09 AND 2008/07)**

MULTIDISCIPLINARY AREA OF R&D	2008/09		2007/08	
	R'000	%	R'000	%
Biotechnology	303 483	7.2	253 872	7.0
Nanotechnology	153 013	3.7	170 405	4.7
<b>Total</b>	<b>456 496</b>	<b>10.9</b>	<b>424 277</b>	<b>11.7</b>
<b>Total R&amp;D expenditure</b>	<b>4 191 366</b>	<b>100</b>	<b>3 621 862</b>	<b>100</b>

#### 4.3.5.2 Higher education sector R&D expenditure by specific areas of national interest

Table 4.14 indicates that 21.5% of higher education R&D expenditure was devoted to the areas of national interest: open source software, new materials,

tuberculosis, HIV/AIDS and malaria in 2008/09. Research on health related issues consumed the bulk of this expenditure (15.5%).

**TABLE 4.14: HERD BY SPECIFIC AREAS OF NATIONAL INTEREST (2008/09 AND 2007/08)**

SPECIFIC AREAS OF INTEREST	2008/09		2007/08	
	R'000	%	R'000	%
Open source software	49 532	1.2	41 234	1.1
New materials	202 242	4.8	160 993	4.4
Tuberculosis (TB), HIV/AIDS, malaria	650 502	15.5	583 726	16.1
<b>Total</b>	<b>902 276</b>	<b>21.5</b>	<b>785 953</b>	<b>21.7</b>
<b>Total R&amp;D expenditure</b>	<b>4 191 366</b>	<b>100</b>	<b>3 621 862</b>	<b>100</b>



## Chapter 5

# Not-for-profit Sector

### 5.1 Introduction

The Not-for-profit sector covers the non-market, private non-profit institutions serving the general public.

### 5.2 Survey Methods

The 2008/09 R&D survey methodology for the NPO sector remained largely unchanged. A purposive sampling method was followed whereby NPOs that were considered likely to undertake R&D activities, as well as organisations whose primary activities had not yet been clarified, were surveyed. Previous surveys showed marginal adjustments in the methodology with the aim of ensuring a better response rate.

The baseline register compiled for the first survey (2001/02) is continuously updated and expanded for each R&D Survey using various sources including internet searches, newspaper reports, journals and referrals. The NPO sample consists of organisations that previously completed a questionnaire, as well as large and likely R&D performers. Experience from past surveys showed that only about 20–30 organisations actually took the time to complete the R&D questionnaire. The 2007/08 and the 2008/09 surveys used the existing register which had been updated and included 90 organisations to which questionnaires were sent. The NPO register appears to be more or less static in number, because the number of organisations added is balanced by the number that had to be removed because they had closed down or become untraceable. The task at hand is to continuously identify and include the as yet unknown NPOs that conduct research.

Questionnaires were sent by post and email to the 90 NPOs identified and selected for the 2008/09 survey. These were followed up with telephonic support and reminders. Attempts were made to complete some questionnaires telephonically. Another strategy was to

contact respondents to enquire if their information or R&D activities had remained the same as previously reported. If it had, we asked for permission to reuse their information collected in the previous survey (adjusted by the current inflation rate).

A total of 32 questionnaires including commuted questionnaires accounted for the 2008/09 NPO financial and human resource data. Commuted questionnaires were compiled from historic information from previous R&D surveys, annual reports and some telephonic enquiries. Returned questionnaires were checked for completeness and accuracy of data before uploading into the SMRS.

The poor return rate underlines the necessity of finding new strategies for surveying the NPO sector as the current method or survey instrument is insufficient to measure R&D in the sector. CeSTII is also involved in the process with Stats SA of drawing up a SASQAF quality management plan that will aim to address various issues, including poor response rates and commutation of data for the sector. The research team has succeeded in compiling a register of NPOs and has good historical data collected over the last six years. New efforts will be made to extend the register significantly for future surveys. This can help improve efforts to gain more insight into this sector and to ensure that the quality of each survey improves.

### 5.3 Detailed Results

#### 5.3.1 Key Results

As was the case in the previous surveys, the NPO sector still accounts for the smallest proportion (1.1%) of total R&D expenditure across all sectors in South Africa. The 2008/09 R&D survey found steady increases in the nominal R&D spend over the last three surveys (Table 5.1) with total R&D expenditure for 2008/09 of R240 million.



**TABLE 5.1: IN-HOUSE R&D EXPENDITURE BY SECTOR (2008/09, 2007/08 AND 2006/07)**

SECTOR	2008/09		2007/08		2006/07	
	R'000S	%	R'000S	%	R'000S	%
Business enterprise	12 332 012	58.6	10 738 456	57.7	9 243 165	55.9
Government	1 139 676	5.4	1 154 399	6.2	1 021 355	6.2
Higher education	4 191 366	19.9	3 621 862	19.4	3 298 808	20.0
Not-for-profit	240 649	1.1	223 202	1.2	212 538	1.3
Science councils	3 137 343	14.9	2 886 094	15.5	2 744 718	16.6
<b>Grand Total</b>	<b>21 041 046</b>	<b>100</b>	<b>18 624 013</b>	<b>100</b>	<b>16 520 584</b>	<b>100</b>

NPO expenditure on R&D as a percentage of GDP has remained the same at 0.01% in 2006/07, 2007/08 and 2008/09 (Table 5.2). Total NPO R&D personnel

and researchers (FTEs in both cases) remained relatively stable over the last three survey rounds.

**TABLE 5.2: MAIN INDICATORS OF THE NPO SECTOR (2008/09, 2007/08 AND 2006/07)**

MAIN INDICATORS	2008/09	2007/08	2006/07
Not for profit domestic expenditure on R&D (Rand million)	241	223	213
Not for profit expenditure on R&D as a % of GDP	0.01%	0.01%	0.01%
Total NPO R&D personnel (FTEs)	366.4	379.1	362.7
Total NPO researchers (FTEs)	207.6	215.6	203.6
% of NPO expenditure on R&D financed by industry	11.0%	10.7%	11.5%
% of NPO expenditure on R&D financed by government	13.6%	15.0%	14.0%

In the last two surveys R&D personnel in the NPO sector made up approximately 1% of the total R&D workforce (Table 5.3). The 2008/09 survey results indicate that

the NPO sector accounted for 262 researchers, 0.9% of the national total of researchers.

**TABLE 5.3: HEADCOUNT OF R&D PERSONNEL BY SECTOR (2008/09 AND 2007/08)**

SECTORS	RESEARCHERS		TECHNICIANS DIRECTLY SUPPORTING R&D		OTHER PERSONNEL DIRECTLY SUPPORTING R&D		GRAND TOTAL		PERCENTAGE	
	08/09	07/08	08/09	07/08	08/09	07/08	08/09	07/08	08/09	07/08
Business enterprise	8 560	8 336	5 584	5 303	4 451	4 312	18 595	17 951	38.8	36.9
Government	1 169	1 138	744	739	1 050	917	2 963	2 794	6.2	5.7
Higher education*	16 313	17 008	2 054	2 006	1 856	2 351	20 223	21 365	42.2	44.0
Not-for-profit	262	264	77	77	163	161	502	502	1.0	1.0
Science councils	2 648	2 594	1 302	1 351	1 659	2 043	5 609	5 988	11.7	12.3
<b>Grand total</b>	<b>28 952</b>	<b>29 340</b>	<b>97 61</b>	<b>9 476</b>	<b>9 179</b>	<b>9 784</b>	<b>47 892</b>	<b>48 600</b>	<b>100</b>	<b>100</b>
Higher education doctoral and postdoctoral students	11 003	10 744	-	-	-	-	11 003	10744	-	-
<b>Total</b>	<b>39 955</b>	<b>40 084</b>	<b>9 761</b>	<b>9 476</b>	<b>9 179</b>	<b>9 784</b>	<b>58 895</b>	<b>59 344</b>	<b>100</b>	<b>100</b>

\*Excluding postgraduate and postdoctoral students

## Not-for-profit Sector continued

### 5.3.2 Financial Data

Current expenditure totalled R233 million and comprised labour costs and other operational expenses (Table 5.4). It accounted for the greater proportion (97.0%) of total NPO expenditure on R&D. The cost of infrastructure, equipment and buildings,

and maintenance of physical plant accounted for the remaining 3.0%. The trend in the percentage breakdown of capital and current expenditure remained similar to that recorded for the last three R&D Surveys.

**TABLE 5.4: NPO R&D BY ACCOUNTING CATEGORY (2008/09, 2007/08 AND 2006/07)**

TYPE OF EXPENDITURE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Capital expenditure on R&amp;D</b>	<b>7 249</b>	<b>3.0</b>	<b>7 025</b>	<b>3.1</b>	<b>6 974</b>	<b>3.3</b>
Land: buildings and other structures	3 137	1.3	2 959	1.3	2 624	1.2
Vehicles, plant, machinery, equipment	4 112	1.7	4 066	1.8	4 350	2.0
<b>Current expenditure</b>	<b>233 400</b>	<b>97.0</b>	<b>216 177</b>	<b>96.9</b>	<b>205 564</b>	<b>96.7</b>
Labour costs	114 292	47.5	109 147	48.9	98 631	46.4
Other current expenditure	119 108	49.5	107 030	48.0	106 933	50.3
<b>Total</b>	<b>240 649</b>	<b>100</b>	<b>223 202</b>	<b>100</b>	<b>212 538</b>	<b>100</b>

Table 5.5 shows that more than half (54.5%) of the total R&D expenditure in the NPO sector was used to

support applied research, followed by basic research (29.4%) and experimental development (16.1%).

**TABLE 5.5: NPO R&D EXPENDITURE BY TYPE OF RESEARCH (2008/09, 2007/08 AND 2006/07)**

TYPE OF RESEARCH	2008/09		2007/08		2006/07	
	R'000S	%	R'000	%	R'000	%
Basic research	70 725	29.4	65 337	29.3	54 915	25.8
Applied research	131 259	54.5	119 982	53.8	110 698	52.1
Experimental development	38 665	16.1	37 883	17.0	46 925	22.1
<b>Total</b>	<b>240 649</b>	<b>100</b>	<b>223 202</b>	<b>100</b>	<b>212 538</b>	<b>100</b>



It is a characteristic of the NPO sector that international development agencies are the largest source of funding as indicated in Table 5.6. Funding from foreign sources has been increasing steadily each year from 55.8%

(2006/07) to 58.9% (2007/08) and 59.6% (2008/09). Funding from government increased marginally, from 2006/07 to 2007/08, but the 2008/09 data shows a drop from 15.0% (2007/08) to 13.6% (2008/09).

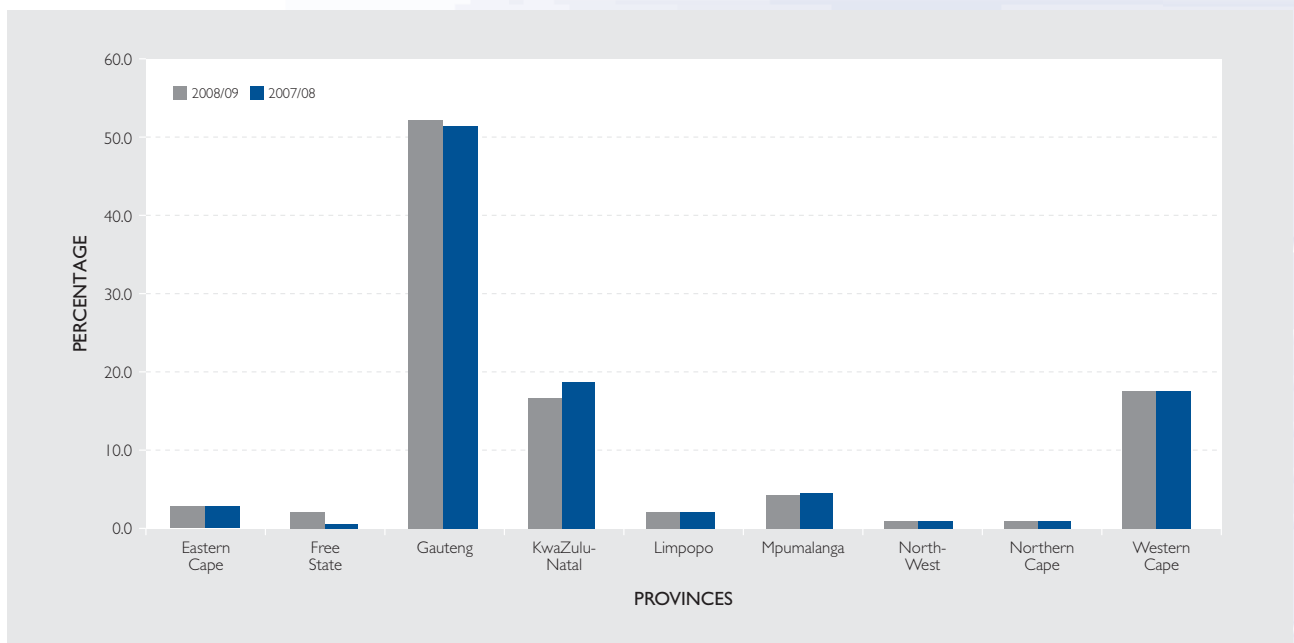
**TABLE 5.6: NPO R&D EXPENDITURE BY SOURCES OF FUNDS (2008/09, 2007/08 AND 2006/07)**

SOURCE OF FUNDS	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Organisation</b>	<b>9 650</b>	<b>4.0</b>	<b>6 325</b>	<b>2.8</b>	<b>14 974</b>	<b>7.0</b>
Own funds	9 650	4.0	6 325	2.8	14 974	7.0
<b>Government</b>	<b>32 711</b>	<b>13.6</b>	<b>33 399</b>	<b>15.0</b>	<b>29 816</b>	<b>14.0</b>
Grants	21 724	9.0	18 301	8.2	17 352	8.2
Contracts	10 987	4.6	15 098	6.8	12 464	5.9
<b>Business</b>	<b>26 591</b>	<b>11.0</b>	<b>23 791</b>	<b>10.7</b>	<b>24 339</b>	<b>11.5</b>
Business (Domestic only)	26 591	11.0	23 791	10.7	24 339	11.5
<b>Other South African sources</b>	<b>28 297</b>	<b>11.8</b>	<b>28 162</b>	<b>12.6</b>	<b>24 736</b>	<b>11.6</b>
Higher education	3 442	1.4	3 134	1.4	2 722	1.3
Not for profit organisations	19 473	8.1	18 758	8.4	19 100	9.0
Individual donations	5 382	2.2	6 270	2.8	2 914	1.4
<b>Foreign</b>	<b>143 400</b>	<b>59.6</b>	<b>131 525</b>	<b>58.9</b>	<b>118 673</b>	<b>55.8</b>
All sources	143 400	59.6	131 525	58.9	118 673	55.8
<b>Total</b>	<b>240 649</b>	<b>100</b>	<b>223 202</b>	<b>100</b>	<b>212 538</b>	<b>100</b>

Figure 5.1 shows that R&D expenditure was mainly concentrated in Gauteng (52.4%), followed by the

Western Cape (17.7%) and KwaZulu-Natal (16.8%) during 2008/09.

**FIGURE 5.1: PROVINCIAL DISTRIBUTION OF R&D ACTIVITY (2008/09 AND 2007/08)**



## Not-for-profit Sector continued

### 5.3.3 NPO R&D Orientation

NPO R&D expenditure on social sciences was 70.1% in 2008/09 with the remaining 29.9% being spent on natural sciences (Table 5.7).

**TABLE 5.7: NPO R&D EXPENDITURE BY RESEARCH FIELDS (2008/09, 2007/08 AND 2006/07)**

MAIN RESEARCH FIELD	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Natural sciences, technology and engineering</b>	<b>72 018</b>	<b>29.9</b>	<b>61 494</b>	<b>27.6</b>	<b>53 937</b>	<b>25.4</b>
Mathematical sciences	1 041	0.4	0	0.0	0	0.0
Physical sciences	0	0.0	0	0.0	0	0.0
Chemical sciences	0	0.0	0	0.0	0	0.0
Earth sciences	1 012	0.4	459	0.2	185	0.1
Information, computer and communication	1 555	0.6	1 446	0.6	925	0.4
Applied sciences and technologies	0	0.0	0	0.0	1 407	0.7
Engineering sciences	0	0.0	0	0.0	0	0.0
Biological sciences	2 126	0.9	2 005	0.9	1 874	0.9
Agricultural sciences	19 426	8.1	18 324	8.2	17 234	8.1
Medical and health sciences	36 032	15.0	29 603	13.3	25 237	11.9
Environmental sciences	8 396	3.5	7 363	3.3	3 097	1.5
Material sciences	0	0.0	0	0.0	0	0.0
Marine sciences	2 431	1.0	2 294	1.0	3 978	1.9
<b>Division 2: Social sciences and humanities</b>	<b>168 631</b>	<b>70.1</b>	<b>161 708</b>	<b>72.4</b>	<b>158 601</b>	<b>74.6</b>
Social sciences	165 924	68.9	159 155	71.3	156 574	73.7
Humanities	2 707	1.1	2 553	1.1	2 027	1.0
<b>Total</b>	<b>240 649</b>	<b>100</b>	<b>223 202</b>	<b>100</b>	<b>212 538</b>	<b>100</b>



Expenditure by socio-economic objectives (SEOs) in the NPO section was the highest in Division 3: Society at 58.7%, followed by Division 2: Economic development at 29.0%, as seen in Table 5.8. In 2008/09 the main

thrust observed in Division 3 was social development and community services (29.7%), followed by health (15.6%) and education and training (13.4%).

**TABLE 5.8: NPO R&D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2008/09, 2007/08 AND 2006/07)**

SOCIO-ECONOMIC OBJECTIVE	2008/09		2007/07		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Defence</b>	<b>2 050</b>	<b>0.9</b>	<b>1 438</b>	<b>0.6</b>	<b>1 312</b>	<b>0.6</b>
Defence	2 050	0.9	1 438	0.6	1 312	0.6
<b>Division 2: Economic development</b>	<b>69 810</b>	<b>29.0</b>	<b>63 450</b>	<b>28.4</b>	<b>61 743</b>	<b>29.1</b>
Economic development unclassified	0	0.0	0	0.0	0	0.0
Plant production and plant primary products	17 520	7.3	16 030	7.2	13 996	6.6
Animal production and animal primary products	972	0.4	918	0.4	1 850	0.9
Mineral resources (excluding energy)	0	0.0	0	0.0	0	0.0
Energy resources	1 760	0.7	1 000	0.4	656	0.3
Energy supply	2 575	1.1	1 438	0.6	1 312	0.6
Manufacturing	0	0.0	0	0.0	0	0.0
Construction	0	0.0	0	0.0	0	0.0
Transport	74	0.0	70	0.0	0	0.0
Information and communication services	0	0.0	0	0.0	1 388	0.7
Commercial services	827	0.3	782	0.4	622	0.3
Economic framework	39 059	16.2	36 588	16.4	37 516	17.7
Natural resources	7 022	2.9	6 624	3.0	4 403	2.1
<b>Division 3: Society</b>	<b>141 189</b>	<b>58.7</b>	<b>129 159</b>	<b>57.9</b>	<b>127 170</b>	<b>59.8</b>
Society unclassified	0	0.0	0	0.0	0	0.0
Health	37 461	15.6	33 549	15.0	28 057	13.2
Education and training	32 308	13.4	32 161	14.4	38 907	18.3
Social development and community services	71 420	29.7	63 449	28.4	60 206	28.3
<b>Division 4: Environment</b>	<b>6 937</b>	<b>2.9</b>	<b>5 885</b>	<b>2.6</b>	<b>4 493</b>	<b>2.1</b>
Environment unclassified	0	0.0	0	0.0	0	0.0
Environmental knowledge	3 406	1.4	2 553	1.1	1 090	0.5
Environmental aspects of development	593	0.2	559	0.3	209	0.1
Environmental and other aspects	2 938	1.2	2 773	1.2	3 194	1.5
<b>Division 5: Advancement of knowledge</b>	<b>20 663</b>	<b>8.6</b>	<b>23 271</b>	<b>10.4</b>	<b>17 819</b>	<b>8.4</b>
Advancement of knowledge unclassified	0	0.0	0	0.0	0	0.0
Natural sciences, technologies and engineering	486	0.2	459	0.2	925	0.4
Social sciences and humanities	20 177	8.4	22 812	10.2	16 894	7.9
<b>Total</b>	<b>240 649</b>	<b>100</b>	<b>223 203</b>	<b>100</b>	<b>212 537</b>	<b>100</b>

## Not-for-profit Sector continued

### 5.3.4 R&D Personnel

Table 5.9 indicates the NPO sector accounted for 262 researchers, 77 technicians and 163 other personnel directly supporting R&D in 2008/09. There were 207.6 FTE researchers in the NPO sector, spending an average of about 79.2% of their time on research. This indicates a slight decrease in FTE numbers as well as time spent on research from 2007/08. The number of FTE technicians remained static at 56.5 as did the time they reported spending on R&D at 73.4%. Support

staff accounted for 102.3 FTEs and dedicated 62.8% of their time to R&D again representing decreases from 2007/08. Females were once again well represented accounting for 55.2% of the total headcounts and 46.6% of researchers. Previous surveys show the same pattern, indicating that despite females making up the greater proportion of total R&D personnel, male researchers are still in the majority.

**TABLE 5.9: NPO R&D PERSONNEL HEADCOUNT AND FULL-TIME EQUIVALENTS (2008/09, 2007/08 AND 2006/07)**

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
	MALE	FEMALE	TOTAL	FTEs	FTEs AS % OF HEADCOUNT
<b>2008/09</b>					
Researchers	140	122	262	207.6	79.2
Technicians	44	33	77	56.5	73.4
Other personnel	41	122	163	102.3	62.8
<b>Total</b>	<b>225</b>	<b>277</b>	<b>502</b>	<b>366.4</b>	<b>73.0</b>
<b>2007/8</b>					
Researchers	134	130	264	215.6	81.7
Technicians	44	33	77	56.5	73.4
Other personnel directly supporting R&D	41	120	161	107.0	66.5
<b>Total</b>	<b>219</b>	<b>283</b>	<b>502</b>	<b>379.1</b>	<b>75.5</b>
<b>2006/07</b>					
Researchers	127	125	252	203.6	80.8
Technicians	43	34	77	55.3	71.8
Other personnel	38	117	155	103.9	67.0
<b>Total</b>	<b>208</b>	<b>276</b>	<b>484</b>	<b>362.7</b>	<b>74.9</b>

Tables 5.10.1 and 5.10.2 provide a breakdown of total R&D personnel by race, gender and qualification within the NPO sector for 2008/09 and 2007/08 respectively. The 2008/09 R&D Survey showed that of the total R&D personnel in the NPO sector, Africans (41.0%)

and Whites (40.8%) make up the biggest proportions followed by, Coloureds (10.2%) and Indians (8.0%). Just over half of the R&D personnel (52.2%) consist of researchers. Approximately 10% of the NPO R&D personnel have doctoral degrees.



**TABLE 5.10.1 : NPO R&D PERSONNEL HEADCOUNT BY GENDER, POPULATION GROUP AND QUALIFICATION LEVEL (2008/09)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	6	1	3	1	1	0	26	7	37	9	46
Masters, honours, bachelor or equivalent	49	29	7	3	4	14	41	64	100	111	211
Diplomas	3	1	0	0	0	1	0	0	3	2	5
<b>Subtotal</b>	<b>58</b>	<b>31</b>	<b>10</b>	<b>4</b>	<b>5</b>	<b>16</b>	<b>67</b>	<b>71</b>	<b>140</b>	<b>122</b>	<b>262</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	0	0	0	0	0	0	0	0	0	0	0
Masters, honours, bachelor or equivalent	10	12	3	2	2	4	7	2	22	20	42
Diplomas	14	5	0	3	2	1	6	4	22	13	35
<b>Subtotal</b>	<b>24</b>	<b>17</b>	<b>3</b>	<b>5</b>	<b>4</b>	<b>5</b>	<b>13</b>	<b>6</b>	<b>44</b>	<b>33</b>	<b>77</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	0	0	0	0	0	0	3	2	3	2	5
Masters, honours, bachelor or equivalent	6	25	0	10	2	3	13	15	21	52	73
Diplomas	10	35	4	15	2	3	1	14	17	67	84
<b>Subtotal</b>	<b>16</b>	<b>60</b>	<b>4</b>	<b>25</b>	<b>4</b>	<b>6</b>	<b>17</b>	<b>31</b>	<b>41</b>	<b>122</b>	<b>163</b>
<b>Total</b>	<b>98</b>	<b>108</b>	<b>17</b>	<b>34</b>	<b>13</b>	<b>27</b>	<b>97</b>	<b>108</b>	<b>225</b>	<b>277</b>	<b>502</b>

**TABLE 5.10.2 NPO R&D PERSONNEL HEADCOUNT BY GENDER, POPULATION GROUP AND QUALIFICATION LEVEL (2007/08)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	7	1	3	0	1	0	21	5	32	6	38
Masters, honours, bachelor or equivalent	48	29	7	3	4	14	39	56	99	102	201
Diplomas	3	21	0	0	0	1	0	0	3	22	25
<b>Subtotal</b>	<b>58</b>	<b>51</b>	<b>10</b>	<b>3</b>	<b>5</b>	<b>15</b>	<b>60</b>	<b>61</b>	<b>134</b>	<b>130</b>	<b>264</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	0	0	0	0	0	0	0	0	0	0	0
Masters, honours, bachelor or equivalent	10	12	3	2	2	4	7	2	22	20	42
Diplomas	14	5	0	3	2	1	6	4	22	13	35
<b>Subtotal</b>	<b>24</b>	<b>17</b>	<b>3</b>	<b>5</b>	<b>4</b>	<b>5</b>	<b>13</b>	<b>6</b>	<b>44</b>	<b>33</b>	<b>77</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	0	0	0	0	0	0	3	3	3	3	6
Masters, honours, bachelor or equivalent	6	25	0	10	2	3	10	14	18	51	69
Diplomas	13	36	4	15	2	4	1	10	20	65	85
<b>Subtotal</b>	<b>19</b>	<b>61</b>	<b>4</b>	<b>25</b>	<b>4</b>	<b>8</b>	<b>14</b>	<b>27</b>	<b>41</b>	<b>120</b>	<b>161</b>
<b>Total</b>	<b>101</b>	<b>129</b>	<b>17</b>	<b>33</b>	<b>13</b>	<b>28</b>	<b>87</b>	<b>94</b>	<b>219</b>	<b>283</b>	<b>502</b>



## Not-for-profit Sector continued

### 5.3.5 R&D in multidisciplinary and other specific areas

#### 5.3.5.1 Multidisciplinary R&D

The data on multidisciplinary R&D in Table 5.11 shows that the NPO sector had no expenditure on research in nanotechnology and that only 0.1% of total R&D expenditure was devoted to research in biotechnology.

**TABLE 5.11: NPO EXPENDITURE BY MULTIDISCIPLINARY R&D (2008/09 AND 2007/08)**

MULTIDISCIPLINARY AREA OF R&D	2008/09		2007/08	
	R'000	%	R'000	%
Biotechnology	255	0.1	491	0.2
Nanotechnology	0	0.0	0	0.0
<b>Total</b>	<b>255</b>	<b>0.1</b>	<b>491</b>	<b>0.2</b>
<b>Total R&amp;D expenditure</b>	<b>240 649</b>	<b>100</b>	<b>223 202</b>	<b>100</b>

#### 5.3.5.2. NPO sector R&D expenditure by specific areas of national interest

Table 5.12 shows that in 2008/09 the NPO sector spent about 3.6% of its R&D on TB, HIV/AIDS or malaria related research. There was insufficient data available for 2007/08 to report on these categories.

**TABLE 5.12: NPO EXPENDITURE BY SPECIFIC AREAS OF NATIONAL INTEREST OF R&D (2008/09 AND 2007/08)**

SPECIFIC AREAS OF INTEREST	2008/09		2007/08	
	R'000	%	R'000	%
Open source software	0	0.0	0	0.0
New materials	0	0.0	0	0.0
Tuberculosis (TB), HIV/AIDS, malaria	8 763	3.6	0	0.0
<b>Total</b>	<b>8 763</b>	<b>3.6</b>	<b>0</b>	<b>0.0</b>
<b>Total R&amp;D expenditure</b>	<b>240 649</b>	<b>100</b>	<b>223 202</b>	<b>100</b>



# Chapter 6

## Science Council Sector

### 6.1 Introduction

The science councils, as directed by acts of parliament, perform research with outcomes that are critical to the direction of policy development and the achievement of developmental goals. There are nine science councils in South Africa that are included in the R&D Survey. The R&D Survey provides insight into the extent to which science councils are investing in activities that enhance research and innovation and ultimately contribute to economic growth.

It is important that the purpose of the R&D Survey is well understood at all levels of the science councils as this assists them to structure their reporting mechanisms and systems to provide the data requested for the survey. Furthermore, taking part in the survey helps them to identify where resources for R&D are most needed within their organisations.

### 6.2 Survey Methods

The survey instrument (questionnaire) for the 2008/09 survey was updated and checked prior to dispatch. There were no substantial changes made to the survey instruments. The register was verified and contact information was updated before the fieldwork began. While the other science councils provide data through a single reporting unit for the entire organisation, the various units of the National Research Foundation (NRF) provide R&D data individually. In the 2008/09

survey 15 electronic questionnaires were dispatched to the science councils sector.

This survey covered expenditure in the year ending March 2009 (for science councils and all government departments). Respondents were given two to three months to complete and return the survey questionnaire. Telephonic and electronic follow-ups were used to ensure that the questionnaires were returned on time.

The response rate in the science councils sector for the 2008/09 survey was 100%. Where necessary, follow-up calls were made to verify data. The questionnaires were checked and verified for accuracy and completeness before capturing the data on the SMRS.

### 6.3 Detailed Results

#### 6.3.1 Key Results

In-house R&D expenditure by the science councils (Table 6.1) accounted for 14.9% of GERD in 2008/09, a 0.6% decrease from 15.5% in 2007/08. Despite this, nominal expenditure increased from R2.88 billion in 2007/08 to R3.13 billion in 2008/09 (Table 6.1), constituting an 8.7% increase in the 2008/09 survey reference period. R&D personnel (FTEs) decreased from 5 058.8 in 2007/08 to 4 699.9 in 2008/09, while researchers (FTEs) in the science council sector increased from 1 982.7 to 2 246.7 between 2006/07 and 2008/09 (Table 6.2).

**TABLE 6.1: IN-HOUSE R&D EXPENDITURE BY SECTOR (2008/09, 2007/08 AND 2006/07)**

SECTOR	2008/09		2007/08		2006/07	
	R'000S	%	R'000S	%	R'000S	%
Business enterprise	12 332 012	58.6	10 738 456	57.7	9 243 165	55.9
Government	1 139 676	5.4	1 154 399	6.2	1 021 355	6.2
Higher education	4 191 366	19.9	3 621 862	19.4	3 298 808	20.0
Not-for-profit	240 649	1.1	223 202	1.2	212 538	1.3
Science councils	3 137 343	14.9	2 886 094	15.5	2 744 718	16.6
<b>Grand Total</b>	<b>21 041 046</b>	<b>100</b>	<b>18 624 013</b>	<b>100</b>	<b>16 520 584</b>	<b>100</b>

# Science Council Sector continued

**TABLE 6.2: MAIN INDICATORS OF THE SCIENCE COUNCIL SECTOR (2008/09, 2007/08 AND 2006/07)**

MAIN INDICATORS	2008/09	2007/08	2006/07
Expenditure on R&D (millions of Rands)	3 137	2 886	2 745
Expenditure on R&D as % of GDP	0.137%	0.166%	0.178%
R&D personnel (FTEs)	4 699.9	5 058.8	4 956.1
Researchers (FTEs)	2 246.7	2 300.2	1 982.7
% Expenditure financed by local industry	10.5	9.1	9.7
% Expenditure financed by Government	52.6	64.9	66.7

The 2008/09 survey results reveal that science councils employed a total of 5 609 (headcounts) R&D personnel (Table 6.3). This constituted 11.7% of total R&D personnel. The total number of R&D researchers

in the science councils sector increased by 2.1% in the 2008/09 survey whilst the total R&D personnel decreased by 6.3% from 5 988 in 2007/08 to 5 609 in 2008/09.

**TABLE 6.3: R&D PERSONNEL HEADCOUNT BY SECTOR (2008/09 AND 2007/08)\***

SECTORS	RESEARCHERS		TECHNICIANS DIRECTLY SUPPORTING R&D		OTHER PERSONNEL DIRECTLY SUPPORTING R&D		GRAND TOTAL		PERCENTAGE	
	08/09	07/08	08/09	07/08	08/09	07/08	08/09	07/08	08/09	07/08
Business enterprise	8 560	8 336	5 584	5 303	4 451	4 312	18 595	17 951	38.8	36.9
Government	1 169	1 138	744	739	1 050	917	2 963	2 794	6.2	5.7
Higher education	16 313	17 008	2 054	2 006	1 856	2 351	20 223	21 365	42.2	44.0
Not-for-profit	262	264	77	77	163	161	502	502	1.0	1.0
Science councils	2 648	2 594	1 302	1 351	1 659	2 043	5 609	5 988	11.7	12.3
<b>Grand total</b>	<b>28 952</b>	<b>29 340</b>	<b>9 761</b>	<b>9 476</b>	<b>9 179</b>	<b>9 784</b>	<b>47 892</b>	<b>48 600</b>	<b>100</b>	<b>100</b>
Higher education doctoral and postdoctoral students	11 003	10 744	-	-	-	-	11 003	10 744	-	-
<b>Total</b>	<b>39 955</b>	<b>40 084</b>	<b>9 761</b>	<b>9 476</b>	<b>9 179</b>	<b>9 784</b>	<b>58 895</b>	<b>59 344</b>	<b>100</b>	<b>100</b>

\*Excluding postgraduate and postdoctoral students

Table 6.4 provides a summary of total R&D expenditure, researchers (FTEs), expenditure on basic

research and capital expenditure by science councils for the 2008/09 survey.



**TABLE 6.4: SCIENCE COUNCIL OVERVIEW 2008/09\***

SCIENCE COUNCILS	TOTAL R&D EXPENDITURE	RESEARCHERS	BASIC RESEARCH	CAPITAL EXPENDITURE
	R'000	(FTEs)	R'000	R'000
Africa Institute of South Africa	28 722	22.0	11 489	2 001
Agricultural Research Council	536 012	310.0	80 402	60 066
Council for Scientific and Industrial Research	1 337 428	1 308.0	187 240	212 000
Council for Geoscience	94 393	80.0	73 627	23 712
Human Sciences Research Council	197 000	86.0	19 700	11 522
Medical Research Council	387 725	249.0	232 635	15 815
Mintek	389 222	69.2	77 844	16 587
National Research Foundation	166 841	122.5	93 470	42 224
<b>Total</b>	<b>3 137 343</b>	<b>2 246.7</b>	<b>776 407</b>	<b>383 927</b>

\*Note that the SABS recorded a nil expenditure on R&D for the 2008/09 financial year.

### 6.3.2 Financial Data

Capital expenditure on R&D in the science councils sector increased from R205 million (7.1%) in the 2007/08 survey to R383 million (12.2%) in the 2008/09 survey (Table 6.5), a percentage increase of 86.5%. Current expenditure made up 87.8% of total

R&D expenditure in science councils during 2008/09. Of the current expenditure labour costs made up 40.9% whilst other current expenditure contributed 46.9%. Other current expenditure stood at R1.4 billion during 2007/08 and 2008/09.

**TABLE 6.5: R&D EXPENDITURE BY ACCOUNTING CATEGORY (2008/09, 2007/08 AND 2006/07)**

TYPE OF EXPENDITURE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Capital expenditure on R&amp;D</b>	<b>383 927</b>	<b>12.2</b>	<b>205 857</b>	<b>7.1</b>	<b>212 625</b>	<b>7.7</b>
Land: Buildings and other structures	61 063	1.9	30 704	1.1	53 713	2.0
Vehicles, plant, machinery, equipment	322 864	10.3	175 153	6.1	158 912	5.8
<b>Current expenditure</b>	<b>2 753 416</b>	<b>87.8</b>	<b>2 680 237</b>	<b>92.9</b>	<b>2 532 093</b>	<b>92.3</b>
Labour costs	1 283 210	40.9	1 250 480	43.3	1 162 633	42.4
Other current expenditure	1 470 206	46.9	1 429 757	49.5	1 369 460	49.9
<b>Total</b>	<b>3 137 343</b>	<b>100</b>	<b>2 886 094</b>	<b>100</b>	<b>2 744 718</b>	<b>100</b>

## Science Council Sector continued

In the three survey reference periods presented, science council sector expenditure on R&D mostly went to applied research compared to other types of research

(Table 6.6). Basic research accounted for 24.7% of the total R&D performed in 2008/09. This was a percentage decrease of 3.5% between 2007/08 and 2008/09.

**TABLE 6.6: SCIENCE COUNCIL R&D EXPENDITURE BY TYPE OF RESEARCH (2008/09, 2007/08 AND 2006/07)**

TYPE OF RESEARCH	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
Basic research	776 407	24.7	804 731	27.9	647 191	23.6
Applied research	1 384 860	44.1	1 314 770	45.6	1 328 996	48.4
Experimental research	976 077	31.1	766 593	26.6	768 531	28.0
<b>Total</b>	<b>3 137 343</b>	<b>100</b>	<b>2 886 094</b>	<b>100</b>	<b>2 744 718</b>	<b>100</b>

Funding for R&D activities in the science councils came from a variety of sources. Most funding came from government grants and contracts, which made up 70.8% of total funding (Table 6.7). The science councils funded

about 12.1% of their R&D while funding from the business sector decreased to 4.4% in 2008/09. The share of funding from abroad amounted to 12.5% of total R&D expenditure by science councils in the 2008/09 survey.

**TABLE 6.7: SCIENCE COUNCIL R&D EXPENDITURE BY SOURCES OF FUNDS (2008/09, 2007/08 AND 2006/07)**

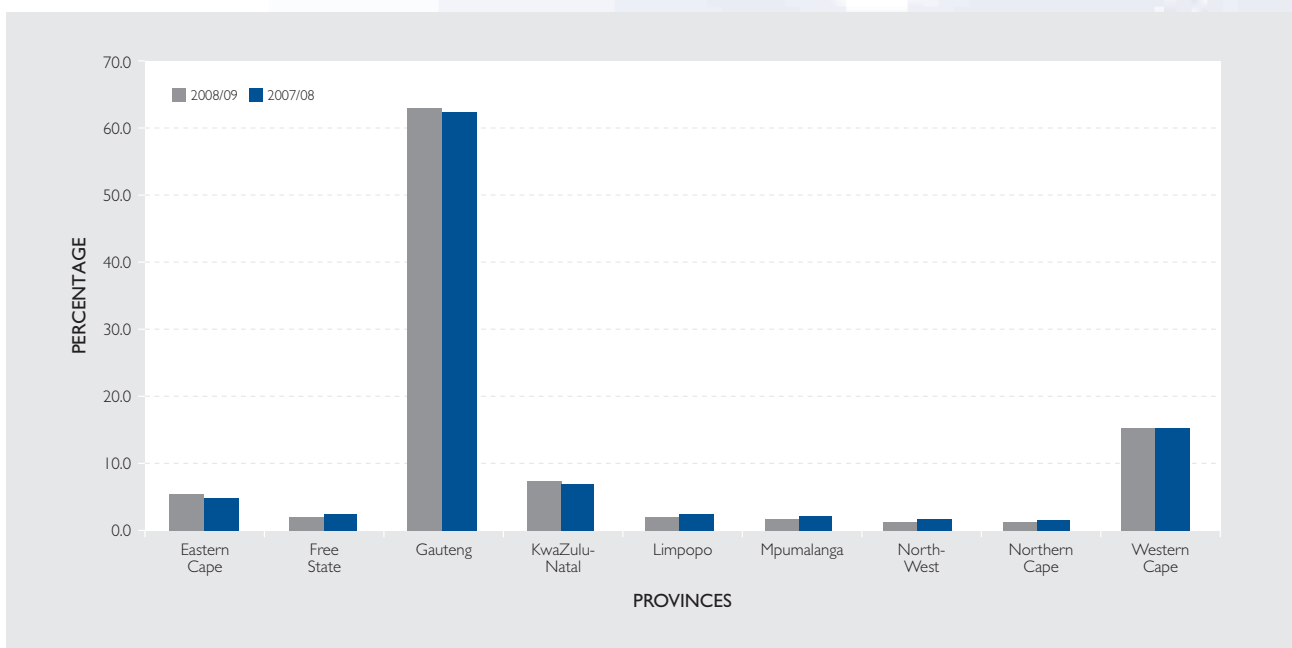
SOURCE OF FUNDS	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Organisation</b>	<b>381 137</b>	<b>12.1</b>	<b>422 811</b>	<b>14.6</b>	<b>305 577</b>	<b>11.1</b>
Own funds	381 137	12.1	422 811	14.6	305 577	11.1
<b>Government</b>	<b>2 221 321</b>	<b>70.8</b>	<b>1 874 511</b>	<b>64.9</b>	<b>1 829 383</b>	<b>66.7</b>
Grants	1 316 975	42.0	1 086 663	37.7	1 146 192	41.8
Contracts	904 346	28.8	787 848	27.3	683 191	24.9
<b>Business</b>	<b>137 356</b>	<b>4.4</b>	<b>263 098</b>	<b>9.1</b>	<b>265 441</b>	<b>9.7</b>
Business (Domestic)	137 356	4.4	263 098	9.1	265 441	9.7
<b>Other South African sources</b>	<b>5 521</b>	<b>0.2</b>	<b>26 768</b>	<b>0.9</b>	<b>23 449</b>	<b>0.9</b>
Higher education	677	0.0	3 353	0.1	583	0.0
Not for profit organisations	2 463	0.1	21 608	0.7	22 846	0.8
Individual donations	2 381	0.1	1 807	0.1	20	0.0
<b>Foreign</b>	<b>392 008</b>	<b>12.5</b>	<b>298 906</b>	<b>10.4</b>	<b>320 868</b>	<b>11.7</b>
All sources	392 008	12.5	298 906	10.4	320 868	11.7
<b>Total</b>	<b>3 137 343</b>	<b>100</b>	<b>2 886 094</b>	<b>100</b>	<b>2 744 718</b>	<b>100</b>



Figure 6.1 provides data on the location of R&D activities by province, that is, where R&D is actually performed, as opposed to where it is managed or financed. Of the nine South African provinces, only four reported an increase in R&D expenditure during 2008/09. R&D expenditure performed by science councils in Gauteng province amounted to 63.5%

of the total performed in the country in 2008/09, a percentage increase of 10.0%, based on actual figures on expenditure. The Eastern Cape and KwaZulu-Natal provinces showed percentage increases of 24.0% and 14.9% respectively. The Western Cape (the second highest performer of R&D within science councils) reported a percentage increase of 8.8%.

**FIGURE 6.1: PROVINCIAL DISTRIBUTION OF R&D ACTIVITY (2008/09 AND 2007/08)**



## Science Council Sector continued

### 6.3.3 R&D Orientation

In the 2008/09 survey, 27.5% of total R&D expenditure was attributed to the engineering sciences followed by medical and health sciences at 14.3% and agricultural sciences at 14.1% (see Table 6.8). Information,

computer and communication sciences also feature significantly at 6.4% within the science councils sector in relation to other fields of science.

**TABLE 6.8: SCIENCE COUNCIL R&D EXPENDITURE BY RESEARCH FIELD (2008/09, 2007/08 AND 2006/07)**

MAIN RESEARCH FIELD	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Natural sciences, technology and engineering</b>	<b>2 916 350</b>	<b>93.0</b>	<b>2 623 455</b>	<b>90.9</b>	<b>2 530 246</b>	<b>92.2</b>
Mathematical sciences	40 632	1.3	35 551	1.2	27 129	1.0
Physical sciences	115 737	3.7	93 583	3.2	126 542	4.6
Chemical sciences	44 271	1.4	37 430	1.3	33 774	1.2
Earth sciences	167 463	5.3	147 427	5.1	130 879	4.8
Information, computer and communication	201 731	6.4	212 796	7.4	133 328	4.9
Applied sciences and technologies	139 267	4.4	138 849	4.8	126 107	4.6
Engineering sciences	863 084	27.5	643 349	22.3	642 923	23.4
Biological sciences	171 810	5.5	175 592	6.1	306 056	11.2
Agricultural sciences	442 060	14.1	566 561	19.6	521 454	19.0
Medical and health sciences	447 479	14.3	358 726	12.4	340 764	12.4
Environmental sciences	101 920	3.2	85 414	3.0	72 191	2.6
Material sciences	155 529	5.0	108 068	3.7	51 020	1.9
Marine sciences	25 368	0.8	20 108	0.7	18 079	0.7
<b>Division 2: Social sciences and humanities</b>	<b>220 993</b>	<b>7.0</b>	<b>262 639</b>	<b>9.1</b>	<b>214 472</b>	<b>7.8</b>
Social sciences	194 646	6.2	238 019	8.2	194 040	7.1
Humanities	26 347	0.8	24 620	0.9	20 432	0.7
<b>Total</b>	<b>3 137 343</b>	<b>100</b>	<b>2 886 094</b>	<b>100</b>	<b>2 744 718</b>	<b>100</b>

Table 6.9 indicates that in the 2008/09 survey, 50.7% of R&D expenditure was directed towards economic development, 16.2% went towards advancement of knowledge, society accounted for a further 13.3%, while environment and defence stood at 10.8% and 8.9% respectively. Within the economic development division, science councils funded R&D related to energy resources amounting to almost R380 million (12.1%) followed by plant production and plant primary products amounting to R349 million (11.2%

of the total). R&D related to manufacturing decreased from R385 million in 2007/08 to R225 million in the 2008/09 survey. Within the society division, the health field increased from R272 million in the 2007/08 survey to R326 million in the 2008/09 survey. The R&D expenditure in the natural sciences, technologies and engineering field within the advancement of knowledge division, increased from R361 million in 2007/08 to R407 million in the 2008/09 survey.



**TABLE 6.9: SCIENCE COUNCIL EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE (2008/09, 2007/08 AND 2006/07)**

SOCIO-ECONOMIC OBJECTIVE	2008/09		2007/08		2006/07	
	R'000	%	R'000	%	R'000	%
<b>Division 1: Defence</b>	<b>280 219</b>	<b>8.9</b>	<b>228 603</b>	<b>7.9</b>	<b>260 354</b>	<b>9.5</b>
Defence	280 219	8.9	228 603	7.9	260 354	9.5
<b>Division 2: Economic development</b>	<b>1 592 110</b>	<b>50.7</b>	<b>1 560 688</b>	<b>54.1</b>	<b>1 172 607</b>	<b>42.7</b>
Economic development unclassified	0	0.0	0	0.0	0	0.0
Plant production and plant primary products	349 907	11.2	433 850	15.0	332 655	12.1
Animal production and animal primary products	18 760	0.6	25 124	0.9	115 649	4.2
Mineral resources (excluding energy)	67 418	2.1	63 469	2.2	62 585	2.3
Energy resources	379 859	12.1	38 979	1.4	51 257	1.9
Energy supply	0	0.0	874	0.0	8 033	0.3
Manufacturing	225 227	7.2	385 822	13.4	130 396	4.8
Construction	116 781	3.7	101 232	3.5	149 809	5.5
Transport	41 260	1.3	33 817	1.2	30 943	1.1
Information and communication services	24 146	0.8	17 429	0.6	25 177	0.9
Commercial services	19 536	0.6	8 975	0.3	3 546	0.1
Economic framework	106 105	3.4	206 878	7.2	85 194	3.1
Natural resources	243 111	7.7	244 239	8.5	177 363	6.5
<b>Division 3: Society</b>	<b>418 385</b>	<b>13.3</b>	<b>368 010</b>	<b>12.8</b>	<b>359 982</b>	<b>13.1</b>
Society unclassified	0	0.0	0	0.0	0	0.0
Health	326 340	10.4	272 905	9.5	240 248	8.8
Education and training	50 525	1.6	37 449	1.3	56 054	2.0
Social development and community services	41 520	1.3	57 656	2.0	63 680	2.3
<b>Division 4: Environment</b>	<b>338 290</b>	<b>10.8</b>	<b>263 325</b>	<b>9.1</b>	<b>225 563</b>	<b>8.2</b>
Environment unclassified	0	0.0	0	0.0	0	0.0
Environmental knowledge	173 945	5.5	130 041	4.5	120 806	4.4
Environmental aspects of development	59 943	1.9	46 190	1.6	50 877	1.9
Environmental and other aspects	104 402	3.3	87 094	3.0	53 880	2.0
<b>Division 5: Advancement of knowledge</b>	<b>508 339</b>	<b>16.2</b>	<b>465 468</b>	<b>16.1</b>	<b>726 212</b>	<b>26.5</b>
Advancement of knowledge unclassified	0	0.0	0	0.0	0	0.0
Natural sciences, technologies and engineering	407 189	13.0	361 714	12.5	616 487	22.5
Social sciences and humanities	101 150	3.2	103 754	3.6	109 725	4.0
<b>Total</b>	<b>3 137 343</b>	<b>100</b>	<b>2 886 094</b>	<b>100</b>	<b>2 744 718</b>	<b>100</b>



## Science Council Sector continued

### 6.3.4 R&D Personnel

The science councils sector employed a total of 5 609 R&D personnel (headcounts) in 2008/09 (Table 6.10). This is equivalent to nearly 4 700 FTEs engaged in R&D, a decrease of 7.1% compared to the 2007/08

survey. Generally, in the science council sector R&D personnel devote most of their time to R&D activities as evidenced by their FTEs consistently exceeding 80% of their headcounts.

**TABLE 6.10: SCIENCE COUNCIL R&D PERSONNEL HEADCOUNT AND FTEs (2008/09, 2007/08 AND 2006/07)**

OCCUPATION	HEADCOUNT			FULL-TIME EQUIVALENTS	
	MALE	FEMALE	TOTAL	FTEs	FTEs AS % OF HEADCOUNT
<b>2008/09</b>					
Researchers	1 615	1 033	2 648	2 246.7	84.8
Technicians	681	621	1 302	1 119.1	86.0
Other personnel directly supporting R&D	829	830	1 659	1 334.0	80.4
<b>Total</b>	<b>3 125</b>	<b>2 484</b>	<b>5 609</b>	<b>4 699.9</b>	<b>83.8</b>
<b>2007/08</b>					
Researchers	1 602	992	2 594	2 300.2	88.7
Technicians	741	610	1 351	1 099.2	81.4
Other personnel directly supporting R&D	1 205	838	2 043	1 659.4	81.2
<b>Total</b>	<b>3 548</b>	<b>2 440</b>	<b>5 988</b>	<b>5 058.8</b>	<b>84.5</b>
<b>2006/07</b>					
Researchers	1 409	846	2 255	1 982.7	87.9
Technicians	891	679	1 570	1 342.1	85.5
Other personnel	1 129	844	1 973	1 631.3	82.7
<b>Total</b>	<b>3 429</b>	<b>2 369</b>	<b>5 798</b>	<b>4 956.1</b>	<b>85.5</b>

Tables 6.11.1 and 6.11.2 provide a breakdown of total R&D personnel by race, gender and qualification within the science councils sector. During the 2008/09 survey, 2 648 researchers (headcounts) were employed within the science councils. Of these researchers, 27.5% held a PhD degree, 62.2% held a masters, bachelor or equivalent degree and the remaining 10.3% held a diploma. The number of researchers who held a PhD degree has increased by 8.0% compared to the 2007/08 survey. In the same period, male researchers

with a PhD degree made up 65.0% of total doctoral degrees. There were 255 women researchers with a PhD degree with 43.1% of these women being African, Indian or Coloured. White male researchers were the largest group in the science council sector (32.9%), followed by African males (21.1%), white females (18.0%) and African females (15.0%). Indian male and female researchers together made up 8.6% of the total, while Coloured male and female researchers together made up less than 5% of the total in 2008/09.



**TABLE 6.11.1: SCIENCE COUNCIL R&D PERSONNEL HEADCOUNT BY GENDER, POPULATION GROUP & QUALIFICATION LEVEL (2008/09)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	118	75	15	9	36	26	304	145	473	255	728
Masters, honours, bachelor or equivalent	346	269	41	31	73	81	485	320	945	701	1 646
Diplomas	94	54	11	6	9	4	83	13	197	77	274
<b>Subtotal</b>	<b>558</b>	<b>398</b>	<b>67</b>	<b>46</b>	<b>118</b>	<b>111</b>	<b>872</b>	<b>478</b>	<b>1 615</b>	<b>1 033</b>	<b>2 648</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	9	2	0	0	0	0	12	2	21	4	25
Masters, honours, bachelor or equivalent	95	131	18	16	10	27	107	69	230	243	473
Diplomas	231	222	52	19	6	12	141	121	430	374	804
<b>Subtotal</b>	<b>335</b>	<b>355</b>	<b>70</b>	<b>35</b>	<b>16</b>	<b>39</b>	<b>260</b>	<b>192</b>	<b>681</b>	<b>621</b>	<b>1 302</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	9	4	1	0	1	1	13	5	24	10	34
Masters, honours, bachelor or equivalent	80	100	11	17	13	9	52	70	156	196	352
Diplomas	450	324	62	90	21	21	116	189	649	624	1 273
<b>Subtotal</b>	<b>539</b>	<b>428</b>	<b>74</b>	<b>107</b>	<b>35</b>	<b>31</b>	<b>181</b>	<b>264</b>	<b>829</b>	<b>830</b>	<b>1 659</b>
<b>Total</b>	<b>1 432</b>	<b>1 181</b>	<b>211</b>	<b>188</b>	<b>169</b>	<b>181</b>	<b>1 313</b>	<b>934</b>	<b>3 125</b>	<b>2 484</b>	<b>5 609</b>

**TABLE 6.11.2: SCIENCE COUNCIL R&D PERSONNEL HEADCOUNT BY GENDER, POPULATION GROUP & QUALIFICATION LEVEL (2007/08)**

QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers</b>											
Doctoral degree or equivalent	111	39	16	7	24	18	326	133	477	197	674
Masters, honours, bachelor or equivalent	298	245	36	34	67	69	486	316	887	664	1 551
Diplomas	109	73	14	12	14	16	101	30	238	131	369
<b>Subtotal</b>	<b>518</b>	<b>357</b>	<b>66</b>	<b>53</b>	<b>105</b>	<b>103</b>	<b>913</b>	<b>479</b>	<b>1 602</b>	<b>992</b>	<b>2 594</b>
<b>Technicians directly supporting R&amp;D</b>											
Doctoral degree or equivalent	8	0	0	0	0	0	12	2	20	2	22
Masters, honours, bachelor or equivalent	85	111	16	12	11	19	87	59	199	201	400
Diplomas	268	240	67	21	9	28	178	118	522	407	929
<b>Subtotal</b>	<b>361</b>	<b>351</b>	<b>83</b>	<b>33</b>	<b>20</b>	<b>47</b>	<b>277</b>	<b>179</b>	<b>741</b>	<b>610</b>	<b>1 351</b>
<b>Other personnel directly supporting R&amp;D</b>											
Doctoral degree or equivalent	7	1	1	0	5	2	14	6	27	9	36
Masters, honours, bachelor or equivalent	68	66	7	16	11	7	55	66	141	155	296
Diplomas	796	312	80	92	24	21	137	249	1 037	674	1 711
<b>Subtotal</b>	<b>871</b>	<b>379</b>	<b>88</b>	<b>108</b>	<b>40</b>	<b>30</b>	<b>206</b>	<b>321</b>	<b>1 205</b>	<b>838</b>	<b>2 043</b>
<b>Total</b>	<b>1 750</b>	<b>1 087</b>	<b>237</b>	<b>194</b>	<b>165</b>	<b>180</b>	<b>1 396</b>	<b>979</b>	<b>3 548</b>	<b>2 440</b>	<b>5 988</b>

## Science Council Sector continued

### 6.3.5 R&D in multidisciplinary and other specific areas of national interest

#### 6.3.5.1 Multidisciplinary R&D

R&D expenditure related to nanotechnology has increased sharply from nearly R48 million in 2007/08 to R173 million in the 2008/09 survey (Table 6.12). There has been a decline in expenditure on

biotechnology which has dropped from R216 million in the 2007/08 survey to R207 million in 2008/09, a decrease of 4.2%.

**TABLE 6.12: SCIENCE COUNCIL EXPENDITURE BY MULTIDISCIPLINARY R&D (2008/09 AND 2007/08)**

MULTIDISCIPLINARY AREA OF R&D	2008/09		2007/08	
	R'000	%	R'000	%
Biotechnology	207 250	6.6	216 292	7.5
Nanotechnology	173 834	5.5	47 802	1.7
<b>Total</b>	<b>381 084</b>	<b>12.1</b>	<b>264 094</b>	<b>9.2</b>
<b>Total R&amp;D expenditure</b>	<b>3 137 343</b>	<b>100</b>	<b>2 886 094</b>	<b>100</b>

#### 6.3.5.2 Science councils sector R&D expenditure by specific areas of national interest

Between 2007/08 and 2008/09, expenditure on specific areas of national interest within science councils increased from 13.0% to 22.8% of total expenditure

(Table 6.13). This increase in expenditure was related to R&D performed in the tuberculosis (TB), HIV/AIDS and malaria area followed by expenditure in new materials.

**TABLE 6.13: SCIENCE COUNCIL EXPENDITURE BY SPECIFIC AREAS OF NATIONAL INTEREST (2008/09 AND 2007/08)**

SPECIFIC AREAS OF INTEREST	2008/09		2007/08	
	R'000	%	R'000	%
Open source software	67 833	2.2	77 885	2.7
New materials	157 134	5.0	64 131	2.2
Tuberculosis (TB), HIV/AIDS, malaria	490 982	15.6	233 917	8.1
<b>Total</b>	<b>715 949</b>	<b>22.8</b>	<b>375 933</b>	<b>13.0</b>
<b>Total R&amp;D expenditure</b>	<b>3 137 343</b>	<b>100</b>	<b>2 886 094</b>	<b>100</b>



# Annexure I R&D Survey Questionnaire



## CeSTII SURVEY OF RESEARCH & EXPERIMENTAL DEVELOPMENT (R&D) INPUTS SCIENCE COUNCILS/ GOVERNMENT/ NOT-FOR-PROFIT 2008/09 FINANCIAL YEAR

Organisation	Please modify address label if necessary

### AUTHORITY

The Centre for Science, Technology and Innovation Indicators (CeSTII), within the Knowledge Systems Programme of the Human Sciences Research Council (HSRC), conducts the Survey of Inputs into Research and Experimental Development (R&D) for the Department of Science and Technology (DST). The Survey is a component of Official Statistics, as defined in the Statistics Act No. 6 of 1999, and all data gathered for this survey is confidential. The HSRC and DST will not disseminate any information identifiable with an organisation without their consent.

### PURPOSE AND SCOPE OF SURVEY

The R&D survey collects data on the inputs into R&D activities performed IN-HOUSE in South Africa by all organisations (Including Business, Government, Science Councils, Not-for Profit and Higher Education). The data is used for planning and monitoring purposes and for measuring international competitiveness. Previous survey results may be viewed at [www.hsrc.ac.za/RnDSurvey](http://www.hsrc.ac.za/RnDSurvey). This survey covers the Financial Year 1 April 2008 to 31 March 2009 (or your nearest complete financial year).

### DUE DATE

Kindly complete and return this questionnaire (by post or e-mail) to: [wblankley@hsrc.ac.za](mailto:wblankley@hsrc.ac.za) or R&D Survey, Private Bag X2, Vlaeberg 8018.

### ASSISTANCE

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

Sector	Name	Contact Number	E-mail

## Annexure 1 continued

Details of person completing this questionnaire (Please print)

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

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

*Definition*

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

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

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

**For example** 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. Much business R&D involves development.

*R&D Includes – but is not limited to:*

Activities of personnel who are obviously engaged in R&D. In addition, research activity includes:



- The provision of professional, technical, administrative or clerical support and/or assistance to personnel directly engaged in R&D
- Management of personnel who are either directly engaged in R&D or are providing professional, technical or clerical support to those performing R&D
- Software development where the aim of the project is the systematic resolution of a scientific or technological uncertainty
- Research work in the biological, physical and social sciences, and the humanities
- Social science research includes 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 specific ROUTINE activities are excluded, except where they are an essential part of R&D:

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

## Annexure 1 continued

### PART 1: GENERAL INFORMATION

1. Parent organisation/Department

2. Name of organisation/ unit

3. Total number of employees working for the organisation during financial year (include staff on contract for six months or longer)

4. Did the reporting organisation/unit perform any IN-HOUSE R&D in South Africa during the financial year?

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

**Y** Yes – Please continue with question 5 to question 15

**N** No – Please proceed to Part 5: Question 13, 14 and 15 on Outsourced R&D

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



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

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

### *Researchers*

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

### *Technicians directly supporting R&D*

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

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

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

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

Allowance for these should be made under overheads in R&D expenditure (current expenditure – **Question 7D**) but such persons should not be included as R&D personnel.

### 5. Headcount Of R&D Personnel

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

PERSONNEL CATEGORIES AND HIGHEST QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
<b>Researchers (incl. Research Executives &amp; Research Managers)</b>											
Doctorates											
Masters/Hons/Bachelors or equivalent											
Diplomas and other											
<b>RESEARCHER TOTAL</b>											
<b>Technicians /Technologists</b>											
Doctorates											
Masters/Hons/Bachelors or equivalent											
Diplomas and other											



## Annexure 1 continued

PERSONNEL CATEGORIES AND HIGHEST QUALIFICATION	AFRICAN		COLOURED		INDIAN		WHITE		SUBTOTAL		TOTAL
	M	F	M	F	M	F	M	F	M	F	
TECHNICIAN TOTAL											
Other personnel directly supporting R&D											
Doctorates											
Masters/Hons/Bachelors or equivalent											
Diplomas and other											
OTHER SUPPORT TOTAL											

**CARRY SUBTOTALS OVER TO QUESTION 6****6. Full-Time Equivalents (Ftes) and Labour Costs 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) PERSONS**

Note: For the purpose of this survey, an employee can only work one person year each year (even if he/she works several hours of over-time everyday. For example:

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

*NOTE: please calculate FTEs for all R&D personnel.*



PERSONNEL CATEGORIES	HEADCOUNTS (FROM Q 5)			FULL TIME EQUIVALENTS (FTE'S)			AVERAGE ANNUAL LABOUR COST PER PERSON R'000 (EXCL. VAT) (B)	CALCULATED LABOUR COST OF R&D R'000 (EXCL. VAT) (A X B)
	M	F	TOTAL	M	F	TOTAL (A)		
Researchers (incl. Research Executives & Research Managers)								
Technicians directly supporting R&D								
Other personnel directly supporting R&D								
TOTAL LABOUR COST OF R&D								

Carry over total calculated labour cost to question 7C

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

### 7. In-House R&D Expenditure:

Allocate in-house R&D expenditure as follows:

#### CAPITAL EXPENDITURE ON R&D

- The full price of capital expenses 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 only 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.
- Acquisition of software, including fees, expected to be used for more than one year.
- Purchase of databases expected to be used for more than one year.
- Major repairs & improvements on land & buildings

#### Excluding:

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

		R'000 (Excl. VAT)
Vehicles, plant, machinery and equipment	<b>A</b>	R
Land; buildings and other structures	<b>B</b>	R

#### LABOUR COSTS OF R&D

		R'000 (Excl. VAT)
Labour Costs of R&D personnel (from Question 6: )	<b>C</b>	R

## Annexure 1 continued

**OTHER CURRENT EXPENDITURE ON R&D***Including - but not limited to:*

- Materials, fuels and other inputs.
- Water, electricity and other overheads expenses
- Repair and maintenance expenses.
- Payments to outside organisations for use of specialised testing facilities.
- Payments to outside organisations for analytical work, engineering or other specialised services in support of R&D projects carried out by this department/unit
- Commission/consultant expenses for research projects carried out by this department/unit
- Other R&D expenses and indirect costs not classified in 7A, 7B or 7C.
- The relevant % of labour costs of persons providing indirect services such as Head office, HR, Finance, security, maintenance personnel, staff of central libraries, IT departments

*Excluding:*

- Contract R&D expenses where the research project is carried out elsewhere by others on behalf of this department/unit.
- Payments for purchases of technical know-how.
- Payments for patent searches.
- Depreciation provisions.

		R'000 (Excl. VAT)
Other Current Expenditure	<b>D</b>	R
		R'000 (Excl. VAT)
<b>TOTAL R&amp;D EXPENDITURE (A + B + C + D)</b>	<b>R</b>	

**8. Sources of Funds for In-House R&D**

Provide a breakdown of the total R&D expenditure (as reported in question 7) according to sources of funds.

R'000 (Excl. VAT)

**Organisation**

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

Grants (including SPII, Innovation Fund etc)	R
Contracts	R

**Business**

Business (Domestic only)	R
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**Other South African**

Higher Education	R
Not For Profit Organisations	R
Individual Donations	R

**Foreign**

All sources	R
-------------	---

	<b>R'000 (Excl. VAT)</b>
<b>TOTAL R&amp;D EXPENDITURE</b> (to correspond with Q7)	<b>R</b>

**9. Provincial Expenditure On R&D**

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

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

Eastern Cape	
Free State	
Gauteng	
KwaZulu-Natal	
Limpopo	

Mpumalanga	
Northern Cape	
North-West	
Western Cape	
<b>TOTAL</b>	<b>100%</b>

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

**10. In-House R&D Current Expenditure by type Of R&D**

Specify the percentage of total IN-HOUSE LABOUR COST and OTHER CURRENT R&D expenditure by **type of R&D**.

*Basic Research*

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

<b>Percentage</b>
%

# Annexure 1 continued

## Applied Research

- Original investigation to acquire new knowledge with a specific application in view.
- 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.
- Information or knowledge derived from applied research may be published in peer-reviewed journals or subjected to other forms of intellectual property protection.

<b>Percentage</b>
%

## Experimental Development

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

<b>Percentage</b>
%

**TOTAL**

<b>100%</b>
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## 11A. Research Fields (Rf)

Classify R&D according to Research Fields (See Appendix B in Code book) and provide the associated % of the Total R&D expenditure per research field.

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

RF Codes		Percentage	RF Codes		Percentage
RF			RF		
RF			RF		
RF			RF		
RF			RF		
RF			RF		
			<b>Total</b>	<b>100 %</b>	

## 11B. Multidisciplinary R&D

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

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

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



## DEFINITIONS

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

MULTIDISCIPLINARY AREA OF R&D	% OF R&D EXPENDITURE
Biotechnology	%
Nanotechnology	%

**No Multidisciplinary R&D in these areas.** TICK if no such R&D is done:

## 11C. R&D and National Priority Areas

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

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

NATIONAL PRIORITY AREA OF R&D	% OF R&D EXPENDITURE
National Priority Area of R&D	%
Open source software	%
New materials	
Tuberculosis (TB), HIV/AIDS, Malaria	

**No R&D in these areas.** TICK if no such R&D is done:

# Annexure 1 continued

## 12. Socio-Economic Objectives (SEO)

Classify R&D according to Socio-Economic Objectives with associated % expenditure. (See Appendix C in Code book)

The SEO classification provides an indication of the sector of the national economy which will be the main beneficiary of the R&D you are practising

SEO Codes	Percentage	SEO Codes	Percentage
S		S	
S		S	
S		S	
S		S	
S		S	
<b>Total</b>			<b>100 %</b>

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

Outsourced R&D refers to:

- Outsourced or extramural expenditures are the amounts an organisation 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

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

R'000 (Excl. VAT)

R

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

R'000 (Excl. VAT)

R



15. If the amount stated in **question 13 and 14** is in excess of **1 million Rands**, please indicate the name of the organisation that received payment, the approximate payment made for the performance of R&D and the associated expenditure.

*State details of R&D outsourced inside South Africa*

OUTSOURCED TO:	APPROXIMATE VALUE R'000 (EXCL. VAT)

*State details of R&D outsourced outside South Africa*

OUTSOURCED TO:	APPROXIMATE VALUE R'000 (EXCL. VAT)

**THANK YOU FOR YOUR TIME AND EFFORT**



## Annexure II

# User Satisfaction Survey

In order to improve the quality and relevance of the R&D statistics it would be useful to receive the views of users of this publication. It would therefore be appreciated if you could **complete the following questionnaire and return by fax to +27 (0)21 461 1255 or e-mail to wblankley@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	<input type="checkbox"/>	International organisation	<input type="checkbox"/>
Private enterprise	<input type="checkbox"/>	Media	<input type="checkbox"/>
Public enterprise	<input type="checkbox"/>	Not-for-profit organisation	<input type="checkbox"/>
Academic or research institution	<input type="checkbox"/>	Other, specify	<input type="checkbox"/>

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

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

Excellent	<input type="checkbox"/>	Good	<input type="checkbox"/>	Average	<input type="checkbox"/>	Satisfactory	<input type="checkbox"/>	Poor	<input type="checkbox"/>
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### 5. How useful is this publication for your work?

Extremely useful	<input type="checkbox"/>	Very useful	<input type="checkbox"/>	Useful	<input type="checkbox"/>	Partly useful	<input type="checkbox"/>	Not at all useful	<input type="checkbox"/>
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### 6. How accurate is the picture of R&D in your sector or research field/s as presented in this publication?

Very accurate	<input type="checkbox"/>	Fairly accurate	<input type="checkbox"/>	Unsure	<input type="checkbox"/>	Not too accurate	<input type="checkbox"/>	Not at all accurate	<input type="checkbox"/>
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### 7. How easy was it to find specific information that you required in the publication?

Extremely easy	<input type="checkbox"/>	Very easy	<input type="checkbox"/>	Easy	<input type="checkbox"/>	Not very easy	<input type="checkbox"/>	Not at all easy	<input type="checkbox"/>
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### 8. What information (i.e. tables, text or figures) were of most interest to you? Please be as specific as possible e.g. provide table, page or figure numbers.

### 9. What did you like best about the publication?

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

Thank you for completing the questionnaire.

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