

FINANCIAL AND FISCAL COMMISSION

# Technical Report: Submission for the 2013/14 Division of Revenue

FOR AN EQUITABLE SHARING OF NATIONAL REVENUE

29 JUNE 2012

ISBN: 978-0-621-40887-4  
RRP149/2012

Financial and Fiscal Commission  
Montrose Place (2nd Floor), Bekker Street,  
Waterfall Park, Vorna Valley, Midrand,  
Private Bag X69, Halfway House 1685  
[www.ffc.co.za](http://www.ffc.co.za)  
Tel: +27 11 207 2300  
Fax: +27 86 589 1038



*For an Equitable Sharing of National Revenue*

# TABLE OF CONTENTS

<b>Contents .....</b>	<b>ii</b>
<b>Figures .....</b>	<b>vi</b>
<b>Tables .....</b>	<b>ix</b>
<b>Acronyms .....</b>	<b>xiii</b>
<b>Foreword and Editorial .....</b>	<b>xvii</b>
<b>About the Authors .....</b>	<b>xxiv</b>
 <b>Part 1:        Supporting Inclusive Growth: Jobs, Knowledge and Regional Development .....</b>	 <b>29</b>
<b>Chapter 1:    Perspectives and Prospects for Job Creation and the Fiscal Interventions in South Africa .....</b>	<b>30</b>
1.1 Introduction .....	30
1.2 Understanding Causes of Unemployment in South Africa .....	31
1.3 Infrastructure and Total Factor Productivity .....	35
1.4 Data and Methodology .....	37
1.5 Policy Simulations and Results .....	40
1.6 Conclusion .....	68
1.7 Recommendations .....	69
References .....	71
 <b>Chapter 2:    Financing e-Education and Achieving Policy Goals in Public Ordinary Schools in South Africa .....</b>	 <b>75</b>
2.1 Introduction .....	75
2.2 View of the Problem: Schooling, e-Education and Financing .....	76
2.3 Policy Goals: e-Education and Quality in Basic Education .....	77
2.4 Some Perspectives on Financing e-Education .....	78
2.5 An Overview of Historical and Projected e-Learning Expenditure .....	81
2.6 Conclusion .....	83
2.7 Recommendations .....	84
References .....	87
 <b>Chapter 3:    Budget Review of Public Universities in South Africa .....</b>	 <b>89</b>
3.1 Introduction .....	89
3.2 South African University Funding Models .....	90
3.3 Review of the Performance of Public Universities .....	96
3.4 Review of the Income of Public Universities .....	107
3.5 Reconsidering Funding Policies for Public Universities .....	118

3.6 Conclusion .....	124
3.7 Recommendations .....	125
References.....	126
<b>Part 2: Climate Change and Environmental Sustainability: Opportunities and Risks for Inclusive Growth and Innovation.....</b>	<b>127</b>
<b>Chapter 4: The Impact of Climate Change on South Africa's Rural Areas .....</b>	<b>128</b>
4.1 Introduction .....	128
4.2 The Impact of Climate Change on Agricultural Productivity .....	130
4.3 Methods.....	137
4.4 Results .....	141
4.5 Discussion.....	172
4.6 Vulnerabilities of Municipalities to Climate Change .....	177
4.7 Fiscal and Financial Measures for Improving Resilience to Climate Change in Rural Areas .....	197
4.8 Recommendations .....	205
Annexure 4A. Vulnerability Scores for Municipalities.....	208
References.....	214
<b>Chapter 5: Alternative Financing Mechanisms for Disaster Risk Management in South Africa.....</b>	<b>221</b>
5.1 Introduction .....	221
5.2 Disaster Risk Reduction vs. Disaster Response and Recovery.....	224
5.3 Financial Tools .....	227
5.4 South Africa's Current Funding Arrangements .....	247
5.5 Methodology.....	250
5.6 Findings and Discussions.....	250
5.7 Conclusion .....	260
5.8 Recommendations .....	261
Annexure 5A. The NDMC's Response to the FFC Recommendations.....	263
References.....	267
<b>Chapter 6: Financing of Waste Management in South Africa.....</b>	<b>273</b>
6.1 Introduction .....	273
6.2 Literature Review.....	279
6.3 Methodology.....	306
6.4 Findings and Discussions.....	306
6.5 Conclusion .....	313
6.6 Recommendations .....	314
Appendix 6A. Government, Civil Society and Their Roles in Waste Management .....	316
References.....	317

<b>Part 3: Institutional Development for Inclusive Growth and Innovation.....</b>	<b>324</b>
<b>Chapter 7: The Impact of Aggregate Revenue and Expenditure Assignments on Economic Growth: The Case of Provinces and Municipalities in South Africa .....</b>	<b>325</b>
7.1 Introduction .....	325
7.2 Theoretical Underpinnings.....	326
7.3 Empirical Evidence .....	329
7.4 Empirical Analysis for South Africa.....	332
7.5 Results .....	334
7.6 Recommendations .....	340
Appendix 7A. Theoretical Model .....	342
Appendix 7B. Data Transformations .....	344
References.....	346
 <b>Chapter 8: Alternative Service Delivery Arrangements: The Case of Municipal Agencies... 349</b>	
8.1 Introduction .....	349
8.2 Methodology.....	350
8.3 Literature Review.....	351
8.4 South African Context .....	357
8.5 Discussion.....	361
8.6 Towards a Set of Principles.....	364
8.7 Recommendations .....	364
Annexure 8A. Municipal Agencies 2009/10 .....	366
References.....	368
 <b>Chapter 9: Understanding the Dynamics of the Capacity Challenge at Local Government Level .....</b>	<b>370</b>
9.1 Introduction .....	370
9.2 Methodology.....	372
9.3 Literature Review.....	375
9.4 South African Context .....	380
9.5 Capacity Roles and Responsibilities .....	393
9.6 Recommendations .....	401
References.....	403
 <b>Chapter 10: Assessing Gender Responsive Budgeting in Local Government.....</b>	<b>407</b>
10.1 Introduction .....	407
10.2 Literature Review.....	409
10.3 Research Methodology .....	411
10.4 Findings.....	414
10.5 Conclusion .....	428
10.6 Recommendations .....	429
References.....	43

# FIGURES

Figure 1.1.	South Africa's annual GDP growth: 1990–2011.....	22
Figure 0.1.	The Role of IGFR in the innovation process: implications for growth and inequality.....	xix
Figure 1.1.	South Africa's annual GDP growth 1990–2010.....	31
Figure 1.2.	South Africa's unemployment rate 1994–2010 (%).....	32
Figure 1.3.	Unemployment rate for Brazil, China, Mexico, Russia and South Africa in 2010 (%) .....	32
Figure 1.4.	The value-added structure.....	38
Figure 1.5.	Impact on government savings .....	44
Figure 1.6.	Impact on total private investment .....	44
Figure 1.7.	Impact on total investment.....	45
Figure 1.8.	Impact on GDP.....	45
Figure 1.9.	Impact on private investment.....	51
Figure 1.10.	Impact on total investment.....	51
Figure 1.11.	Impact on GDP (at basic price) .....	52
Figure 1.12.	Household income over public spending ratio trend .....	52
Figure 1.13.	Impact on government savings .....	54
Figure 1.14.	Impact on private investment.....	55
Figure 1.15.	Impact on GDP.....	56
Figure 1.16.	Impact on private investment.....	59
Figure 1.17.	Impact on total investment.....	59
Figure 1.18.	Impact on GDP (basic prices).....	60
Figure 1.19.	Impact on government savings .....	62
Figure 1.20.	Impact on private investment.....	63
Figure 1.21.	Impact on total investment.....	63
Figure 1.22.	Impact on GDP.....	64
Figure 1.23.	Impact on private investment.....	67
Figure 1.24.	Impact on total investment.....	67
Figure 1.25.	Impact on GDP (at basic prices).....	68
Figure 2.1.	Reasons for not implementing technology-integrated lessons .....	79
Figure 3.1.	2003 Government Gazette on funding mechanisms in new framework.....	93
Figure 3.2.	Shares by broad categories of government funding allocations to public universities.....	95
Figure 3.3.	Average annual increases in government funding to public universities during funding phases .....	95
Figure 3.4.	Gross participation rates in public universities 1986–2010.....	98
Figure 3.5.	Gross participation rates by race group in the public university system .....	99
Figure 3.6.	Gross participation rates in the public university system by gender.....	99

Figure 3.7.	Master's and doctoral enrolments as % of total head counts in the public university system .....	101
Figure 3.8.	Highest formal qualifications of permanent academics in public higher education system .....	101
Figure 3.9.	Total head count enrolments and graduates (thousands) .....	102
Figure 3.10.	Cohort output equivalents .....	103
Figure 3.11.	Totals of high-level knowledge outputs .....	104
Figure 3.12.	Ratios of high-level research outputs to permanent academic staff .....	104
Figure 3.13.	Total income of public universities (rands billions) .....	108
Figure 3.14.	Summary of income sources of public universities .....	108
Figure 3.15.	Average annual increases in income (2000–2010) .....	110
Figure 3.16.	Income from all sources by cluster (rands billions) .....	112
Figure 3.17.	Cluster shares of income and FTE student enrolments: 2010 compared to 2000 .....	113
Figure 3.18.	Total income from all sources per FTE-enrolled student by cluster (rands thousands) .....	114
Figure 3.19.	Total private income by cluster (rands millions) .....	114
Figure 3.20.	Shares of total private income and permanent academic totals .....	115
Figure 3.21.	Private income per permanent academic staff member (rands thousands) .....	115
Figure 3.22.	Distribution of outputs by cluster – averages for 2008–2010 .....	117
Figure 3.23.	Total government allocations to public universities as % of GDP and total government expenditure .....	118
Figure 4.1.	Change in net revenue as a result of decrease in rainfall and increase in temperature .....	151
Figure 4.2.	Change in net revenue as a result of increase in temperature .....	151
Figure 4.3.	Change in net revenue as a result of decrease in rainfall .....	152
Figure 4.4.	Change in net revenue (in rands) as a result of decrease in rainfall and increased temperature .....	168
Figure 4.5.	Change in net revenue (in rands) as a result of increased temperature .....	168
Figure 4.6.	Change in net revenue(in rands) as a result of decreased rainfall .....	168
Figure 4.7.	Predicted change in net revenue as a result of change in rainfall and temperature at a provincial level .....	171
Figure 4.8.	Determinants of vulnerability to climate change .....	179
Figure 4.9.	Composition of the overall vulnerability layer and its various components .....	183
Figure 4.10.	Patterns of potential exposure .....	185
Figure 4.11.	Factors affecting sensitivity .....	186
Figure 4.12.	Measures affecting adaptive capacity of South African municipalities: .....	189
Figure 4.13.	Index value of vulnerability to climate change for South African municipalities .....	191
Figure 4.14.	Box and whisker plot of the vulnerability scores of different types of municipalities .....	191
Figure 5.1.	Pay-off structure for European put option on weather .....	236
Figure 5.2.	CAT bond with a single purpose reinsurer .....	240
Figure 6.1.	Waste hierarchical structure .....	285

Figure 6.2.	Illustration of the fiscal framework.....	286
Figure 6.3.	Employment from waste collection, treatment and disposal services.....	302
Figure 6.4.	Per capita waste generation in tonnes.....	309
Figure 6.5.	Extent of refuse removal by municipality in 2007.....	310
Figure 7.1.	Scatter diagrams for economic growth and revenue/expenditure assignments: provinces.....	336
Figure 7.2.	Average values for revenue and expenditure assignments (2006–2009; metropolitan and district municipalities).....	337
Figure 7.3.	Scatter diagram of GVA growth and revenue/expenditure assignment: metropolitan and district municipalities.....	337
Figure 8.1.	Incentive power, authority type and service delivery choice.....	356
Figure 8.2.	Number of municipal agencies per sector (30 June 2010).....	358
Figure 8.3.	Number of municipal agencies per province with particular audit outcomes, 2009/10.....	359
Figure 9.1.	Components of capacity-building.....	375
Figure 9.2.	Municipalities' definition of capacity-building.....	380
Figure 9.3.	Perception of the success of the minimum competency levels guidelines.....	383
Figure 9.4.	Municipal skills challenges.....	383
Figure 9.5.	Municipal senior management vacancies.....	384
Figure 9.6.	Average period that positions remain vacant.....	384
Figure 9.7.	Capacity-building funding mechanisms.....	387
Figure 9.8.	Capacity-building national allocations and expenditure.....	388
Figure 9.9.	National government capacity support.....	393
Figure 9.10.	Provincial government capacity support.....	393
Figure 9.11.	Do national and provincial departments have sufficient capacity to address the challenges experienced by municipalities?.....	396

# TABLES

Table 1.1.	The skills composition of employment 1995–2008.....	34
Table 1.2.	Correspondence between occupations and skills level.....	37
Table 1.3.	Impact on unemployment for skilled workers (in % to BAU) .....	41
Table 1.4.	Impact on unemployment for semi-skilled workers (in % to BAU) .....	41
Table 1.5.	Impact on unemployment for unskilled workers (in % to BAU) .....	41
Table 1.6.	Impact on total production (in % to BAU).....	42
Table 1.7.	Impact on household income (in % to BAU) .....	43
Table 1.8.	Impact on firms (in % to BAU) .....	43
Table 1.9.	Impact on government's income (in % to BAU) .....	43
Table 1.10.	Impact on unemployment rate for skilled workers .....	46
Table 1.11.	Impact on unemployment rate for semi-skilled workers .....	47
Table 1.12.	Impact on unemployment rate for low-skilled workers .....	47
Table 1.13.	Impact on production (in % to BAU values) .....	47
Table 1.14.	Impact on households (in % to BAU values) .....	48
Table 1.15.	Impact on firms (in % to BAU values) .....	49
Table 1.16.	Impact on government (in % to BAU values) .....	50
Table 1.17.	Impact on unemployment for skilled workers (in % to BAU) .....	53
Table 1.18.	Impact on unemployment for semi-skilled workers (in % to BAU) .....	53
Table 1.19.	Impact on unemployment for unskilled workers (in % to BAU) .....	53
Table 1.20.	Impact on production (in % to BAU) .....	53
Table 1.21.	Impact on household income (in % to BAU) .....	54
Table 1.22.	Impact on firms (in % to BAU) .....	54
Table 1.23.	Impact on government (in % to BAU) .....	54
Table 1.24.	Impact on unemployment for skilled workers (in % to BAU) .....	56
Table 1.25.	Impact on unemployment for semi-skilled workers (in % to BAU) .....	56
Table 1.26.	Impact on unemployment for low-skilled workers (in % to BAU) .....	57
Table 1.27.	Impact on production (in % to BAU) .....	57
Table 1.28.	Impact on household income (in % to BAU) .....	58
Table 1.29.	Impact on firms (in % to BAU values) .....	58
Table 1.30.	Impact on government (in % to BAU) .....	59
Table 1.31.	Impact on unemployment for skilled workers (% to BAU) .....	61
Table 1.32.	Impact on unemployment for semi-skilled workers (% to BAU) .....	61
Table 1.33.	Impact on unemployment for low-skilled workers (% to BAU) .....	61
Table 1.34.	Impact on production (% to BAU) .....	61



Table 1.35.	Impact on household income (in % to BAU) .....	62
Table 1.36.	Impact on firms' income (in % to BAU).....	62
Table 1.37.	Impact on government (in % to BAU) .....	62
Table 1.38.	Impact on unemployment for skilled workers (% to BAU) .....	64
Table 1.39.	Impact on unemployment for semi-skilled workers (% to BAU) .....	65
Table 1.40.	Impact on unemployment for low-skilled workers (% to BAU) .....	65
Table 1.41.	Impact on production (% to BAU) .....	65
Table 1.42.	Impact on household income (% to BAU) .....	66
Table 1.43.	Impact on firms (% to BAU) .....	66
Table 1.44.	Impact on government (% to BAU) .....	67
Table 2.1.	Basic education expenditure .....	81
Table 2.2.	Computer services expenditure .....	82
Table 2.3.	Communications expenditure .....	82
Table 2.4.	Learner and teacher support material expenditure .....	83
Table 2.5.	Guidelines for inter-governmental financing.....	84
Table 2.6.	Guidelines for analysing e-education financing.....	85
Table 3.1.	Example of government subsidy calculations in year N for University X under 1983 formula (rands millions).....	91
Table 3.2.	A-factors used to reduce government subsidy commitments under 1983 funding framework .....	92
Table 3.3.	Summary of government allocations to public universities (rands millions).....	95
Table 3.4.	Goals, indicators and targets for the public university system.....	96
Table 3.5.	Head count student enrolments in the public higher education system by broad field of studies (thousands) .....	100
Table 3.6.	Public universities clustered on basis of academic core indicators.....	106
Table 3.7.	Income in 2000 compared to 2010 income (rands millions) .....	109
Table 3.8.	Income per FTE-enrolled student (rands thousands) .....	109
Table 3.9.	Public higher universities by institutional cluster .....	111
Table 3.10.	Output totals for 2008–2010 .....	117
Table 3.11.	Details of government transfers to universities (rands millions).....	120
Table 3.12.	Proportion of government grant in each category .....	120
Table 3.13.	Details of other government earmarked funds for universities (rands millions).....	121
Table 4.1.	Temperature and rainfall elasticities (with regional dummies) .....	133
Table 4.2.	Marginal climate effects and elasticities for livestock farming in Africa .....	133
Table 4.3.	Change in revenue from crop and livestock production for different AOGCM predictions (\$/farm).....	134
Table 4.4.	Impacts of changing temperature and rainfall on crop net revenue in percentage (%).....	135
Table 4.5.	Impacts of selected climate scenarios on net revenues (\$/ha) .....	136
Table 4.6.	South Africa climate change scenarios.....	139

Table 4.7.	Descriptive statistics – subsistence farmers.....	141
Table 4.8.	Distribution of total gross revenue by household needs – subsistence farmers .....	143
Table 4.9.	Ricardian regressions of net revenue model – subsistence farmers .....	144
Table 4.10.	Marginal effects and elasticity – subsistence farmers .....	149
Table 4.11.	Climate change impact by type of farmer – subsistence farmers.....	150
Table 4.12.	Correlation between food adequacy and agricultural revenue – subsistence farmers .....	153
Table 4.13.	Ricardian regressions of food adequacy – subsistence farmers .....	153
Table 4.14.	Marginal effects and elasticity of food adequacy – subsistence farmers .....	158
Table 4.15.	Descriptive statistics – commercial farmers.....	159
Table 4.16.	Ricardian regressions of net revenue model – commercial farmers.....	162
Table 4.17.	Marginal effects and elasticity – commercial farmers .....	165
Table 4.18.	Climate change impact by type of farmer – commercial farmers.....	166
Table 4.19.	Total loss in revenue of commercial farmers by province .....	169
Table 4.20.	Parameters used in the index, and the units and source of the data .....	183
Table 4.21.	The 11 indicators used to compile the South African index of multiple deprivations.....	188
Table 4.22.	Audit outcomes and the score assigned to each.....	189
Table 4.23.	The twenty most vulnerable municipalities .....	191
Table 4.24.	Suggested funding arrangements for disaster risk management by municipalities .....	199
Table 4.25.	Climate change adaptation measures for adverse impacts in rural areas and the types of fiscal and financial measures required to bring these about.....	201
Table 5.1.	Examples of pre- and post-disaster risk financing arrangements .....	227
Table 6.1.	Key issues from stakeholder workshop .....	274
Table 6.2.	Functional roles and responsibilities for solid waste management in South Africa .....	283
Table 6.3.	Taxonomy of economic instruments for waste management .....	289
Table 6.4.	GHG savings from recycling of municipal waste (tonnes of CO <sub>2</sub> /MT of waste).....	293
Table 6.5.	Externalities/cost benefits of waste management options.....	298
Table 6.6.	Employment, job creation and GDP indicators from waste sector.....	300
Table 6.7.	Employment from waste collection, treatment and disposal services.....	301
Table 6.8.	Typologies of community-based waste management organisations .....	304
Table 6.9.	Aggregate waste management budget trends.....	306
Table 6.10.	Metros' operating revenue, 2003/04–2009/10.....	307
Table 6.11.	Tariff structures of the six metros (2011) .....	308
Table 6.12.	Trends in refuse removal (2001–2007).....	309
Table 6.13.	Capital and estimated cost of power generation from renewable sources.....	312
Table 6.14.	Projected waste generation.....	313
Table 7.1.	Sample and cross-section specification used in estimation .....	332
Table 7.2.	Summary of the empirical analyses .....	333
Table 7.3.	Relation of independent variables to economic growth – Equation (1).....	334

Table 7.4.	Descriptive statistics for the expenditure and revenue assignments (provinces; percentage of general government expenditure and revenue).....	335
Table 7.5.	Average composition of provincial revenue (1999-2009; percentage of total) .....	335
Table 7.6.	Estimation results for provincial data.....	338
Table 7.7.	Estimation results for District Municipalities.....	338
Table 8.1.	Phases in the Next Steps Initiative .....	353
Table 8.2.	Examples of municipal services according to asset specificity and metering .....	354
Table 8.3.	Agencies without websites or not listing annual reports.....	360
Table 9.1.	Municipal response rate for electronic questionnaires.....	374
Table 9.2.	Vacancies in key sectors.....	383
Table 9.3.	Municipal audit outcomes .....	389
Table 9.4.	Local government restructuring grant (rands millions) .....	390
Table 9.5.	Municipal systems improvement programme grant (rands million).....	390
Table 9.6.	Financial Management Grant (rands millions) .....	391
Table 10.1.	Sample of municipalities.....	412
Table 10.2.	An assessment of the gender responsiveness of IDPs .....	414
Table 10.3.	Summary of the case study findings.....	426
Table 10.4.	Summary of findings in four areas of service provision .....	427

# ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AMSA	Amended Municipal Systems Act
APF	Adaptation Policy Framework
ASD	Alternative Service Delivery
AsgiSA	Accelerated and Shared Growth Initiative for South Africa
BAU	Business As Usual
BUS	Business and Management
CAC	Command and Control
CAT	Catastrophe (as in Catastrophe bonds)
CBA	Cost Benefit Analysis
CBO	Community-based Organisation
CBWM	Community-based Waste Management
CDM	Clean Development Mechanisms
CEDAW	Convention on the Elimination of all Forms of Discrimination Against Women
CER	Certified Emission Reduction
CES	Constant Elasticity of Substitution
CGE	Computable General Equilibrium
CHET	Centre for Higher Education Transformation
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
CSR	Corporate Social Responsibility
DAFF	Department of Agriculture, Forestry and Fisheries
DBSA	Development Bank of Southern Africa
DCoG	Department of Cooperative Governance
DEA	Department of Environmental Affairs
DG	Director General
DMA	Disaster Management Act
DoBE	Department of Basic Education
DoC	Department of Communications
DoE	Department of Education
DoHET	Department of Higher Education and Training
DPLG	Department of Local Government
DRMC	Disaster Relief Management Centres
DSD	Department of Social Development
DST	Department of Science and Technology

DWAF	Department Of Water Affairs and Forestry
ECA	Environmental Conservation Act (Act 73 of 1989
ECD	Early Childhood Development
EDI	Electricity Distribution Industry
EI	Economic Instrument
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPA	United States Environmental Protection Agency
EPWP	Expanded Public Works Programme
ESTA	Extension of Security and Tenure Act
FBS	Free Basic Services
FCA	Full Cost Accounting
FEMIS	Further Education Management Information System
FET	Further Education and Training
FFC	Financial and Fiscal Commission
FFW	Food For Work
FRA	Fund-Raising Act
FTE	Full Time Equivalent
GBV	Gender-Based Violence
GCM	Global Climate Model
GDP	Gross Domestic Product
GEAR	Growth Employment and Redistribution
GFP	Gender Focal Person
GHG	Greenhouse Gases
GIS	Geographic Information Systems
GRB	Gender-Responsive Budgeting
GRID	Global Resource Information Database
GVA	Gross Value Add
HDA	Housing Development Agency
HEMIS	Higher Education Management Information System
HIV	Human Immunodeficiency Virus
HR	Human Resources
HRD	Human Resource Development
ICASA	Independent Communications Authority of South Africa
ICT	Information, Communication and Technology
IDASA	Institute for A Democratic Alternative for South Africa.
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IGDP	Integrated Growth and Development Plan
IGFR	Intergovernmental Fiscal Relations
IMF	International Monetary Fund

IP&WM	Integrated Pollution and Waste Management
IPC	Integrated Pollution Control
IPCC	Intergovernmental Panel on Climate Change
IWMP	Integrated Waste Management Plan
IWMSA	Institute of Waste Management of Southern Africa
KPI	Key Performance Indicators
KZN	KwaZulu-Natal
LED	Local Economic Development
LES	Local Equitable Share
LGSETA	Local Government Sector Education and Training Authority
MDB	Municipal Demarcation Board
MDG	Millennium Development Goals
MDMC	Municipal Disaster Management Centre
MFMA	Municipal Finance Management Act (Act 56 Of 2003)
MIG	Municipal Infrastructure Grant
MISA	Municipal Infrastructure Support Agency
MSA	Municipal Systems Act (Act 32 Of 2000)
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
MT/a	Metric tons per annum
MTBPS	Medium Term Budget Policy Statement
MTEF	Medium Term Expenditure Framework
MTSF	Medium Term Strategic Framework
NCCF	National Calamity Central Fund
NDMA	National Disaster Management Authority
NDMC	National Disaster Management Centres
NDMF	National Disaster Management Framework
NDP	National Development Plan
NDRA	National Disaster Relief Arrangements
NEMA	National Environmental Management Act (Act 107 Of 1998)
NEMWA	National Environmental Management Waste Act (59 Of 2008)
NGO	Non-government Organisation
NGP	New Growth Path
NHI	National Health Insurance
NIDS	National Income Dynamics Study
NLDF	National Lottery Distribution Trust Fund
NDMC	National Disaster Management Centres
NPC	National Planning Commission
NPM	New Public Management
NQF	National Qualifications Framework

NSFAS	National Student Financial Aid Scheme
NWMS	National Waste Management Strategy
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
PALAMA	Public Administration Leadership and Management Academy
PDMC	Provincial Disaster Management Centre
PFMA	Public Finance Management Act
PPP	Public-Private Partnership
PRASA	Paper Recycling Association of South Africa
PSNP	Productive Safety Net Programme
RED	Regional Electricity Distributor
RWSI	Relative Water Stress Index
SADC	Southern African Development Community
SALGA	South African Local Government Association
SAM	Social Accounting Matrix
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SASSA	South African Social Security Agency
SAWIS	South African Waste Information System
SDMA	State Disaster Management Authority
SET	Science and Technology
SETA	Sector Education and Training Authority
SMMES	Small, Medium and Micro Enterprises
SO <sub>2</sub>	Sulphur Dioxide
SPR	Single Purpose Reinsurer
SPU	Special Programmes Unit
SPV	Special Purpose Vehicle
StatsSA	Statistics South Africa
TDF	Tyre-Derived Fuel
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention for Climate Change
Unisa	University of South Africa
USEPA	United States Environment Protection Agency
VAT	Value-added Tax
WBI	Women's Budget Initiative
WBR	Waste By Rail
WHO	World Health Organisation
WMP	Waste Minimisation Programme
WSSD	World Summit on Sustainable Development

# FOREWORD AND EDITORIAL

The Financial and Fiscal Commission (the Commission) provides independent, impartial advice and recommendations on Intergovernmental Fiscal Relations (IGFR), including the technical evaluation and design of provincial and local fiscal and economic policy. Established by the Constitution of South Africa in 1994, the Commission provides information to all organs of state to help them make informed decisions about complex fiscal issues. In this respect, one of the Commission's main objectives is to help inform the following year's budget by making recommendations on the division of revenue among the three spheres of government and to support government's policy-making on IGFR. This is done by submitting annually to Parliament an advisory document that summarises the recommendations, which the executive should take into account when crafting the next year's budget. This Submission for the Division of Revenue is made in terms of Section 214 (2) and Section 229 (5) of the Constitution, and Section 9 of the Intergovernmental Fiscal Relations Act of 1999. This volume of technical chapters is published as a companion document to the Submission for the Division of Revenue 2013/14 that the Commission tabled with Parliament in May 2012.

South Africa remains one of the most unequal countries in the world today. The symptoms of poverty and inequality are apparent, especially in health and educational outcomes, settlement patterns and vulnerability to crime and environmental disasters. To gain greater insights into how the IGFR policy broadly affects economic development and in particular the equitable distribution of public resources, the theme of this Technical Report is:

## **“Moving People Out of Poverty: Supporting Innovation in Intergovernmental Financing”**

Collectively, the chapters in this Technical Report argue that the distribution of competencies between the different spheres and levels of government may have remarkable effects on economic growth and development. Despite tensions between growth and inclusion, the report finds that growth can lead to increased economic opportunities for the poor and a reduction in inequality. The report specifically explores what local, provincial and national governments might do to strengthen economic development and increase employment. The focus is on the IGFR system's instruments that contribute to economic development (of regions) and the transmission mechanisms, and how they unblock structural impediments towards inclusive growth. When looking specifically at the knowledge economy, a key challenge for the intergovernmental system is that the emerging functional economic regions will typically not match the administrative geographic jurisdictions (such as municipalities and provinces) but transcend them in ways that will change dynamically over time. In all this, the aim is to investigate how the different elements of the IGFR system, and the different spheres of government, can be used efficiently to address inclusive growth and stimulate innovation.

The Technical Report is divided into three parts:

Part 1: Supporting inclusive growth: jobs, knowledge and regional development

Part 2: Climate change and environmental sustainability: opportunities and risks for inclusive growth and innovation

Part 3: Institutional development for inclusive growth and innovation.

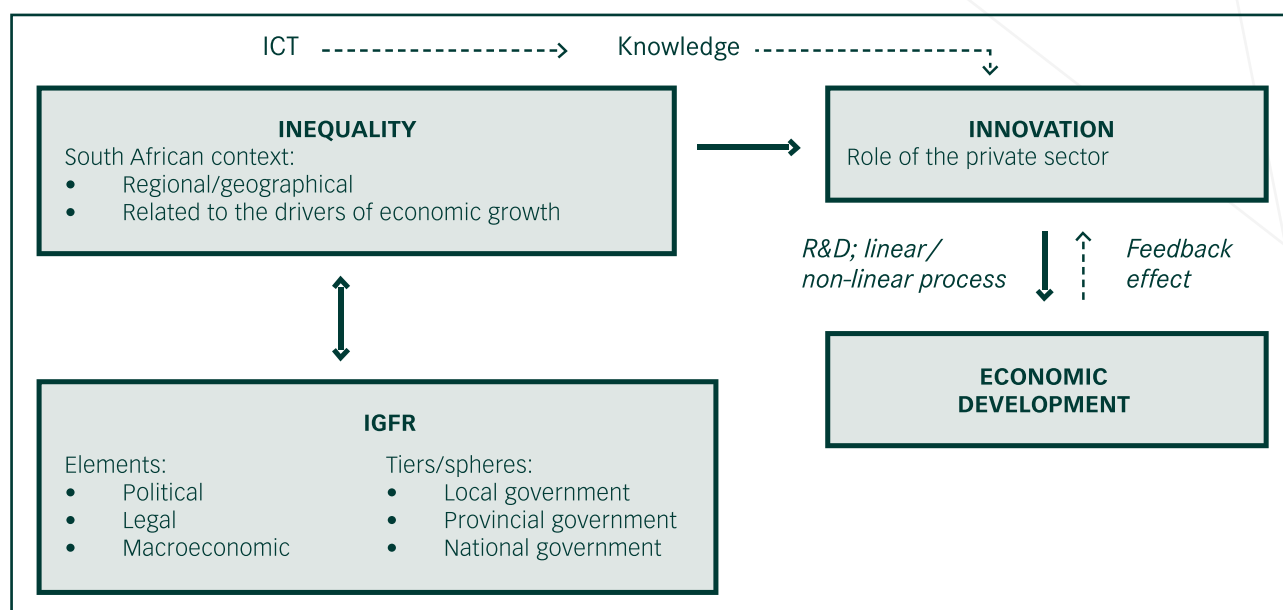
A unifying theme underpinning the three parts is the role of innovation and the knowledge economy in facilitating inclusive development. This is organised around two thematic focuses: (i) enhancing the framework for sub-national development and innovation, and (ii) facilitating growth with jobs.

The report explores specifically unemployment in general and that of the youth in particular. One way to move people out of poverty is to ensure that the IGFR system supports job creation and regional development. Since the poor are disproportionately affected by disasters and climate change, a pro-poor IGFR system should mitigate this risk. Finally, the poor also rely mainly on public services. Therefore, they are the hardest hit if the capacities of all spheres of government are not sufficient to ensure that grant allocations etc. are converted into effective service delivery to those who need them most. Hence, the need is to focus on institutional development and innovation. Gender and capacity enhancement is a cross-cutting theme, with an emphasis on women's economic empowerment. Figure 0.1 maps the



arguments that trace the flows of fiscal transfers, capital and technology through the intergovernmental and sector budgeting on economic progress.

Figure 0.1. The Role of IGFR in the innovation process: implications for growth and inequality<sup>1</sup>



The Technical Report consists of 10 chapters and brings together papers that focus on major cross-cutting issues, such as job creation, growth, capacity, gender and climate change, and specific case studies.

Chapter 1 points out that South Africa is trapped in a cycle of modest growth, high inequality and record unemployment. With unemployment at unprecedented levels, the stakes are high. As the main weapon at government's disposal, fiscal policy is where the battle against very high unemployment in South Africa will be won (or lost). Government has put in place a number of employment and training policies, including reinforcing social nets and scaling up resources for active labour market policies aimed at helping job seekers find work. Significant injections of capital, as part of stimulus packages, have led to job creation (opportunities) at the local level both in the public and private sectors. By examining a broad range of policy approaches designed to reduce unemployment, this study helps to bring forward the frontiers of knowledge and develop the capacities of policy-makers to design and implement innovative policy initiatives. It provides a set of key principles for action, summarising findings from analysis based on detailed economy-wide modelling.

Chapter 2 highlights key issues to consider regarding the financing of e-education in South Africa, in light of the forthcoming ten year anniversary of the *White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies* (ICTs). The chapter presents an overview of key issues in financing e-education and lays the foundation for further research to be conducted for the next Annual Submission (2014–2015). As the world is shifting to a knowledge-based economy, South Africa's ability to promote inclusive growth depends on producing successive generations of well-educated young people contributing to socio-economic development. A South African society with a large well-educated population will overcome more easily the many obstacles to social and economic equality experienced by the majority of households. One of many approaches to building the necessary long-term capacity will be e-education, which uses ICT to enhance the quality of learning and teaching. The result is potentially greater completion rates and better educational outcomes, as learners can have access to a more complex knowledge base and can engage in more self-learning, with the guidance of teachers.

Chapter 3 explores higher education financing. It argues that a key lever to new growth is creating a well-established, good quality post-school education system, so that the further and higher education sectors improve their performance significantly in the next two decades. Improving the quality of academic throughput and research and innovation output can introduce greater added value and higher employment into all sectors of the economy, and also potentially contribute

<sup>1</sup> Note that the arrow between the inequality box and the IGFR box can be bi-directional. While the IGFR can influence inequality, inequality has also helped shaped the objectives and modalities of the IGFR

to long-term poverty reduction and development. South Africa must transition from a low added-value economy to a more knowledge-intensive economy that combines low-, medium- and high-knowledge intensive productive activity in order to increase the proportion of medium to high income jobs. Such a transition requires a strong, adequately funded post-school education system, comprising colleges, vocational institutions and universities.

Chapter 4 examines the impact of climate change on South Africa's rural areas and begins by assessing the impact of climate change on agricultural productivity. It then looks at the vulnerability of rural municipalities to climate change and examines a number of instruments that can be used to build resilience to climate change in rural areas. The findings imply that mixed farming will strengthen the resilience of farmers and that the use of adaptation strategies, such as fertilisers, pesticides and dips and access to insurance, would be advisable to reduce the risks. The chapter finds that overall adaptive capacity is highest for the more developed metropolitan municipalities and for most of the south-western municipalities. Adaptive capacity is particularly low in the eastern half of the Eastern Cape and in northern KwaZulu-Natal, as well as parts of Limpopo and North West Province. Overall vulnerability is highest in the eastern half of the country, particularly in areas corresponding to former homeland areas, while most municipalities in the western half of the country as well as several in Gauteng and Mpumalanga are comparatively resilient. Rural municipalities (type B4), as a group, are significantly more vulnerable than other types of non-metro municipalities. The differences between the average vulnerability scores of other types of municipalities are not significant. The chapter also examines some of the adaptation measures required to improve the resilience of vulnerable rural municipalities, as well as what fiscal and financial measures could be used to achieve resilience.

Chapter 5 points out that South Africa is prone to climate-related hazards, such as floods, fires, gales force winds and snowfalls. Municipalities in South Africa, specifically districts municipalities, are having difficulties implementing the provisions of the *Disaster Management Act* (No 57 of 2002) and the guidelines provided in the *National Disaster Management Framework* (2005). One of the main reasons for this is a lack of funding (or a lack of understanding of funding allocation) by national and provincial governments. Municipalities also fail to make provision for such funds in their budgets and, in some cases, allege that the national government has provided them with an unfunded mandate. The reality is that, instead of improving disaster risk reduction within the local sphere of government, the lack of policy implementation leads to higher levels of vulnerability and increases the likelihood of hazardous occurrences leading to disasters. The purpose of this chapter is to provide answers to questions raised by these challenges. The questions include: What are the problems associated with current disaster risk management funding mechanism? What are the feasible alternative funding mechanisms for disaster risk reduction in South Africa? Are the institutional, policy and legislative frameworks for funding disaster risk management and possible disasters adequate and effective in South Africa? Is there a space for risk sharing and public-private partnership? Qualitative research and a literature review were used as the basis for developing a new model for disaster risk management funding in South Africa. The model includes both disaster reduction and disaster relief and recovery components.

Chapter 6 argues that the majority of municipalities and cities in South Africa face serious economic, social and environmental challenges related to solid waste management. Research shows that, while the intent is good, government needs to implement better, well thought through approaches to create jobs and employment in the waste service sector. Through the poverty alleviation fund system, government has wasted money and resources on events such as 'clean-up campaigns' and on funding small recycling centers in rural areas, which are not linked to larger markets. The report calls upon all spheres of government to take a radically different approach to waste management, as laid out in the *National Waste Management Strategy* (NWMS) that was promulgated in terms of the *National Environmental Management: Waste Act* (No 58 of 2009). The NWMS mentions the need for financial mechanisms but does not (and is not intended to) provide any details. The chapter explores some of the options available to trigger sustainable financing of waste management in South Africa. These options require further and detailed research before concrete and sound policy decisions can be made. The chapter recommends introducing and implementing economic instruments (EI), to complement the existing control and command (CAC) framework, and ensuring that the private and social costs of waste generation are covered. Funding should be directed towards developing and operating infrastructure for alternative waste management options, such as recycling, reuse, resource recovery, and treatment, which offer higher cost benefits than traditional, economically and environmentally unsustainable landfill sites. Government must oversee municipal financial accounting, to prioritise and plan for waste management, ensure that a full cost accounting (FCA) approach is implemented and that integrated waste management plans include a cost benefit analysis (CBA) of the entire waste management system.

The overriding question of Chapter 7 is whether or not the distribution of competencies among the different spheres of government has an impact on economic growth. The literature has not yet addressed the importance of assigning decision-making competencies for economic growth in South Africa. Hence, this chapter aims to fill the gap by questioning whether South African provinces and district municipalities play a useful role in promoting economic growth and, if so, in what way (i.e. through revenue assignment, expenditure assignment or both). Revenue and expenditure assignments

are important pillars of the IGFR system and for fiscal decentralisation, both of which have many dimensions. The chapter focuses on economic growth, an objective that the South African government is (and has been for some time) strongly pursuing. The empirical analysis uses South African provincial-level and municipal-level data in a modified endogenous growth model.

According to Chapter 8, municipalities find themselves in a difficult position, in part because of persistent backlogs in access to basic services, limited financial resources and poor capacity. Attempts to address some of these challenges and to accelerate service delivery have seen government take a greater interest in the way in which services are delivered. The result has been an increase in the number of agencies and other alternative service delivery (ASD) arrangements, all aimed at reversing poor service delivery performance and facilitating economic and social development in municipalities. South African public policy does not have a diagnostic tool or set of principles against which policy and decision-makers can evaluate ASD arrangements. Drawing from international best practice, this chapter recommends a set of principles that government ought to consider when shifting away from traditional bureaucratic-driven service delivery.

Chapter 9 quantifies the amount of public funds dedicated to local government capacity building since 2000, assesses whether the various spheres of government are playing their required roles in building capacity at local government level (as envisaged by the legislative framework) and critically considers government's approach to capacity building in light of Outcome 9. Primary and secondary data and research were collected and analysed. The chapter makes recommendations on alternative/complementary intergovernmental measures that will assist in minimising the capacity challenge.

The Technical Report concludes with Chapter 10 that examines gender-responsive budgeting (GRB). GRB is an instrument that seeks an efficient and equitable distribution of resources based on the needs of different gender groups in society. In many respects gender-sensitive budgets enhance gender equality and economic development. In South Africa, gender budgeting at national level dates back to 1995. However, it is not clear how government gender commitments are translated into fiscal commitments at sub-national level. From an equity point of view, mainstreaming gender budgets is needed at local level, where gender disparities in service delivery are more evident. This chapter evaluates gender budgeting in the South African local government sector, reviewing 30 municipalities' IDPs for their gender sensitivity. In addition, the gender responsiveness of local government budgets is evaluated through seven municipal case studies. The analysis suggests that the local government budgeting processes are not gender sensitive. The chapter therefore proposes several recommendations that could make local government budgets more gender sensitive.

The Financial and Fiscal Commission would like to thank all the seminar participants and reviewers who contributed immensely to the chapters, government departments and conference participants who assisted in shaping the contents of this submission through their comments. Finally, we wish to express sincere gratitude to Kristina Davidson for technically editing the chapters contained in this volume. The views expressed in this volume are those of the authors and do not necessarily constitute those of the Financial and Fiscal Commission.

(July 2012)

# ABOUT THE AUTHORS

**Ramos Mabugu** holds a PhD in Economics from Gothenburg University, Sweden and joined the Financial and Fiscal Commission in 2006. Ramos's research work focuses mainly on developing 'state of the art' macroeconomic frameworks used to assess the necessary macro-micro links of public policy in order to better understand issues of poverty, equity, growth and macro dynamics. In collaboration with colleagues, Ramos has pioneered the application of CGE microsimulation (static and dynamic) to South Africa and Zimbabwe. He has published many articles in leading academic journals and as book chapters. Prior to joining the Financial and Fiscal Commission, Ramos taught and supervised at postgraduate level at the University of Zimbabwe (1996–2002) and the University of Pretoria in South Africa (2003–2006). While at university, Ramos served as external examiner for a number of Southern and East African universities and has been supervisor and an external opponent to several PhD dissertations. Ramos has also consulted for various international organisations such as the World Bank, ACBF, ILO, IUCN, FAO, CIDA, SIDA, USAID, UNIDO, UNICEF and WWF. Ramos has twice been invited to teach economic modelling courses at the prestigious Ecological and Environmental Economics Programme at the Abdus Salam International Centre for Theoretical Physics (ICTP) in Italy. In 2006 Ramos received a visiting fellowship from Curtin University in Australia.

**Lucienne Abrahams** is a Commissioner of the Financial and Fiscal Commission and is affiliated with the University of the Witwatersrand. She is Director of the Learning, Information, Networking, and Knowledge (LINK) Centre in the Faculty of Humanities. Her research interests are "understanding institutions and economic sectors in the network, knowledge economy", and she has published on topics that include innovation and development, intellectual property rights and open access to knowledge, e-development and ICT policy, e-governance, universities in the knowledge economy. She has drafted policy and strategy documents for various parts of government. Lucienne has served on numerous boards and committees of public sector organisations, including the Development Bank of Southern Africa, the National Advisory Council on Innovation, the State Information Technology Agency, the National Research Foundation, and the Council on Higher Education.

**Ian Bunting** is an Emeritus Professor of Philosophy of the University of Cape Town (UCT). For 11 years, he was full-time Dean of the Faculty of Social Science and Humanities at UCT, before being seconded to the higher education branch of the DoE. Before retiring in 2010, he worked in the department's directorates responsible for the higher education management information system (HEMIS), national higher education planning, and funding for a total of 10 years. His activities included being part of the teams that drafted the 2001 National Plan for Higher Education, the 2003 higher education funding framework, and the 2007 student enrolment planning reports. He now undertakes research work on performance indicators and other policy issues for the Centre for Higher Education Transformation (CHET).

**Margaret Chitiga** is Executive Director (Economic Performance and Development) at the Human Sciences Research Council (HSRC). Prior to joining HSRC, she was a Professor in the Economics Department at the University of Pretoria in South Africa. She obtained her PhD in economics at the University of Gothenburg in Sweden. She taught Microeconomics and Public Sector Economics, Development Economics and Mathematics for Economists and CGE Modeling. Her research interest is the effects of policies on welfare, industry and the rest of the economy. She uses computable general equilibrium models, social accounting models and input-output models to do such investigations. She has worked on various issues, including income distribution effects of alternative transfer initiatives by the government, the impact of the transport sector in South Africa, impacts of recycling CO2 emission taxes, poverty implications of trade reforms and welfare effects of land reforms. She continues to be curious and intrigued by the general equilibrium effects of policies and shocks on economies and welfare. She has published in local and international refereed journals.

**Dewald van Niekerk** is Professor in Disaster Studies and the founder and director of the African Centre for Disaster Studies at North-West University, Potchefstroom Campus in South Africa. He is the author of *A Framework for Multi-sphere Disaster Risk Reduction: The Case of South Africa*, co-author of 14 academic books and numerous articles and research reports. He has been project leader for local, national and international disaster risk-reduction projects and has undertaken disaster risk-reduction research and consultancy in countries such as Botswana, Namibia, Lesotho, Swaziland, Zimbabwe, Malawi, Mozambique, Zambia, Tanzania, Ethiopia, United Arab Emirates, Sweden and India. Dewald is the programme manager for the MA and PhD degree in Development and Management (Disaster Studies)

and programme manager for the research programme in Disaster Risk Studies. Dewald is the founder and Editor in Chief of *Jàmbá: Journal of Disaster Risk Studies*. He holds a Doctorate in public management and administration with a specific focus on disaster risk reduction obtained at North-West University, Potchefstroom Campus. His research interests include community-based disaster risk management, disaster risk assessment, disaster risk governance and building institutional capacities for disaster risk reduction.

**Veronique Robichaud** completed a Bachelor Degree (1992) and a Master's Degree in economics (1994) at Université Laval. Her graduate studies, along with her ongoing research activities at the CIRPÉE (Centre interuniversitaire sur le risque, les politiques économiques et l'emploi), have contributed to the development of strong analytical capacities. Over the years, she has been involved in the development of analytical tools, such as computable general equilibrium models for the CIRPÉE, Finance Canada, the Department of Finance of Québec and other research centres. Given her strong academic background and communication skills, she has been involved in many training sessions and acts as a lecturer at the HEC. Veronique Robichaud has participated in numerous research projects related to regional and international agreements, aboriginal issues, international development and environment.

**Hélène Maisonnave** holds a PhD in Economics and specialises in development economics and computable general equilibrium (CGE) models. She has worked with the PEP network since 2007 and as a permanent staff of PEP Laval since May 2011. Since her PhD, Hélène has developed several CGE models, mostly on African countries, dealing with trade reforms, education and labour market issues, and millennium development goals. Before joining Laval, she worked as a researcher for the European Commission, in the Environmental and Climate Unit in Seville. She has also worked for the Financial and Fiscal Commission and did a post-doctoral degree at the University of the Free State in South Africa.

**Jane Turpie** is Research Coordinator for the Environmental Policy Research Unit at the University of Cape Town and Director of Anchor Environmental Consultants. She has a background in ecology and 17 years of experience in conservation biology and resource economics, with a particular interest in multidisciplinary work and the development of integrated conservation and development strategies and plans. Her work includes the development of indices for assessing ecosystem health, quantification and valuation of ecosystem services, economic impacts of climate change, analysing community dependence and pressures on natural resources, modelling agricultural and ecological-economic systems, incentive and financing systems for conservation, consideration of the value of ecosystem services in conservation and development planning and quantitative scenario analysis for integrated river basin management.

**Martine Visser** is an Associate Professor in the School of Economics, University of Cape Town and Research Fellow of the Environmental Economics Policy Research Unit, which is part of the Environment for Development Initiative. She holds a PhD from Gothenburg University in Sweden. Visser specialises in behavioural economic applications to natural resource use, specifically focusing on the impact of climate change on decision making. Recent work includes experimental work studying cooperation and equity issues in multilateral climate-change negotiations, as well as the role of stakeholder participation and carbon taxes in meeting national emissions targets between sectors. She also studies the role of risk and ambiguity aversion in determining adaptation and technology uptake among the poor, and how credit and insurance mechanisms impacts on risky decision making.

**Henlo van Nieuwenhuyzen** is a specialist in the field of monitoring and evaluation and public financial management, with a particular focus on local government. He has extensive experience in providing policy, strategic, M&E, budget and financial management processes and system advisory services, as well as capacity development to all spheres of government and to both the executive and legislative sectors. He has led multiple projects relating to capacity building, strategic planning, budget analysis, financial systems analysis, evaluation and assessment and the development and implementation of M&E processes and systems.

**Imelda Diouf** is a development planner. She has worked in the public and private sectors and has extensive experience in project planning and design processes, capacity development and training. Her research interests are gender, disability, youth, and children's issues. She participated in the drafting of the gender equality qualifications through the South African Qualifications Authority (SAQA) and, under the auspices of the Public Administration Leadership and Management Academy (PALAMA), developed the accredited gender equality programme for the South African public service.

**Mkhululi Ncube** holds a PhD in Economics. He is currently a Programme Manager in the Local Government Unit of the Financial and Fiscal Commission. Previously, Mkhululi lectured in various universities in and outside South Africa. His present research interests are climate change and fiscal policies, local government budget analysis and gender budgeting. He is passionate about local economic development issues and sustainable resource use in urban spaces.



**Vincent Makinta** re-joined the Financial and Fiscal Commission after spending three years with the National Treasury as a director for Provincial Policy and Planning. His role for the past three years has been managing and coordinating the Intergovernmental Fiscal Relations (IGFR) programme. He now heads the Financial and Fiscal Commission's Data and Information portfolio, where he initially worked in 2000. Among his other responsibilities are strategically translating policy research questions within the IGFR system into models. Previously Vincent was a Geographic Information Systems (GIS) Analyst at the Human Sciences Research Council (HSRC), which he joined after two years as a GIS: Geographer at the Department of the Premier North West and a Town and Regional Planner for Settlement Planning Services Company in Mafikeng. Vincent has a BA in Sciences (Honours) and is studying towards an MSc in population and modelling at the University of the Witwatersrand. His career goal is to contribute to the betterment of life for all South Africans through the use of specialised research and information technologies.

**Marina Marinkov** is a Research Specialist in the Macroeconomics and Public Finance Unit of the Financial and Fiscal Commission. She deals mainly with quantitative modelling of macro and fiscal issues relating to policy across the different spheres of government. She has published articles on fiscal rules and fiscal consolidation in South Africa. She holds a Master's Degree in Economics from the University of Free State. Prior to joining the Financial and Fiscal Commission, Marina was a lecturer at the University of Cape Town. She also taught at the University of Free State.

**Nomonde Madubula** is a Senior Researcher within the Financial and Fiscal Commission's Fiscal Policy Unit. She holds a Master's Degree in Economics from the University of the Witwatersrand. Her research focuses on social sector issues (education and health) and environmental regulation and policy. She has been responsible for path-breaking work related to provisioning of learner support material, funding mechanisms for further education and training and the feasibility of extending the National School Nutrition Programme. In the current financial year, her focus areas are solid waste management financing and alternative financing mechanisms for disaster risk management in South Africa. Prior to joining the Financial and Fiscal Commission, she worked at National Treasury Tax Policy Directorate as an Intern focusing on intergovernmental tax relations.

**Sasha Peters** is a Senior Researcher within the Financial and Fiscal Commission's Local Government Unit. She has an MPhil in Public Policy from the University of Cape Town. At present, her focus areas are municipal debt, service delivery arrangements and local government capacity in South Africa. Previously Sasha was employed at the Presidency and within IDASA's Budget Information Services, where her focus was mainly on social sector departments of education, health and social development.

**Donald Sibanda** is a Researcher in the Data and Information Unit of the Financial and Fiscal Commission. He holds a BSc from the University of Zimbabwe and is currently completing a Master's of Management in Finance and Investments at the University of the Witwatersrand Business School. His area of research pertains mainly to issues of government investment on economic development.

## Part 1

# SUPPORTING INCLUSIVE GROWTH: JOBS, KNOWLEDGE AND REGIONAL DEVELOPMENT

# PERSPECTIVES AND PROSPECTS FOR JOB CREATION AND THE FISCAL INTERVENTIONS IN SOUTH AFRICA

## 1.1 Introduction

This chapter studies the efficacy of a broad array of policy approaches designed to reduce unemployment using a labour model embedded within an economy-wide modelling framework. Section 1.2 reviews the facts and myths about the unemployment situation based on findings from the literature, while Section 1.3 explores the relationship between infrastructure and total factor productivity. Section 1.4 builds a national labour model for South Africa and discusses the data used to operationalise the model. In Section 1.5, the general implications of introducing alternative policies in such a framework are discussed, and how it can assist government to solve problems of job creation, while taking into account fiscal consequences. Section 1.6 summarises the main findings and Section 1.7 offers policy recommendations.

After more than 19 years since the end of apartheid, high unemployment persists, and South Africa is still facing the challenge of creating sustainable employment for a growing labour force. The economy's poor performance in creating employment has led to many debates. One is South Africa's capacity to compete globally: high unemployment is a sign of domestic industries' inability to compete with either the high-tech or the low-wage countries. Another is trade and technologies: new technologies and globalisation can explain the massive restructuring of South African industries and

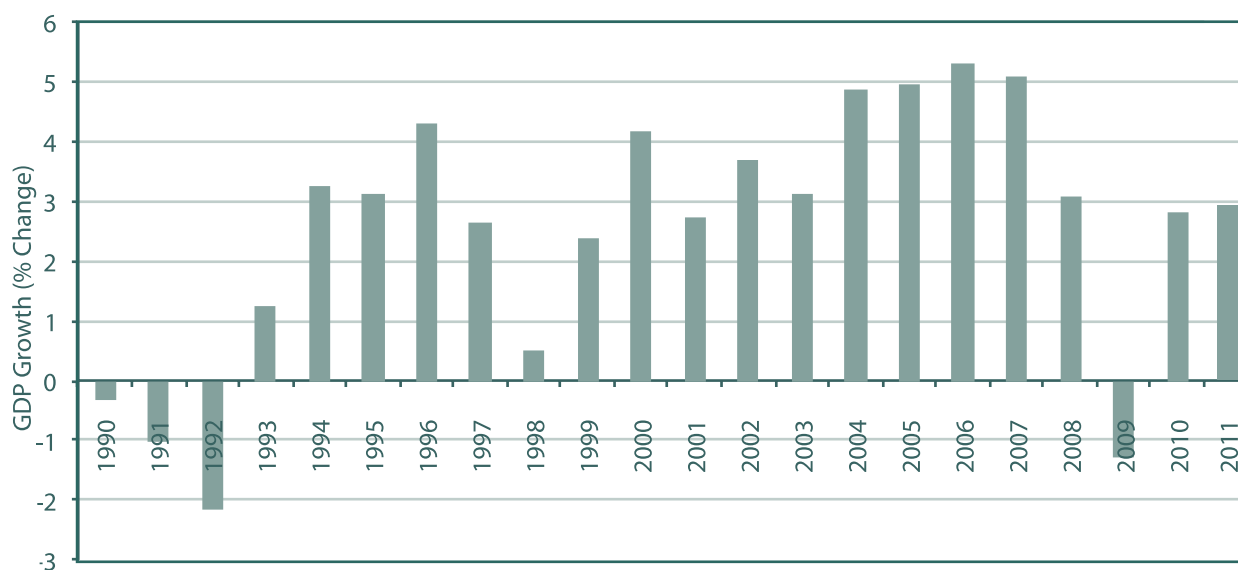
4 Economic Performance and Development, Human Sciences Research Council, South Africa



consequent job losses. Other debates point to the skills mismatch, to insufficient aggregate demand or to the overly generous social policies that negatively affect employment.

Figure 1.1 shows South Africa's annual gross domestic product (GDP) growth for the period 1990–2010. Growth in South Africa was positive between 1993 and 2008 but became negative in 2009 following the 2008 global financial crisis. Recovery started slowly in 2010, with a growth rate of 2.9%. Despite this mostly positive growth, South Africa's economic growth needs to be more labour intensive (Nattrass, 2000). The policies that accompanied the institutional transformation of 1994 focused on dealing with the high inequality in wealth, income and opportunity in the South African economy (McCarthy, 2005). However, what is needed is increased employment, as almost all of South Africa's household income comes from participating in the labour market, mainly through wages (Nattrass, 1998).

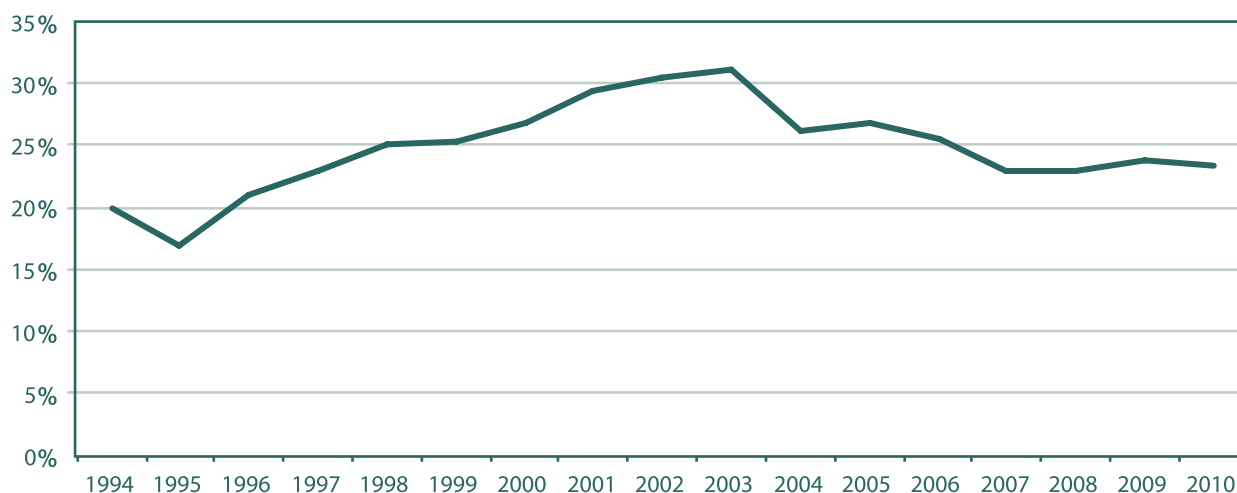
Figure 1.1. South Africa's annual GDP growth: 1990–2011



Source: The South African Reserve Bank, May 2012

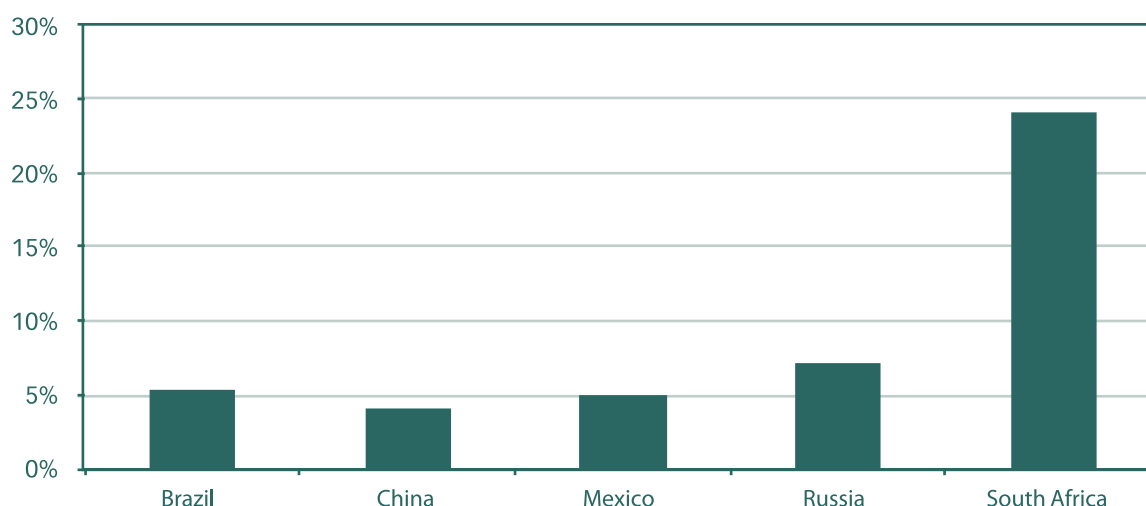
As Figure 1.2 shows, from 1994 unemployment increased, with rates remaining stubbornly above the 20% threshold from 1996. Although international comparisons of unemployment are fraught with problems, the evidence suggests that South Africa has exceptionally high rates of unemployment. As Figure 1.3 illustrates, South Africa's unemployment looks abnormally high when compared with other middle-income countries (as classified by the World Bank).

Figure 1.2. South Africa's unemployment rate: 1994–2010



Source: World Bank, 2012; CIA World Fact Book, 2012

Figure 1.3. Unemployment rate for Brazil, China, Mexico, Russia and South Africa (2010)



Source: *Trading Economics*, 2012

South Africa's inability to handle macroeconomic shocks is a central factor that explains employment developments (FFC, 2010). Over the last 18 years, periods of job growth have been followed by periods of heavy job losses. Jobs were created during the recovery periods but were destroyed by the millions in the downturn periods because of (in part) uncoordinated macro and micro-economic policies. This questions the validity of jobless growth in South Africa since the new democratic dispensation and indeed the links among economic growth, job creation and unemployment. Between September 2001 and September 2008, as economic growth continued and accelerated, as many as 2.5 million new formal- and informal-sector jobs were created in South Africa (The Presidency, 2009, p 20). The period of 'jobless growth' during the early and mid-1990s represented an aberration: since the Second World War, employment growth often lagged output growth in South Africa, but jobless growth has been rare (Hodge, 2009, pp 497–498).

Research suggests that supply-side and demand-side factors have hampered the ability of the South African economy to create enough jobs. On the supply side, South Africa has experienced rapid labour-force growth, especially during the second half of the 1990s (Hodge, 2009, pp 499–500).<sup>5</sup> The labour force has expanded much more rapidly than the working-age population (Kingdon and Knight, 2007, pp 816–819), which implies that labour-force participation rates increased markedly.<sup>6</sup> The increase in participation rates – which has been particularly noticeable among African women – has been ascribed to actual and perceived improvements in employment opportunities following the scrapping of apartheid-era restrictions on the mobility of Africans (Burger and Woolard 2005, pp 5–8; Kingdon and Knight 2007, pp 816–819). Other factors include the introduction of employment-equity legislation, rising education levels, and rapid growth in the number of households because of changes in household structure and HIV/AIDS-related deaths among household heads.

Mismatches between labour supply and demand have constrained the labour intensity of economic growth. Most notably, since 1970 the economy has experienced considerable structural change, with the primary sectors (agriculture and mining) shedding labour and new job opportunities arising in tertiary sectors such as finance, wholesale and retail trade and community, social and personal services (Banerjee et al., 2009, pp 723–724). These changes have contributed to an increase in the demand for more skilled labour accompanied by a fall in the demand for unskilled labour, which has markedly worsened the employment prospects of the large unskilled portion of the South African labour force (Burger and Woolard, 2005, pp 16–18).

Table 1.1 confirms the shift since 1995 in the skills composition of employment, from unskilled and semi-skilled to skilled labour. From 1995 to 2008 only 17.7% of the new jobs created required unskilled workers, and by 2008 only 22.8 % of all jobs were classified as 'unskilled'. Of the new jobs created between 1995 and 2008, 46.4% were in the semi-skilled category, but this category's share of all jobs also decreased. In contrast, jobs requiring skilled workers increased from 21.8 % in 1995 to 26.1 % in 2008.

<sup>5</sup> From 2000 onwards labour-force growth slowed sharply, averaging only 0.7 % per annum from 2000 to 2007 (Hodge, 2009, p 500).

<sup>6</sup> Kingdon and Knight (2007, pp 816–819) pointed out that immigration also contributed to rapid labour-force growth. However, as much immigration has been informal or illegal, the extent of this contribution is difficult to quantify.

Table 1.1. The skills composition of employment (1995–2008)

Year	Percentages		
	Unskilled	Semi-skilled	Skilled
1995	25.1	53.1	21.8
2004	23.4	52.7	23.9
2008	22.8	51.0	26.1
Job growth (1995-2008)	17.7	46.4	35.9

Source: National Treasury, 2010, p 41

The relationship between labour-market institutions and outcomes is a controversial aspect of the unemployment debate in South Africa. Since 1995, government has promulgated a series of laws that have substantially changed the labour-market institutions.<sup>7</sup> Some economists (e.g. Arora and Ricci, 2005, pp 25–30) have argued that aspects of this institutional framework – including the laws governing collective bargaining processes and working conditions – have contributed to high unemployment in South Africa by rendering the labour market inflexible.

Having invested much political capital in establishing its labour market framework, the South African government has long resisted calls for reform. Analysis of the South African labour market has highlighted two additional constraints to overcoming the unemployment problem. First, the legacy of apartheid-era spatial planning (which separated black job seekers from job opportunities) and residual vestiges of racial discrimination may well undermine the effectiveness of employment searches in the labour market (Banerjee et al., 2009, p 734). Second, young people seem to experience exceptional difficulty in obtaining their first jobs and are affected particularly harshly by the scarcity of jobs.<sup>8</sup> When making hiring decisions, firms apparently put a high premium on work experience, possibly as a screening mechanism in an environment where virtually all younger workers now have at least ten years of formal education (Banerjee et al., 2009, pp 736–737).

Another notable feature of the South African labour market is the small size of the informal sector (Kingdon and Knight 2004, pp 391–392). In contrast to the situation in most developing countries, the informal sector appears not to have expanded rapidly to compensate for the scarcity of formal-sector jobs.<sup>9</sup> For example, in the fourth quarter of 2009, about 2.1 million workers were active in the non-agricultural informal sector, whereas 5.8 million were either openly unemployed or classified as discouraged work-seekers (StatsSA, 2009, p vi).

### 1.3 Infrastructure and Total Factor Productivity

Investment in infrastructure was in general very low in the years preceding democracy in South Africa. From 1996 to 2002, during the era of Growth, Employment and Redistribution (GEAR), public infrastructure investment fell from 8.1% to 2.6% of GDP. Fiscal discipline was emphasised more than increased expenditure. It was from the Accelerated and Shared Growth for South Africa (AsgiSA) plan in 2002 that a drive for infrastructure was couched in policy. The AsgiSA plan identified infrastructure as one of the six binding constraints to economic growth. The 2008 Budget Review showed that growth in real gross fixed capital formation increased from 16.5% in the fourth quarter of 2006 to 21.2% in the third quarter of 2007 (National Treasury, 2008). However, the financial and economic crisis that affected South Africa's economy between 2009 and 2010 slowed down the rate of growth in the economy. Thereafter, policy has once again turned to emphasise massive infrastructure investment. In his 2012 State of the Nation address, the President of the Republic of South Africa unravelled an intensive five-year infrastructure investment drive. It is thus appropriate to understand the impact of infrastructure on the South African economy and employment.

<sup>7</sup> The most important pieces of legislation were the Labour Relations Act (1995), the Basic Conditions of Employment Act (1997), the Employment Equity Act (1998), and the Skills Development Act (1998).

<sup>8</sup> According to the National Treasury (2010a pp 51, 42), more than three million young people do not work, and 73 % of the unemployed are aged 15–35.

<sup>9</sup> According to Heintz and Posel (2008), a comparison of Statistics South Africa and International Labour Organisation data for 2006 confirms that the ratios between non-agricultural employment in the informal sector and total employment were markedly higher in Latin and Northern American middle-income countries such as Argentina (36.1 %), Brazil (40.6 %), Mexico (38.0 %) and Paraguay (50.1 %) than in South Africa (18.5 %). Data on the size of informal sectors in sub-Saharan African and Asian developing countries also suggest that the informal sector in South Africa is unusually small (cf. Kingdon and Knight, 2004, pp 391–392).

Over time, studies on the impact of infrastructure on economies have produced differing results. For instance, Jung and Thorbecke (2003) showed that infrastructure spending benefited poor people in Tanzania but worsened the plight of the poor in Zambia. In a summary of some of the main studies on infrastructure, Kirsten and Davies (2008) show that, in general, studies that looked at various infrastructure sectors, roads, sanitation, electrification and dams show varied results – some are beneficial for poverty reduction, others actually cause poverty. Using a CGE model, Perrault *et al.* (2010) showed that the impact of infrastructure spending is very varied in selected sub-Saharan countries. Further, using the same model, they showed that the financing options produce very different results in the different countries. The analysis shows the importance of the underlying structure in determining the impact of infrastructure expenditure in a country.

The extensive work done by Fedderke and Bogetic (2006) has led to greater interest in analysing the importance of infrastructure, from its impact on growth to its impact on productivity. Fedderke and Bogetic (2006) concluded that infrastructure investment had a positive impact on productivity: total factor productivity increased by 0.04% when investment in economic infrastructure increased by 1%. However, Fedderke and Garlick (2008) suggested that the AsgiSA infrastructure plan might have unfavourable effects in South Africa.

Kirsten and Davies (2008, p 4) point out that the impact of increased infrastructure spending on poverty and employment is not clear, even if higher spending increases the rate of growth. Such micro impacts can only be uncovered by more in-depth sectoral analysis of the expenditure patterns, which is one of the purposes of this chapter.

Using a social accounting matrix (SAM) model, a study of the impact of transport infrastructure in South Africa found that middle-income households benefited the most from an increase in transport infrastructure (Mabugu and Chitiga, 2009). A possible problem is that public infrastructure investment could potentially crowd out other investment (Mabugu and Chitiga, 2009, p 36). However, an increase in infrastructure has positive effects on the economy, increasing consumption and investment and thereby creating spill-over effects (Mabugu *et al.*, 2009). As this study used a static CGE model, it opens the way for a dynamic CGE study, as typically the effects of infrastructure are dynamic.

## 1.4 Data and Methodology

For the purpose of this study, the labour factor is disaggregated into occupations. Integrated economic accounts from Statistics South Africa (StatsSA) for 2005, where the labour force is split according to occupation and population groups, are used after ensuring concordance with the SAM economic activities codes. The original SAM used is from Quantec for 2005. The different occupations are then identified as skilled, semi-skilled and unskilled using the StatsSA classification, as shown in Table 1.2.

Table 1.2. Correspondence between occupations and skills level

Skill Category	Occupation
Skilled	Legislators
	Professionals
	Technicians
Semi-Skilled	Clerks
	Service workers
	Skilled agricultural workers
	Craft workers
	Plant and machine operators
Unskilled	Elementary occupations
	Domestic workers
	Occupation unspecified

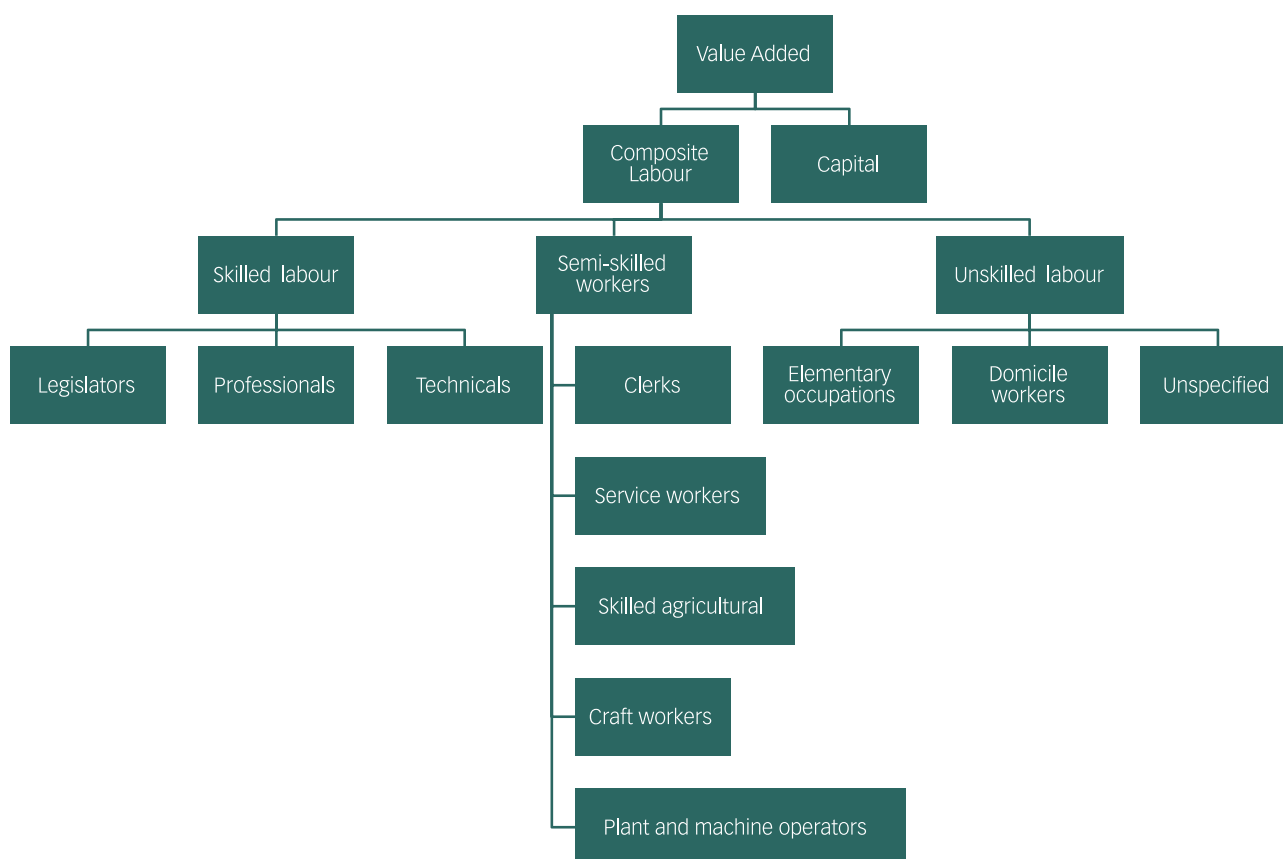
Gibson (2003) is used for the trade parameters and low-bound export supply, while demand elasticities are obtained from Behar and Edwards (2004). Estimates for parameters in industry production and household demand are not available

for South Africa. Therefore, the study borrows these values from the literature surveyed by Annabi *et al.* (2006). Finally, unemployment rates are drawn from the labour force survey report by StatsSA (2009).

To evaluate the impacts of government's policies in the long run, the dynamic Poverty and Economic Policy (PEP 1-t) standard model by Decaluwé *et al.* (2009) is used. However, several assumptions of this standard model are changed in order to take into account the South African economy. The model has two production factors: capital and labour. Labour is disaggregated into three broad types: unskilled, semi-skilled and skilled workers. Each type of broad labour is then disaggregated into occupations. Each activity uses both production factors.

In line with the SAM, the model has 25 activities and 54 commodities. The production function technology is assumed to be of constant returns to scale and is presented in a four-level production process. At the first level, output is a Leontief input-output of value added and intermediate consumption. At the second level, a CES function is used to represent the substitution between a composite labour and capital. At the third level, composite labour demand is also a CES function between skilled, semi-skilled and unskilled labour. Then, the skilled demand is a CES with a low elasticity between legislators, professionals and technicians, capturing the fact that (for instance) it is quite difficult for the firms to substitute a lawyer for a doctor. The semi-skilled demand is a CES with an intermediate value of elasticity between its five components, while the unskilled demand is a CES with a high substitution value, assuming that the producer can relatively easily substitute low skilled workers among them. Figure 1.4 gives the value-added structure.

Figure 1.4. The value-added structure



South Africa has high unemployment problems, notably for semi-skilled and unskilled labour. Moreover, unions are very strong in the country. The trade union movement is the most disciplined and the largest in Africa and has influenced labour and other related industrial policies. Unions negotiate salaries and wages, conditions of service, workforce restructuring and retrenchments on behalf of their members. As a result, wages and salaries are rigid, which the model takes into account by assuming a binding minimum wage. Thus, if the production decreases, producers will not be able to decrease their employees' salary below the minimum wage. This rigidity will also have an impact on unemployment, as if producers cannot decrease the wage bill, they will have to retrench some workers.

The nominal exchange rate is the numeraire in the model.<sup>10</sup> Following the assumption that South Africa is a small country, world prices are fixed. However, also assumed is the fact that South African exporters face less than infinite foreign demand for exports: to increase their market share on the world market, they need to reduce their free-on-board (FOB) export prices, increasing their competitiveness with respect to other suppliers on the international market. Factor supplies are fixed in the first period and then grow, at the population rate for labour force and using an accumulation equation for capital.<sup>11</sup> Transfers between institutions and government's purchases of commodities are fixed at the base year and then grow at the population rate. The assumption is that the rest of the world's savings is a fixed proportion of GDP, which means that South Africa is not allowed to borrow further from the rest of the world.<sup>12</sup>

## 1.5 Policy Simulations and Results

### 1.5.1 Policy Simulations

Several forward-looking policy simulations to examine (ex ante) several job creation policy interventions are put forward. Altogether, three sets of scenarios, each one implying four financing scenarios are run. Thus, there are 12 scenarios (which are permutations to the three expenditure scenarios) in total as follows:

1. Government's spending increases by 3% per year during 2013–2016 and then increases at the population rate thereafter.

Four different ways of financing this policy are proposed. First, government totally finances the increase (i.e. government's savings are endogenous and, given the policy set up, might decrease). Then, in the next three scenarios, government's deficit is kept constant, and the increased spending is financed through increasing direct taxes on households (Simulation A), increasing firms' direct taxes (Simulation B), and increasing indirect taxes (Simulation C).

2. Government's investment programme increases. This investment programme is split into three components:
  - Investment in government sectors (e.g. education, justice). These investments will increase the public sector's capital stock.
  - Investment in infrastructure (e.g. roads, harbours, airports). These investments do not increase the capital stock of any sectors. Indeed, a new road belongs to all the sectors and agents and can be considered as a public good.
  - Investment in productive sectors (e.g. investment in the energy sector) that increases the capital stock of a given sector. For instance, when government invests in a nuclear plant, the capital stock of the electricity/energy sector increases.

For this second scenario, an increase in public investment is stimulated for the three components, following the investment plan for the period up to 2016, and thereafter at the population rate. The same four different ways of financing government's deficit as in Scenario 1 are applied.

3. The third scenario presents the same simulation as Scenario 2 but takes into account the productivity effect of infrastructure investment on other sectors. For instance, the construction of a bridge (investment in infrastructure) will have an impact on other sectors if the use of this bridge reduces travel time.

### 1.5.2 Results

#### ***Impact of an increase in government spending***

##### *Impact on labour demand and unemployment:*

The increase in government spending has a positive impact on labour demand and reduces unemployment for all categories of workers. Government's activities are more intensive in skilled and semi-skilled workers, and so the impact

<sup>10</sup> Note that in the CGE results, a real devaluation of the rand takes the form of a generalised reduction in domestic prices.

<sup>11</sup> To specify the accumulation of capital, the Jung and Thorbecke (2001) function is followed.

<sup>12</sup> This assumption can seem strange given that the country has in the past increased their savings from abroad. However, South Africa does not want to increase substantially its current level of borrowing.

is greater for these two types of workers. It should be noted that the initial unemployment rate for the skilled is very low (1% according to StatsSA), thus the percentages of variation are incredibly big.

Table 1.3. Impact on unemployment for skilled workers (in % to BAU)

	LEG	PRO	TECH
2012	-81.21	-88.96	-79.89
2020	-35.09	-37.17	-33.88

Table 1.4. Impact on unemployment for semi-skilled workers (in % to BAU)

	SERWO	SKILAG	CRAFTWO	PLANTMACH	CLER
2012	-8.96	-4.05	-2.27	-3.05	-6.08
2020	-3.13	-2.40	-1.16	-1.55	-2.46

Table 1.5. Impact on unemployment for unskilled workers (in % to BAU)

	LEG	PRO	TECH
2012	-81.21	-88.96	-79.89
2020	-35.09	-37.17	-33.88

Next to the decrease of unemployment, and workers also receive an increase in wages. Indeed, as government's activities need more workers to produce, they will attract skilled and semi-skilled workers mainly by offering a better wage than the other activities. Thus, to keep their workers, the other activities will also have to increase the wages they pay to their workers, which results in increased production costs. Sectors with a similar labour demand structure will find it more costly to produce.

The increase in government spending also has an impact on the other sectors through an increase of intermediate demand. To produce more, government sectors need extra public servants, buildings, and all types of commodities produced by the other sectors.

Table 1.6 presents the impacts on production for each sector of the economy. In the short run, most of the sectors increase their production, but in the long run most of them experience a decrease because of the increase in wages and a drop in total investment.

#### *Impact on agents*

Table 1.7. Impact on household income (in % to BAU)

	YHL	YHTR	YH
2012	0.80	0.43	0.66
2020	0.34	-0.01	0.20

Household savings and consumption also increase, as they are fixed proportions of disposable income.

The impact on firms is different for the short and long run. In the short run, their capital income, which represents most of their total income, increases. However, in the long run, capital income decreases, and so do firms' income and savings, because of the drop in total investment.

Table 1.6. Impact on total production (in % to BAU)

Sectors	2012	2020
AAGRI	0.18	-0.15
ACOAL	0.05	-0.34
AGOLD	-0.05	-0.21
AOTHM	-0.04	-0.52
AFOOD	0.28	-0.06
ATEXT	0.45	-0.09
AFOOT	0.38	-0.08
APETR	0.21	-0.18
AOTHN	-0.46	-0.54
AIRON	-0.38	-0.54
AELMA	-0.80	-0.67
ARADIO	-0.02	-0.33
ATRANSEQ	0.00	-0.29
AOTHMAN	0.03	-0.29
AELEG	0.35	-0.14
AWATR	0.47	-0.08
ACONS	-1.15	-0.78
ATRAD	0.10	-0.21
AHOT	0.42	-0.13
ATRANSSE	0.13	-0.19
ACOMM	0.38	-0.12
AFINS	0.31	-0.08
ABUSS	0.13	-0.28
AOTHSER	0.61	0.04
AGOVGA	1.98	0.64

The decrease in unemployment and the increase in wages raise household income. Note that their transfer income is composed of dividends they receive from firms (government's transfers are assumed fixed).

Table 1.8. Impact on firms (in % to BAU)

	YFK	YF	SF
2012	0.61	0.54	0.53
2020	-0.02	-0.02	-0.02



Table 1.9 presents all the sources of government's income and how they react to the increase in government spending. The first component represents transfer income and comes mainly from firms (dividends). The second one represents all the taxes on production (on labour, capital, production). The third one is the sum of all taxes on products (import taxes, VAT, export taxes, excise taxes, fuel levy). The final one is the total direct taxes paid by households and by firms.

In the short run, all these components increase, but in the long run the components related to firms and to products decrease slightly.

Table 1.9. Impact on government's income (in % to BAU)

	YGTR	TPRODN	TPRCTS	TDHT	TDFT	YG
2012	0.53	0.56	0.25	0.66	0.61	0.48
2020	-0.02	0.10	-0.04	0.20	-0.02	0.04

Government's income increases by 0.48% in the short run and by 0.04% in the long run. However, the large increase in spending raises the government's deficit a lot, as Figure 1.5 shows.

Figure 1.5. Impact on government savings



Impact on investment:

The huge drop in government savings, followed by the drop in firms' savings, leads to a decrease in total investment. Figures 1.6 and 1.7 present private investment and total investment.

Figure 1.6. Impact on total private investment

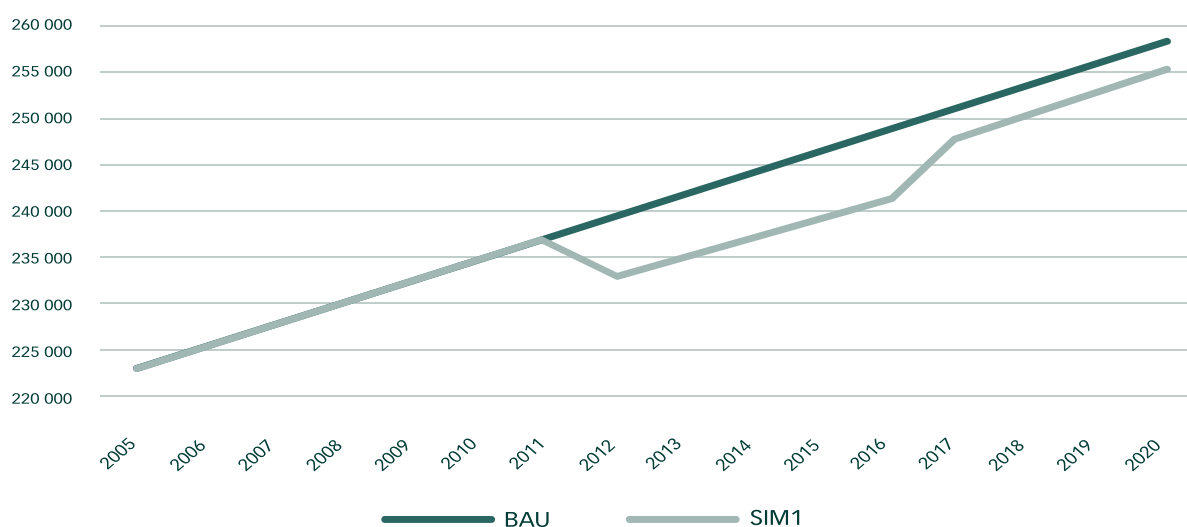
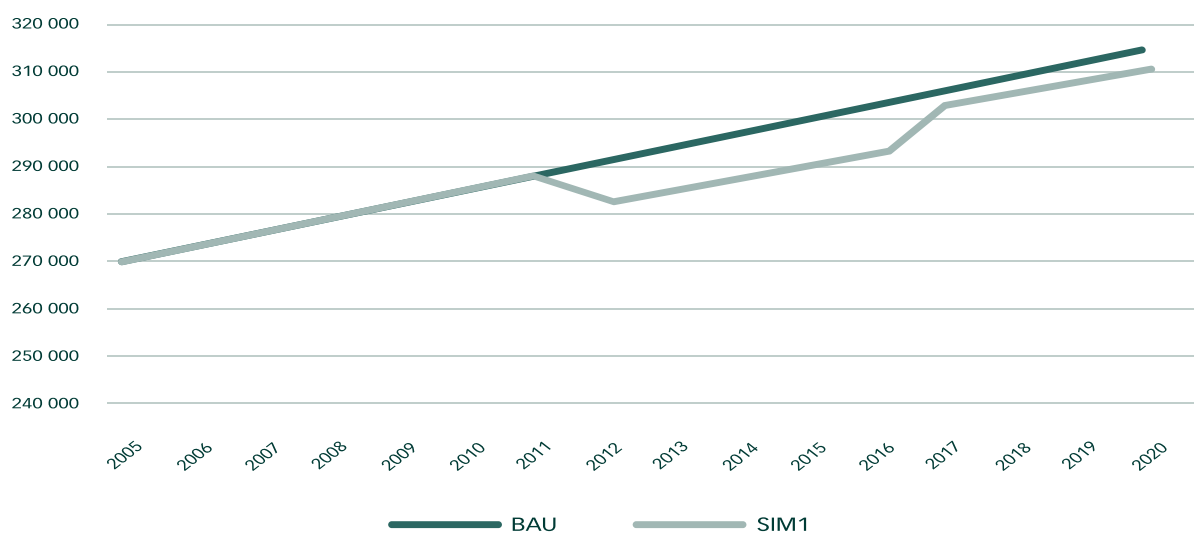


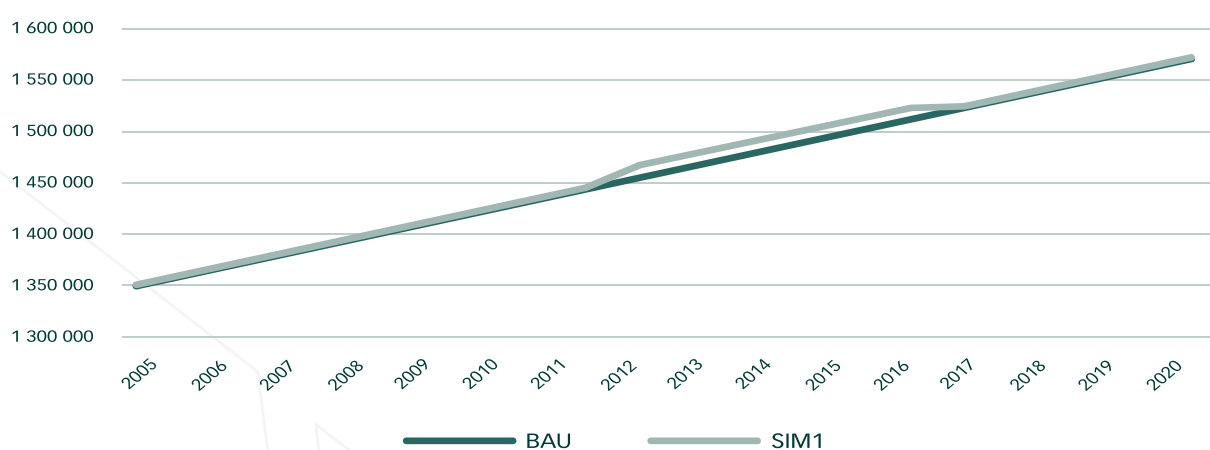
Figure 1.7. Impact on total investment



### Impact on GDP

Finally, the impact on GDP on basic prices is positive for the entire period. Indeed, from 2012 GDP increases and then, after the simulation, the GDP remains a bit higher than in the BAU.

Figure 1.8. Impact on GDP



This first simulation has very positive results on unemployment and benefits to households. However, in the long term, the drop in total investment tends to reduce economic growth. Moreover, it is not sustainable for South Africa to let its deficit grow unabated.

Therefore, the same simulation is presented, but the closure of the model is changed: government's savings are kept fixed, and an endogenous tax finances the policy.

In Simulation 1A, the direct tax rate of households adjusts. In Simulation 1B, the direct tax rate on firms adjusts, and in Simulation 1C, the indirect tax rate adjusts. The results of these three simulations are presented together.

*Impact on labour demand and unemployment:*

The impact on unemployment is different and quite interesting in the three simulations (see Table 1.10–1.12). For Simulations 1A and 1B, all the unemployment rates decreases, but the magnitudes are way below those observed in Simulation 1. However, for Simulation 1C, as shown in Table 1.11, unemployment increases slightly for most semi-skilled and low skilled workers.

Table 1.10. Impact on unemployment rate for skilled workers

	LEG		PRO		TECH	
	2012	2020	2012	2020	2012	2020
<b>Simulation 1A</b>	-53.24	-17.06	-57.21	-18.24	-50.99	-16.45
<b>Simulation 1B</b>	-66.03	-24.53	-71.74	-26.05	-64.2	-23.64
<b>Simulation 1C</b>	-4.06	-2.01	-10.6	-3.94	-1.46	-1.09

Table 1.11. Impact on unemployment rate for semi-skilled workers

	CLER		SERWO		SKILAG		CRAFTWO		PLANTMACH	
	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020
<b>Simulation 1A</b>	-3.94	-1.28	-7.9	-2.67	-0.024	-0.08	-1.45	-0.45	-1.35	-0.4
<b>Simulation 1B</b>	-4.91	-1.76	-8.39	-2.85	-1.98	-1.04	-1.82	-0.75	-2.13	-0.88
<b>Simulation 1C</b>	-1.5	-0.53	-6.22	-2.09	2.59	0.63	1.72	0.57	1.65	0.53

Table 1.12. Impact on unemployment rate for low-skilled workers

	ELEMOC		DOMWORK		OCCUNSP	
	2012	2020	2012	2020	2012	2020
<b>Simulation 1A</b>	-0.43	-0.1	-0.56	-0.18	-0.25	-0.08
<b>Simulation 1B</b>	-0.3	-0.2	-1.01	-0.4	-0.75	-0.3
<b>Simulation 1C</b>	1.32	0.43	0.77	0.26	1.1	0.38

Increasing indirect taxes (Simulation 1C) affects all of the economy, compared with Simulation 1A and Simulation 1B where, respectively, households and firms are hit the hardest. In Simulation 1C, the increase in commodity prices hits all agents and activities (for their intermediate consumption). Thus, activities face an increase in wages for their workers (due to the increase in labour demand) and an increase in their inputs' prices, so their production cost goes up. To adjust, activities will have to cut their costs (mainly by retrenching because the minimum wage means they cannot

decrease wages) and reduce their production. This is clearly shown in Table 1.13, where production for all sectors goes down in Simulation 1C. In Simulation 1A for instance, mostly activities that rely on household consumption are hit, as they face a decrease in household demand. This explains why production goes up in the gold and mining sectors, as these two sectors export most of their total production.

Table 1.13. Impact on production (in % to BAU values)

	Simulation 1A		Simulation 1B		Simulation 1C	
	2012	2020	2012	2020	2012	2020
AAGRI	-0.11	-0.003	0.02	-0.07	-0.33	-0.16
ACOAL	-0.02	0.06	0.01	-0.12	-0.34	-0.17
AGOLD	0.01	0.03	-0.01	-0.07	-0.29	-0.11
AOTHM	0.03	0.11	0	-0.17	-0.20	-0.13
AFOOD	-0.19	-0.03	0.03	-0.05	-0.38	-0.16
ATEXT	-0.31	-0.05	0.04	-0.08	-0.65	-0.27
AFOOT	-0.29	-0.06	0.02	-0.08	-0.62	-0.27
APETR	-0.01	0.05	0.09	-0.06	-0.25	-0.13
AOTHN	0.23	0.15	-0.08	-0.14	-0.16	-0.09
AIRON	0.08	0.1	-0.13	-0.18	-0.38	-0.18
AELMA	0.16	0.11	-0.28	-0.22	-0.34	-0.16
ARADIO	0.01	0.06	0	-0.11	-0.52	-0.23
ATRANSEQ	0.1	0.09	0.06	-0.07	-0.51	-0.22
AOTHMAN	-0.04	0.04	-0.01	-0.1	-0.35	-0.17
AELEG	-0.2	-0.01	0.05	-0.08	-0.40	-0.18
AWATR	-0.04	0.04	0.19	-0.02	-0.23	-0.12
ACONS	0.29	0.15	-0.37	-0.24	-0.27	-0.13
ATRAD	-0.07	0.03	0.01	-0.08	-0.34	-0.15
AHOT	-0.25	-0.03	0.06	-0.09	-0.54	-0.26
ATRANSSER	-0.04	0.03	0.04	-0.07	-0.25	-0.12
ACOMM	-0.09	0.02	0.12	-0.05	-0.29	-0.15
AFINS	-0.09	0	0.09	-0.04	-0.38	-0.18
ABUSS	0	0.07	0.06	-0.08	-0.19	-0.11
AOTHSER	-0.17	-0.01	0.19	0	-0.30	-0.13
AGOVGA	1.99	0.68	1.99	0.66	1.88	0.63

#### Impact on agents:

The impact on household income is still positive but quite low. For Simulation 1A, household disposable income goes down, as do household savings and consumption.

Table 1.14. Impact on households (in % to BAU values)

	YHL		YHTR		YH	
	2012	2020	2012	2020	2012	2020
Simulation 1A	0.52	0.17	0.29	0.13	0.43	0.15
Simulation 1B	0.65	0.24	-0.87	-0.4	0.07	0
Simulation 1C	0.05	0.02	0.06	-0.01	0.05	0.01

As expected, firms suffer in Simulation1B because their direct tax goes up. Thus, firms' savings would go down in this scenario.

Table 1.15. Impact on firms (in % to BAU values)

	YFK		YF		SF	
	2012	2020	2012	2020	2012	2020
<b>Simulation 1A</b>	0.41	0.18	0.37	0.16	0.36	0.15
<b>Simulation 1B</b>	0.51	0.09	0.45	0.08	-1.06	-0.46
<b>Simulation 1C</b>	0.09	-0.01	0.08	-0.01	0.07	-0.01

Table 1.16. Impact on government (in % to BAU values)

	YGTR		TPRODN		TPRCTS		TDHT		TDFT		YG	
	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020
<b>Simulation 1A</b>	0.36	0.15	0.27	0.11	-0.1	0	7.15	2.29	0.41	0.18	2.15	0.71
<b>Simulation 1B</b>	-1.06	-0.46	0.41	0.1	0.06	-0.03	0.07	0	9.08	3.17	2.14	0.72
<b>Simulation 1C</b>	0.07	-0.01	0.17	0.04	5.4	1.84	0.05	0.01	0.09	-0.01	2.18	0.73

The overall impact on government income is essentially the same whatever the scenario. In Simulation1A, the direct tax for households component increases a lot in order to adjust to government's budget, whereas in Simulation1B, firms' taxes increase a lot.

Impact on investment:

For these three simulations, government savings are assumed to be fixed. Therefore, the impact is different from the previous scenario where government saving was hampering private investment.

However, the results here are also interesting. In Simulation 1A, private and total investment increases. In Simulation 1B, the drop in firms' savings has a large effect on private and total investment, as firms are a major contributor to total investment. In Simulation 1C, the results are almost the same as the BAU.

Figure 1.9. Impact on private investment

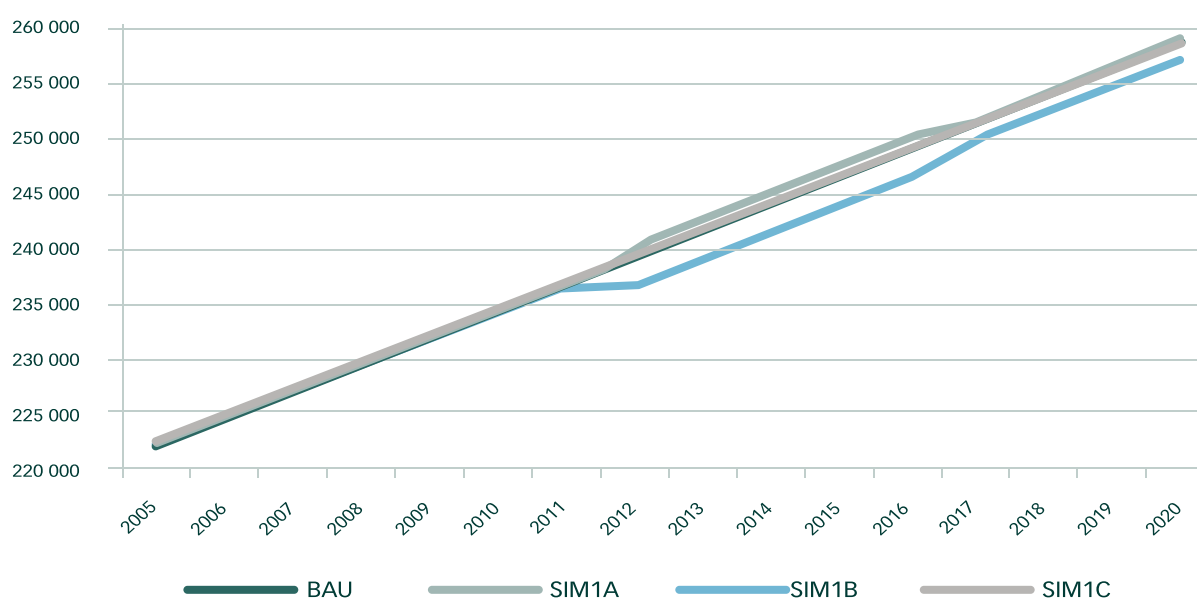
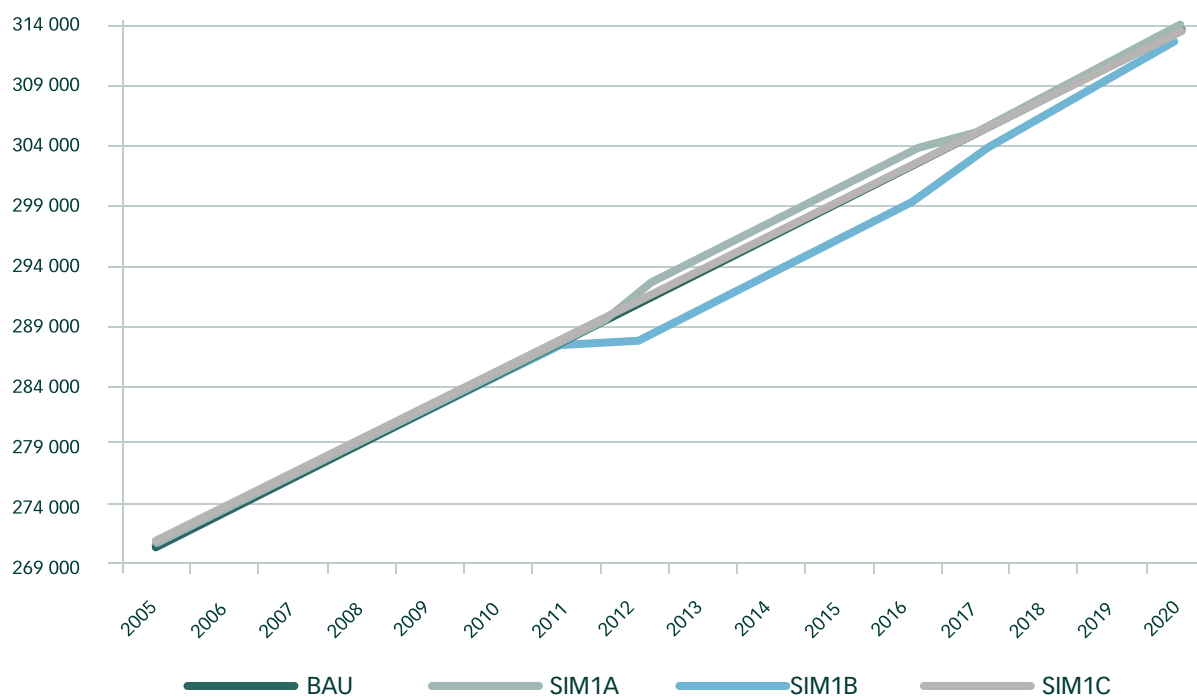


Figure 1.10. Impact on total investment



*Impact on GDP at basic price:*

Finally, the impact on GDP at the basic price is positive during the shock and slightly above the BAU after 2017.

Figure 1.11. Impact on GDP (at basic price)

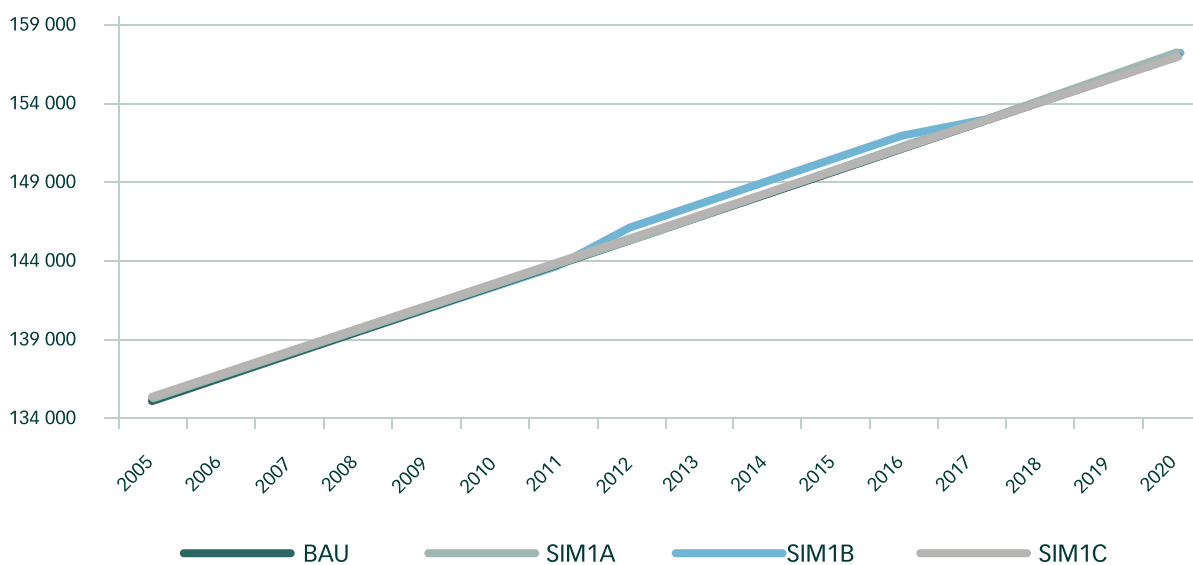
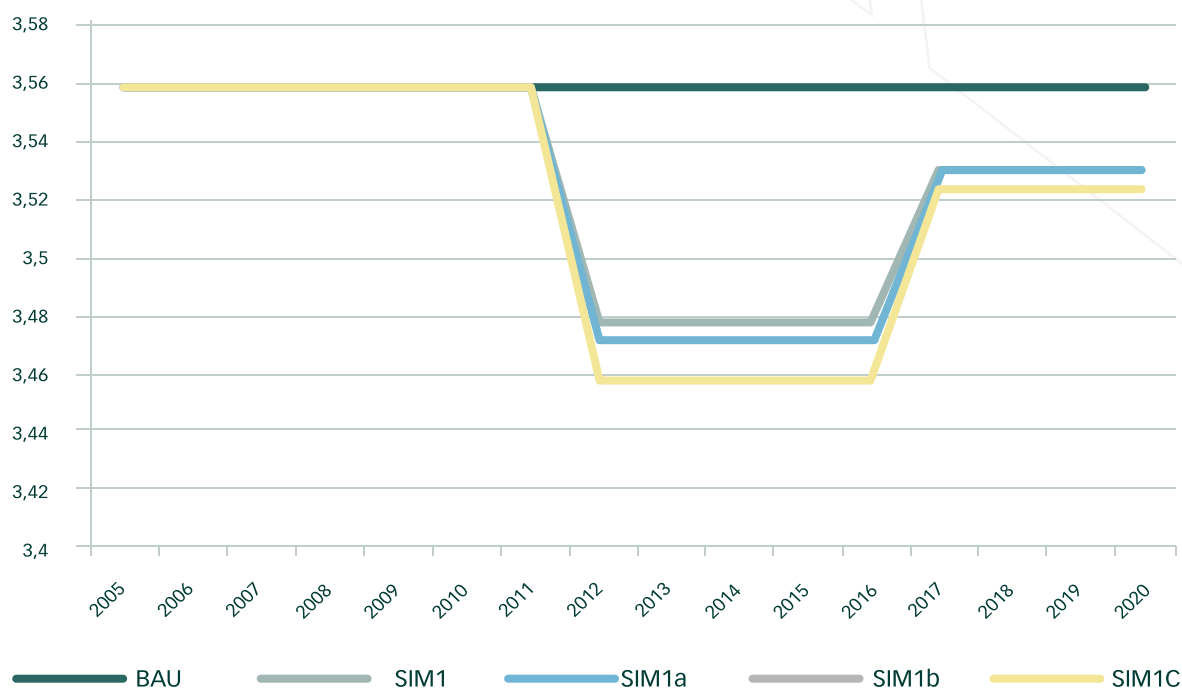


Figure 1.12 represents a ratio between household income and public spending. As the value of public spending is the same for all the simulations (1, 1A, 1B and 1C), the interesting thing here is how the simulation affects household income. This ratio decreases the least in Simulation 1A (if the first scenario without any financing mechanism is excluded).

Figure 1.12. Household income over public spending ratio trend



### Impact of an increase in government's investment in infrastructure

In the second set of scenarios, government's public investment increases. In the first scenario, government totally finances this increase in investment (i.e. government's deficit will increase). In the following scenarios, the same increase in government investment will be evaluated, but different ways of financing (direct, indirect taxation) will be simulated in order to keep government's deficit constant. First, it will be assumed that there are no productivity effects on the other sectors.

#### Impact on labour demand and unemployment:

The increase in government's public investment has a very positive impact on unemployment for all the different types of workers. For the skilled, unemployment even disappears from 2015 onwards. Indeed the effect on unemployment remains even after the shocks.

Table 1.17. Impact on unemployment for skilled workers (in % to BAU)

	LEG	PRO	TECH
2012	-9.91	4.65	-1.76
2020			

Table 1.18. Impact on unemployment for semi-skilled workers (in % to BAU)

	SERWO	SKILAG	CRAFTWO	PLANTMACH	CLER
2012	-0.86	-1.64	-1.06	-1.04	-0.3
2020	-16.14	-29.24	-8.65	-14.32	-12.53

Table 1.19. Impact on unemployment for unskilled workers (in % to BAU)

	ELEMOCC	DOMWORK	OCCUNSP
2012	-1.72	-0.74	-0.61
2020	-13.54	-8.03	-5.90

Sectors react differently to a public investment policy. Some sectors clearly benefit from the policy, as they are directly involved in construction, electricity or government sectors. For other sectors, there is a small decrease.

Table 1.20 Impact on production (in % to BAU)

	2012	2020
AAGRI	-0.01	-2.80
ACOAL	-0.14	-4.73
AGOLD	0.11	-1.65
AOTHM	-0.12	-6.30
AFOOD	0.00	-1.95
ATEXT	0.02	-2.92
AFOOT	0.00	-2.80
APETR	0.00	-2.97
AOTHN	0.79	1.33
AIRON	-0.76	-10.11
AELMA	-2.31	-21.58
ARADIO	0.61	0.72
ATRANSEQ	0.53	0.67
AOTHMAN	0.66	1.46
AELEG	0.01	-0.93
AWATR	-0.05	-2.92
ACONS	1.70	6.78
ATRAD	-0.05	-3.35
AHOT	-0.04	-3.96
ATRANSER	-0.04	-2.98
ACOMM	-0.07	-3.60
AFINS	-0.36	-5.06
ABUSS	-0.56	-7.88
AOTHSER	0.03	-1.54
AGOVGA	0.43	6.01

#### Impact on agents:

Households benefit from the policy, and their income increases slightly due to the increase in their wage component. Transfers they receive decrease because of the drop in firms' income.



Table 1.21. Impact on household income (in % to BAU)

	YHL	YHTR	YH
2012	0.16	-0.20	0.02
2020	2.76	-3.99	0.19

Indeed, firms' income decreases because of the drop in their capital revenues, which represents around 90% of their total income. The crowding out effect of public investment has a serious impact on firms' income and savings.

Table 1.22. Impact on firms (in % to BAU)

	YFK	YF	SF
2012	-0.28	-0.24	-0.24
2020	-5.67	-5.00	-4.89

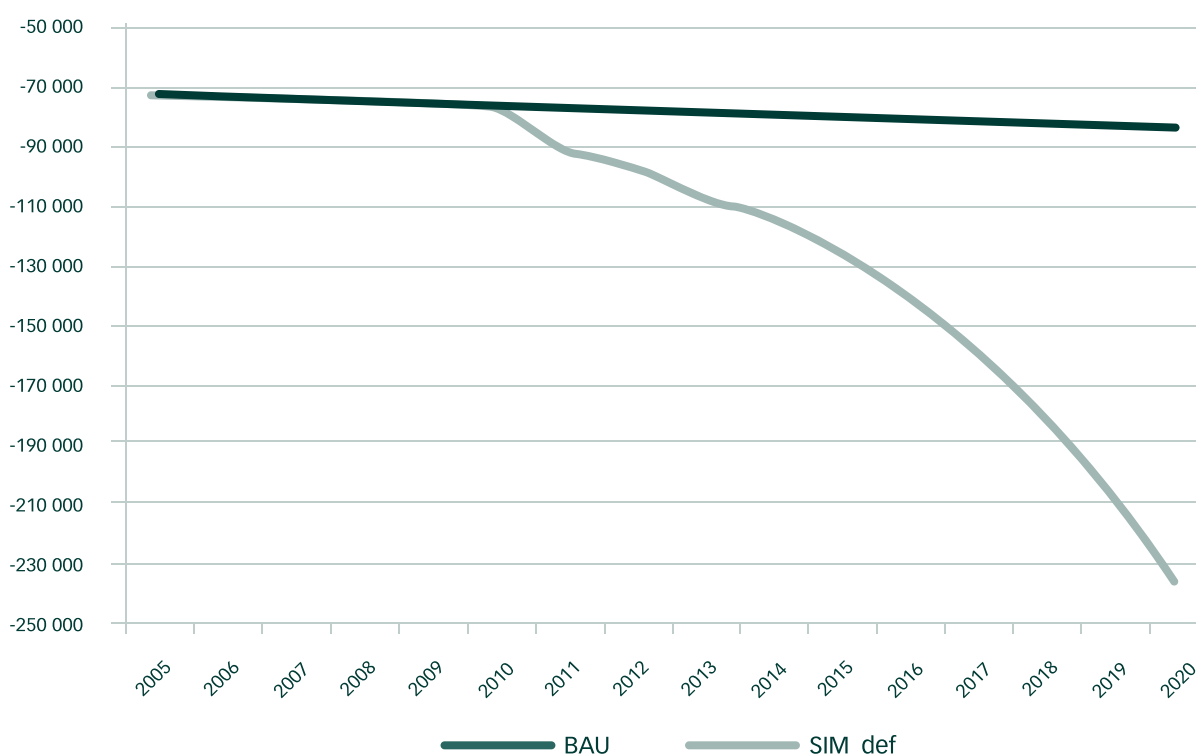
The impact on government is actually very small. Direct taxes paid by households and taxes on commodities increase, whereas the other components decrease. Overall, government's income decreases very slightly (by 0.06%) in the short run and a bit more in the long run.

Table 1.23. Impact on government (in % to BAU)

	YGTR	TPRODN	TPRCTS	TDHT	TDFT	YG
2012	-0.24	-0.29	0.05	0.02	-0.28	-0.06
2020	-4.89	-2.71	-0.87	0.19	-5.67	-1.87

It is assumed in this scenario that government is financing its policy by borrowing. Thus, government savings are decreasing.

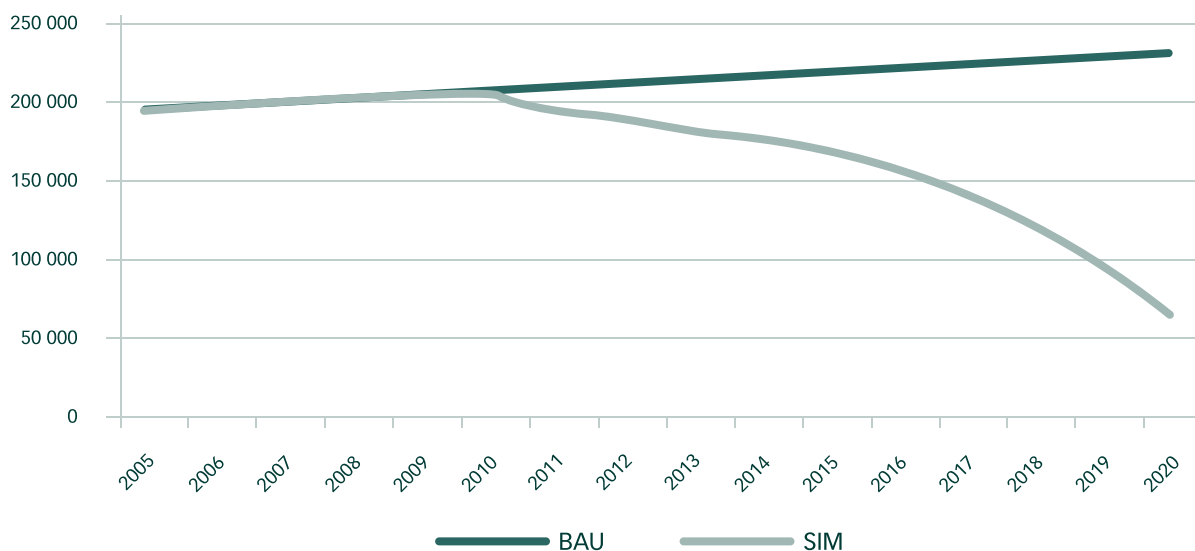
Figure 1.13. Impact on government savings



### Impact on investment:

Figure 1.14 represents the impact on private investment, and clearly there is a crowding-out effect on private investment.

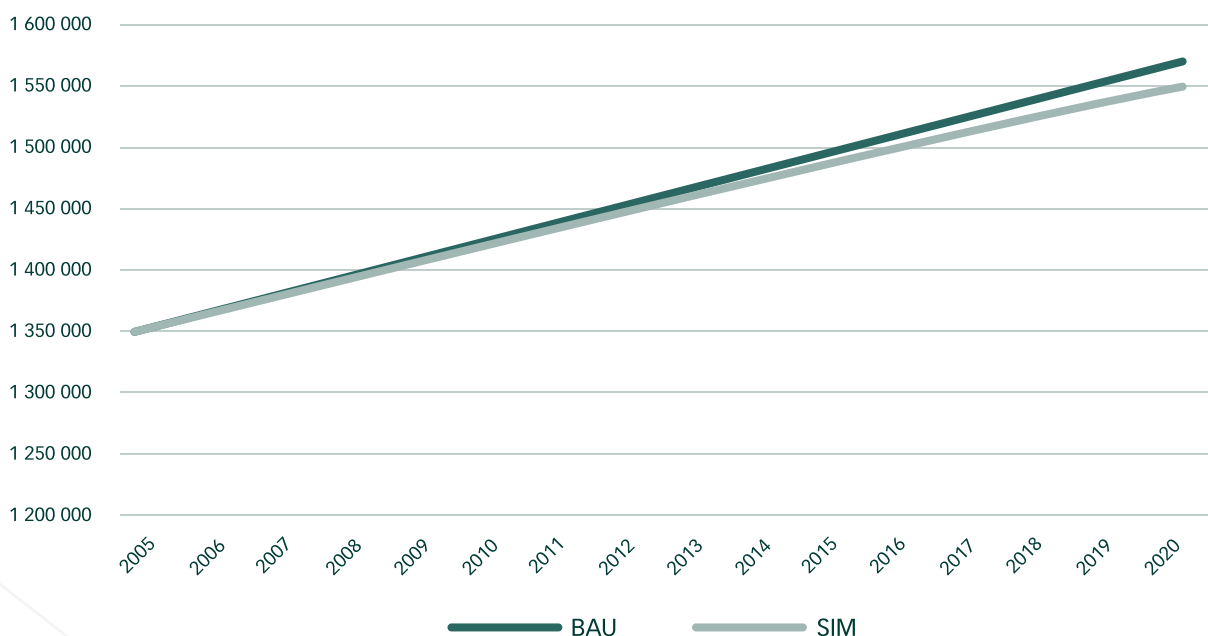
Figure 1.14. Impact on private investment



In the short run, the impact on GDP is hardly perceptible, and in the long run GDP is a bit lower than in the BAU because of the massive drop in the productive investment.

### Impact on GDP:

Figure 1.15. Impact on GDP



With this type of policy, the idea is to see what happens in the long run. It is known that in the short run government deficit increases a lot, but in the long run, can this spending create a greater economic activity in order to generate new revenue? For instance, a policy that creates jobs will have an impact on the fiscal side, as new workers will get income and pay new taxes (direct and indirect).

The following scenarios show the same policy with different types of financing. Depending on the scenario chosen, very different results will be found. In other words, the impacts depend on who finances the policy.

In terms of unemployment, results are very negative. It must be kept in mind that the unemployment level for skilled workers is very low at the base year, and thus variation is very high. Whatever the scenario and the labour type, unemployment increases.

Table 1.24. Impact on unemployment for skilled workers (in % to BAU)

	LEG		PRO		TECH	
	2012	2020	2012	2020	2012	2020
<b>Simulation 2A</b>	47.59	171.63	72.99	321.73	41.02	161.00
<b>Simulation 2B</b>	21.55	-0.80	42.00	112.16	21.68	51.58
<b>Simulation 2C</b>	162.92	1054.20	192.50	1288.50	124.91	728.59

Direct taxes on firms seems to less harmful to unemployment. Unskilled workers appear to be the least affected type of workers, and unemployment decreases for domestic workers and elementary occupations workers. The results are the worst when indirect taxes increase.

Table 1.25. Impact on unemployment for semi-skilled workers (in % to BAU)

	CLER		SERWO		SKILAG		CRAFTWO		PLANTMACH	
	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020
<b>Simulation 2A</b>	4.73	21.33	1.59	-2.38	7.94	44.43	0.68	-0.59	3.11	14.09
<b>Simulation 2B</b>	2.46	5.47	0.49	-9.26	3.61	12.02	-0.09	-5.35	1.24	0.70
<b>Simulation 2C</b>	10.94	70.09	5.90	34.69	15.14	97.40	8.42	58.18	10.59	71.68

Table 1.26. Impact on unemployment for low-skilled workers (in % to BAU)

	ELEMOC		DOMWORK		OCCUNSP	
	2012	2020	2012	2020	2012	2020
<b>Simulation 2A</b>	-2.63	-20.94	1.55	6.87	1.88	9.73
<b>Simulation 2B</b>	-2.21	-18.30	0.52	-0.08	0.76	2.43
<b>Simulation 2C</b>	1.79	12.69	4.95	33.26	5.32	36.22

In terms of production, once again, some sectors benefit from the investment policy, whereas others suffer. Sectors that rely on investment will see their production increase. For instance, the construction sector sees its production increasing substantially (which explains the drop in unskilled unemployment, as this sector is very intensive in unskilled labour).

Table 1.27. Impact on production (in % to BAU)

	Simulation 1A		Simulation 1B		Simulation 1C	
	2012	2020	2012	2020	2012	2020
AAGRI	-0.63	-4.57	-0.35	-3.70	-1.18	-9.45
ACOAL	-0.17	-0.97	-0.16	-2.50	-1.00	-8.58
AGOLD	0.30	2.89	0.22	1.32	-0.44	-3.02
AOTHM	0.25	2.02	0.08	-1.62	-0.37	-4.11
AFOOD	-1.04	-7.32	-0.57	-4.87	-1.55	-11.29
ATEXT	-1.69	-11.88	-0.91	-7.73	-2.60	-19.53
AFOOT	-1.48	-10.58	-0.81	-6.99	-2.38	-17.65
APETR	-0.41	-2.61	-0.22	-2.65	-1.06	-8.62
AOTHN	2.91	21.77	1.94	12.72	1.83	12.46
AIRON	0.63	4.62	0.00	-1.79	-0.55	-5.32
AELMA	0.53	3.45	-0.76	-7.52	-0.81	-7.68
ARADIO	0.62	4.67	0.61	3.11	-0.67	-6.04
ATRANSEQ	0.66	5.03	0.60	3.26	-0.80	-6.96
AOTHMAN	0.43	3.75	0.53	2.84	-0.33	-2.86
AELEG	-1.24	-8.01	-0.67	-4.65	-1.81	-13.93
AWATR	-1.15	-7.70	-0.65	-5.41	-1.68	-12.86
ACONS	5.77	40.44	3.92	25.65	4.28	28.56
ATRAD	-0.36	-2.40	-0.22	-2.70	-1.06	-8.45
AHOT	-1.51	-11.07	-0.85	-7.68	-2.30	-17.59
ATRANSSER	-0.33	-2.15	-0.20	-2.43	-0.90	-7.28
ACOMM	-1.08	-7.58	-0.62	-5.63	-1.64	-13.14
AFINS	-1.15	-7.91	-0.80	-6.37	-1.94	-14.35
ABUSS	-0.66	-4.68	-0.62	-6.04	-1.21	-10.39
AOTHSER	-1.71	-11.45	-0.92	-6.98	-2.12	-15.17
AGOVGA	0.47	7.41	0.45	7.00	0.17	3.76

The impact on household income is negative. In Simulations 2A and 2C, households suffer from the decrease in demand, as household consumption decreases. In the first case this is because direct taxes increase and then what remains for consumption decreases. In Simulation 2C, prices of commodities increase, and so households decrease their consumption. Knowing that households' demand is going down, firms reduce their production and thus lay off people.

Table 1.28. Impact on household income (in % to BAU)

	YHL		YHTR		YH	
	2012	2020	2012	2020	2012	2020
Simulation 2A	-0.47	-1.63	-0.44	-4.13	-0.46	-2.59
Simulation 2B	-0.19	0.26	-3.28	-25.51	-1.36	-9.58
Simulation 2C	-1.66	-10.92	-1.05	-9.23	-1.43	-10.27

In Simulation 2B, household income decreases due to the massive decrease in firms' transfers. Firms suffer from the crowding-out effect: they receive less capital income, and then their savings decrease. This has an impact on total investment, as firms' savings contribute a lot to total investment. Surprisingly the impact is worse for firms in Simulation 2C, whereas firms would have been expected to be affected more in Simulation 2B. However, the decrease in the productive activity is such that firms' income and saving decrease more under 2C.

Table 1.29. Impact on firms (in % to BAU values)

	YFK		YF		SF	
	2012	2020	2012	2020	2012	2020
<b>Simulation 2A</b>	-0.63	-5.88	-0.56	-5.19	-0.54	-5.07
<b>Simulation 2B</b>	-0.47	-5.85	-0.42	-5.16	-4.01	-31.25
<b>Simulation 2C</b>	-1.49	-13.11	-1.31	-11.58	-1.28	-11.31

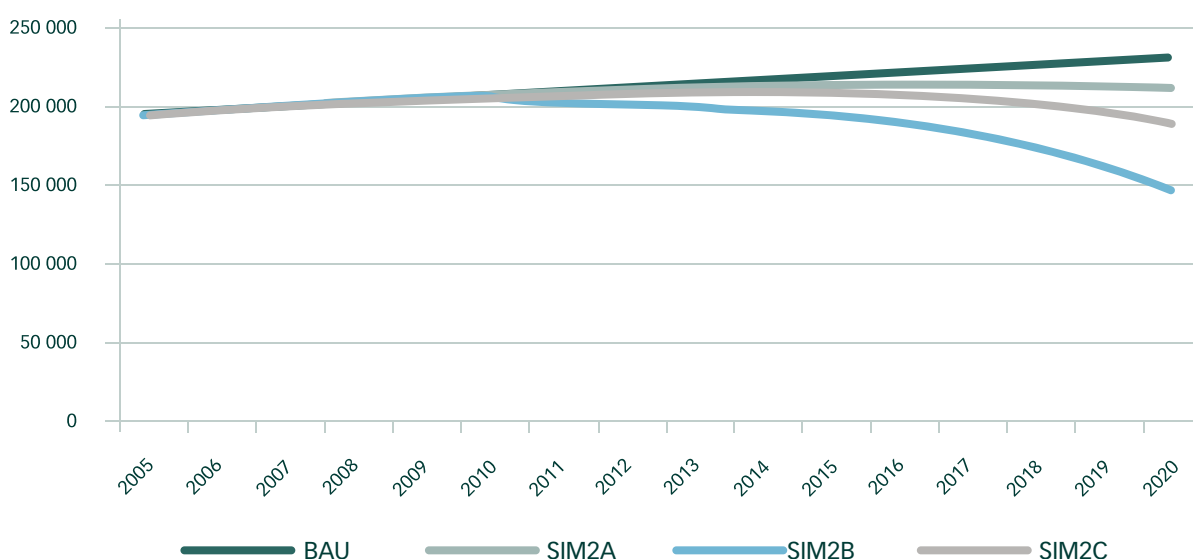
Table 1.30 represents the composition of government income. Government income increases in all three scenarios. In Simulation 2A, direct taxes from households adjust to maintain government deficit, while in Simulation 2b direct taxes from firms adjust. Note that under this simulation, the transfers received by government drop dramatically.

Table 1.30. Impact on government (in % to BAU)

	YGTR		TPRODN		TPRCTS		TDHT		TDFT		YG	
	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020
<b>Simulation 2A</b>	-0.54	-5.07	-0.85	-5.36	-0.69	-4.39	15.62	111.41	-0.63	-5.88	4.01	28.41
<b>Simulation 2B</b>	-4.01	-31.25	-0.60	-4.24	-0.36	-2.84	-1.36	-9.58	20.25		3.99	28.48
<b>Simulation 2C</b>	-1.28	-11.31	-1.17	-8.52	12.88	101.24	-1.43	-10.27	-1.49	-13.11	4.23	33.13

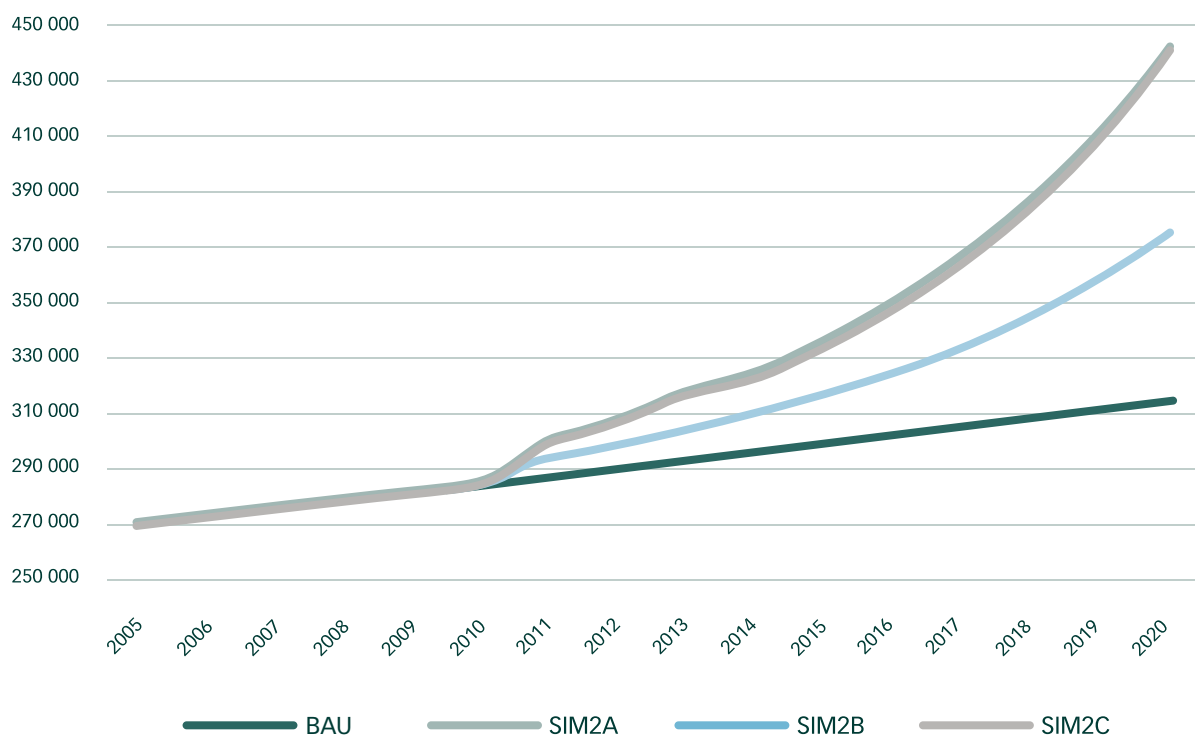
Figure 1.16 shows the impact on private investment depending on the fiscal scenario. In every scenario, the result is below the BAU values, and for Simulation 2B very far away from BAU values.

Figure 1.16. Impact on private investment



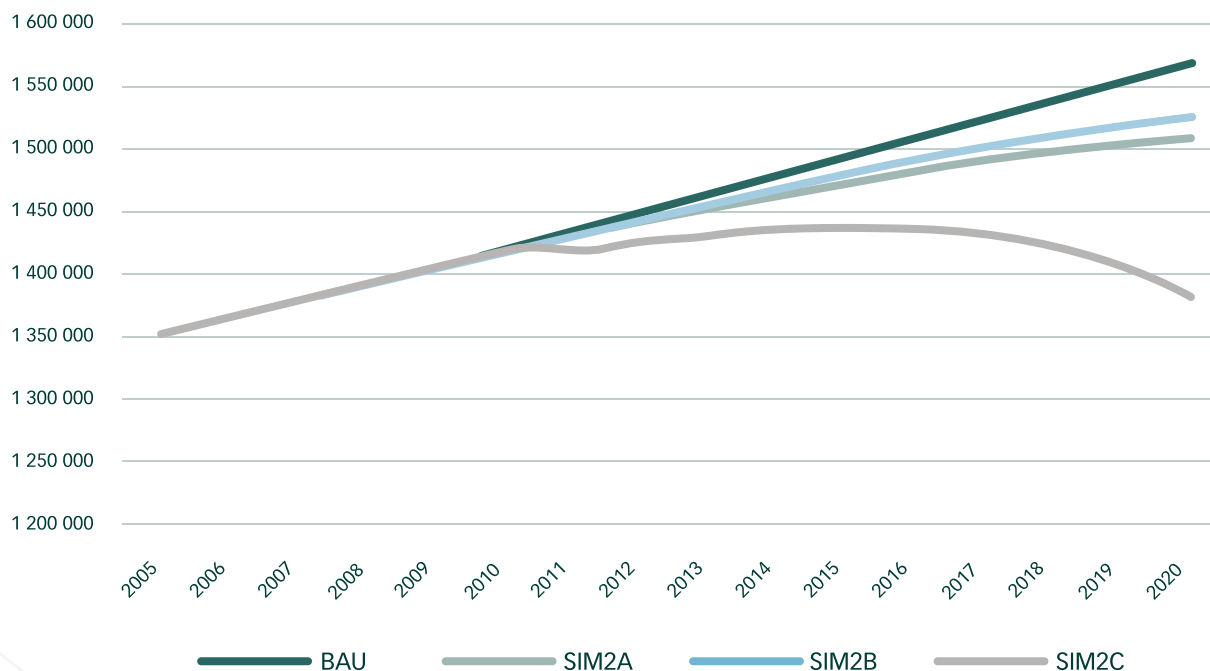
In terms of total investment, all scenarios are above the BAU, driven by the increase in public investment.

Figure 1.17. Impact on total investment



As Figure 1.18 shows, GDP is under the BAU for all the scenarios and worst for Simulation 2C.

Figure 1.18. Impact on GDP (basic prices)



### Impact on other sectors of an increase in government investment in infrastructure

This last set of scenarios presents the same simulations as in the previous section but also takes into account the effect of infrastructure productivity on the other sectors. Indeed, it is easily understandable that government investment in building a road (infrastructure spending), or in constructing/renovating a harbour, has impacts on other sectors: their transport margins will decrease and they will be able to trade more, using the same quantities of labour and capital.

Under these scenarios, the effects are the same as in the previous section, but results improve because of the productive investment.

#### Government financing

Impacts on unemployment are very positive both in short and long run, whatever the labour category. Here again, unemployment disappears for skilled workers from 2015, and positive impacts remain for all categories.

Table 1.31. Impact on unemployment for skilled workers (% to BAU)

	LEG	PRO	TECH
2012	-13.93	-0.06	-5.06
2020			

Table 1.32. Impact on unemployment for semi-skilled workers (% to BAU)

	SERWO	SKILAG	CRAFTWO	PLANTMACH	CLER
2012	-0.92	-1.72	-1.35	-1.27	-0.51
2020	-14.31	-25.64	-11.89	-15.46	-12.83

Table 1.33. Impact on unemployment for low-skilled workers (% to BAU)

	ELEMOCC	DOMWORK	OCCUNSP
2012	-1.88	-0.85	-0.74
2020	-15.08	-8.74	-7.07

The impacts on production are quite positive for most of the sectors. Compared to the previous scenario, activities do not suffer from a total crowding-out effect, as some public investment improves their production.

Table 1.35. Impact on household income (in % to BAU)

	YHL	YHTR	YH
2012	0.20	-0.17	0.06
2020	3.49	-3.26	0.91

Firms are suffering but less than in Scenario 2 (investment in infrastructure without productivity effect).

Table 1.34. Impact on production (% to BAU)

Sectors	2012	2020
AAGRI	0.18	-0.15
ACOAL	0.05	-0.34
AGOLD	-0.05	-0.21
AOTHM	-0.04	-0.52
AFOOD	0.28	-0.06
ATEXT	0.45	-0.09
AFOOT	0.38	-0.08
APETR	0.21	-0.18
AOTHN	0.94	5.26
AIRON	-0.58	-5.75
AELMA	-2.13	-17.06
ARADIO	0.78	4.60
ATRANSEQ	0.68	4.23
AOTHMAN	0.81	5.09
AELEG	0.16	2.94
AWATR	0.09	0.42
ACONS	1.86	10.81
ATRAD	0.07	-0.18
AHOT	0.11	-0.14
ATRANSSER	0.07	-0.07
ACOMM	0.07	-0.18
AFINS	-0.20	-1.44
ABUSS	-0.42	-4.41
AOTHSER	0.15	1.40
AGOVGA	0.53	8.45

Households benefit a lot from this policy, as their income increases in the long run by almost 1%.

Table 1.36. Impact on firms' income (in % to BAU)

	YFK	YF	SF
2012	-0.25	-0.22	-0.21
2020	-4.64	-4.09	-4.00

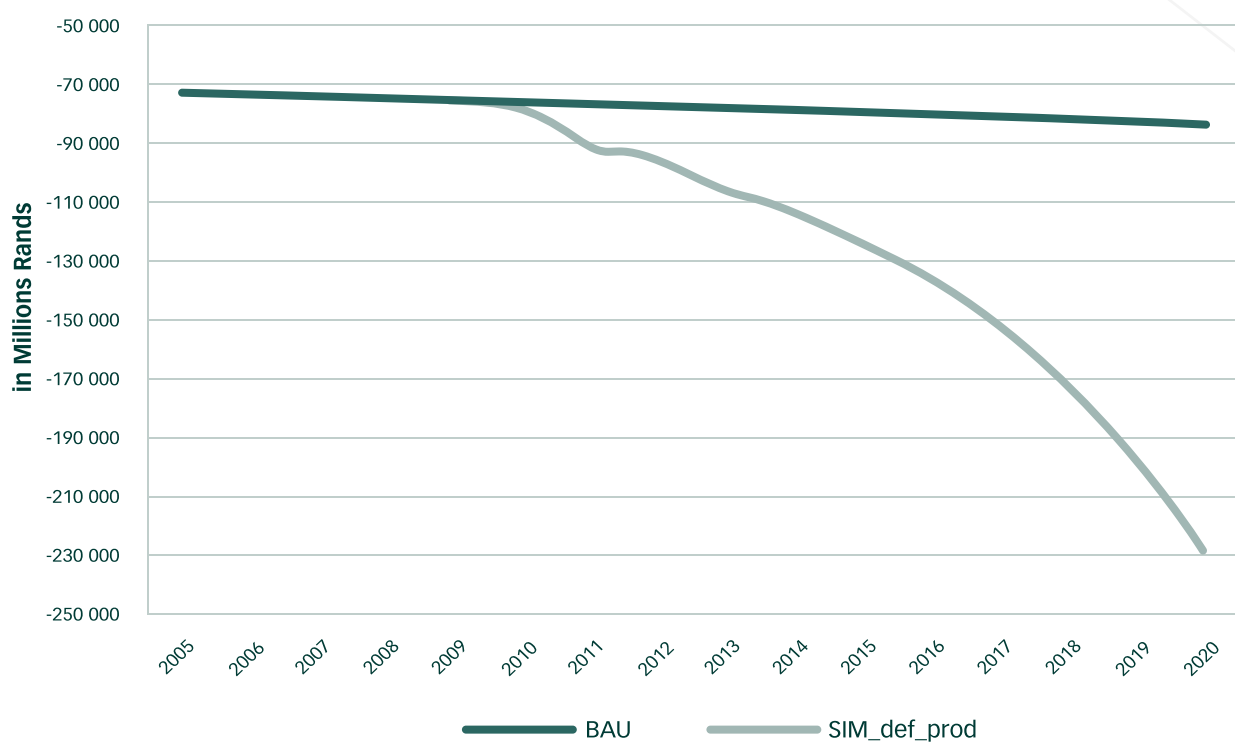
Government income decreases slightly in the long run because of the decrease in transfers that government receives from firms and the receipts from firms. A drop in government savings is observed, as there is no fiscal policy to finance the investment programme.



Table 1.37. Impact on government (in % to BAU)

	YGTR	TPRODN	TPRCTS	TDHT	TDFT	YG
2012	-0.21	-0.24	0.12	0.06	-0.25	-0.01
2020	-4.00	-1.26	0.86	0.91	-4.64	-0.63

Figure 1.19. Impact on government savings



The impact on private investment is less dramatic than in the previous scenario. A crowding-out effect is still there, but the impact on private investment is less harmful because a part of government investment is productive. As seen in Figure 1.20, total investment is slightly below the BAU, given that government deficit is increasing.

Figure 1.20. Impact on private investment

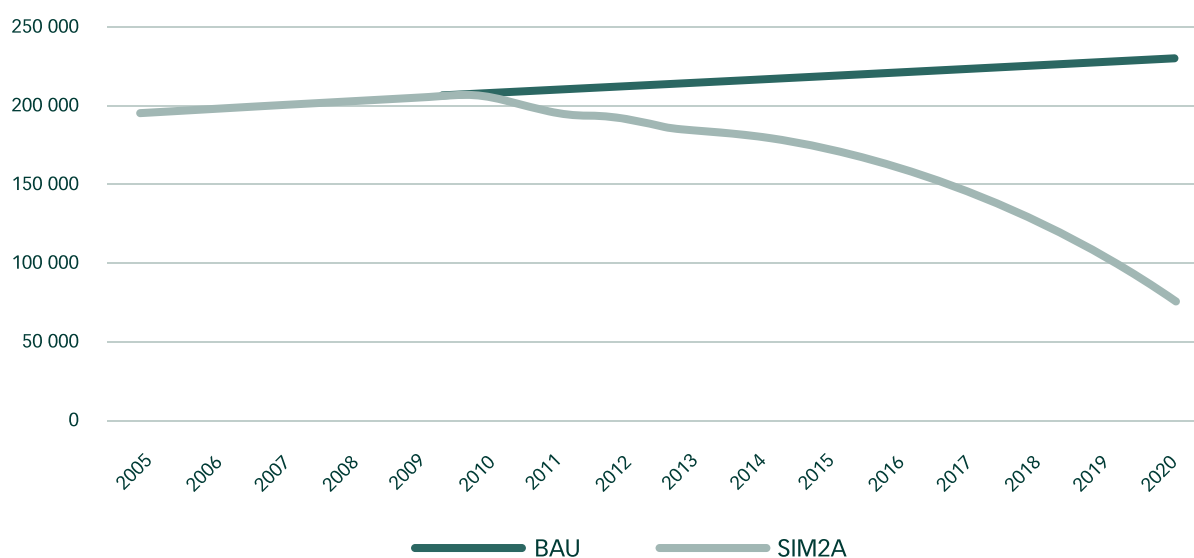
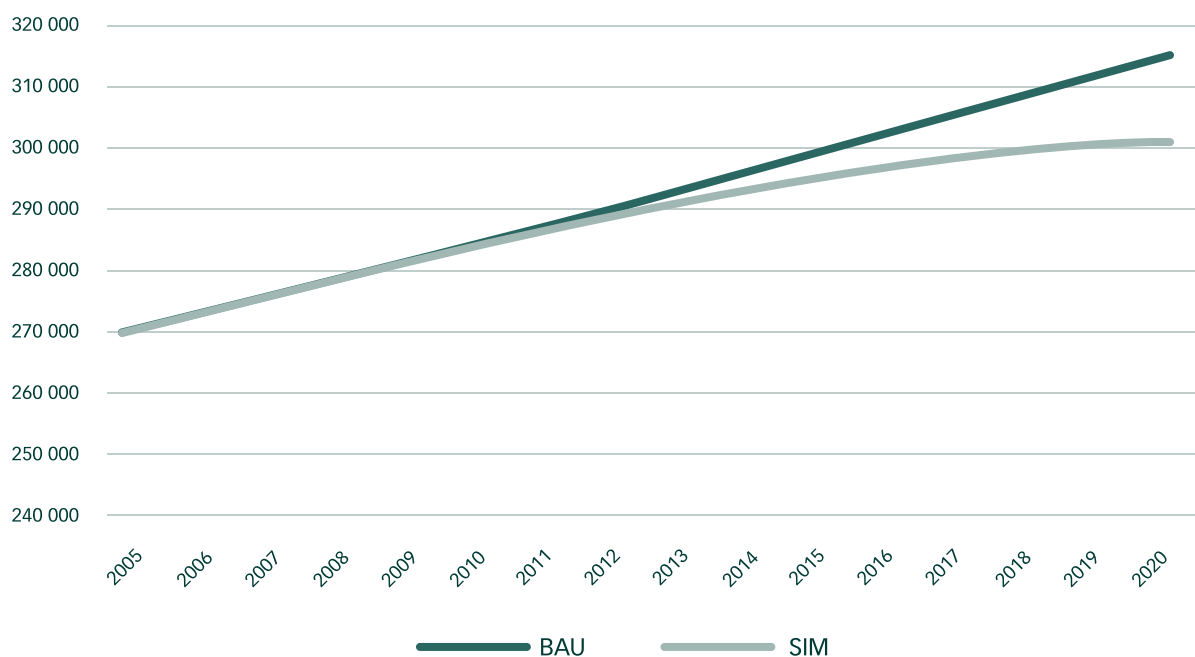


Figure 1.21. Impact on total investment



In the long run, GDP does not change compared with the BAU.

Figure 1.22. Impact on GDP



Alternative fiscal policy arrangements to finance the investment policy

The impact on unemployment is better than in the second set of scenarios (Scenario 2), and unemployment even decreases in Simulation 3B for all types of workers in the long run. In the short run, only elementary occupation workers benefit from a decrease in unemployment; for the rest, unemployment is rising.

Table 1.38. Impact on unemployment for skilled workers (% to BAU)

	LEG		PRO		TECH	
	2012	2020	2012	2020	2012	2020
<b>Simulation 3A</b>	42.75	50.39	67.29	171.88	37.11	73.07
<b>Simulation 3B</b>	17.09		36.75	-32.04	18.05	-34.51
<b>Simulation 3C</b>	156.38	877.84	185.02	1076.57	119.78	606.59

Table 1.39. Impact on unemployment for semi-skilled workers (% to BAU)

	CLER		SERWO		SKILAG		CRAFTWO		PLANTMACH	
	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020
<b>Simulation 3A</b>	4.46	13.99	1.49	-4.79	7.73	38.36	0.37	-8.44	2.82	6.33
<b>Simulation 3B</b>	2.21	-0.81	0.40	-11.15	3.46	8.20	-0.40	-13.02	0.98	-6.14
<b>Simulation 3C</b>	10.58	60.01	5.74	29.80	14.83	88.72	8.00	47.01	10.20	60.83

Table 1.40. Impact on unemployment for low-skilled workers (% to BAU)

	ELEMOC		DOMWORK		OCCUNSP	
	2012	2020	2012	2020	2012	2020
<b>Simulation 3A</b>	-2.77	-24.10	1.40	3.00	1.71	5.26
<b>Simulation 3B</b>	-2.36	-21.81	0.39	-3.53	0.60	-1.61
<b>Simulation 3C</b>	1.58	7.61	4.76	28.01	5.10	30.42

Note though that results are still very negative under Simulation C. The impact on the sectors depends on how heavily sectors rely on investment.

Table 1.41. Impact on production (% to BAU)

	Simulation 3A		Simulation 3B		Simulation 3C	
	2012	2020	2012	2020	2012	2020
AAGRI	-0.50	-1.20	-0.23	-0.43	-1.06	-6.00
ACOAL	0.00	3.96	0.01	2.38	-0.82	-3.47
AGOLD	0.55	10.05	0.47	8.46	-0.18	4.12
AOTHM	0.42	7.05	0.25	3.39	-0.19	0.97
AFOOD	-0.94	-4.52	-0.48	-2.20	-1.44	-8.53
ATEXT	-1.50	-6.84	-0.74	-2.97	-2.41	-14.41
AFOOT	-1.32	-6.27	-0.66	-2.89	-2.21	-13.29
APETR	-0.27	1.24	-0.09	1.12	-0.92	-4.60
AOTHN	3.03	25.42	2.08	16.73	1.97	16.45
AIRON	0.79	9.13	0.16	2.93	-0.38	-0.51
AELMA	0.68	7.52	-0.60	-2.97	-0.65	-3.18
ARADIO	0.78	9.18	0.78	7.63	-0.49	-1.23
ATRANSEQ	0.80	9.06	0.74	7.33	-0.64	-2.51
AOTHMAN	0.58	8.00	0.68	7.06	-0.17	1.56
AELEG	-1.08	-2.92	-0.51	0.12	-1.64	-8.62
AWATR	-0.99	-3.43	-0.50	-1.35	-1.52	-8.47
ACONS	5.87	43.49	4.05	29.36	4.40	32.09
ATRAD	-0.23	1.34	-0.09	0.99	-0.91	-4.55
AHOT	-1.34	-6.01	-0.68	-2.94	-2.11	-12.53
ATRANSER	-0.21	1.27	-0.08	0.93	-0.77	-3.77
ACOMM	-0.92	-3.24	-0.47	-1.48	-1.48	-8.63
AFINS	-0.98	-3.13	-0.63	-1.74	-1.76	-9.49
ABUSS	-0.52	-0.77	-0.48	-2.15	-1.06	-6.25
AOTHSER	-1.57	-7.57	-0.79	-3.31	-1.97	-11.32
AGOVGA	0.57	10.32	0.55	9.89	0.28	6.87

The impact on households is negative because of the drop in transfers they receive from firms and the decrease in labour income they receive. Note that impacts are less dramatic than in the previous scenario.

Table 1.42. Impact on household income (% to BAU)

	YHL		YHTR		YH	
	2012	2020	2012	2020	2012	2020
Simulation 3A	-0.42	-0.34	-0.42	-3.31	-0.42	-1.47
Simulation 3B	-0.14	1.45	-3.21	-23.21	-1.31	-7.96
Simulation 3C	-1.59	-9.11	-1.01	-8.09	-1.37	-8.72

The impact on firms is also negative, notably under Simulation 3B, as they face an increase in the direct taxes they pay. Here, firms' savings drop by almost 30% in the long run, which will have a massive impact on private investment.

Table 1.43. Impact on firms (% to BAU)

	YFK		YF		SF	
	2012	2020	2012	2020	2012	2020
<b>Simulation 3A</b>	-0.59	-4.70	-0.52	-4.15	-0.51	-4.06
<b>Simulation 3B</b>	-0.44	-4.74	-0.39	-4.18	-3.93	-28.44
<b>Simulation 3C</b>	-1.44	-11.50	-1.27	-10.15	-1.24	-9.92

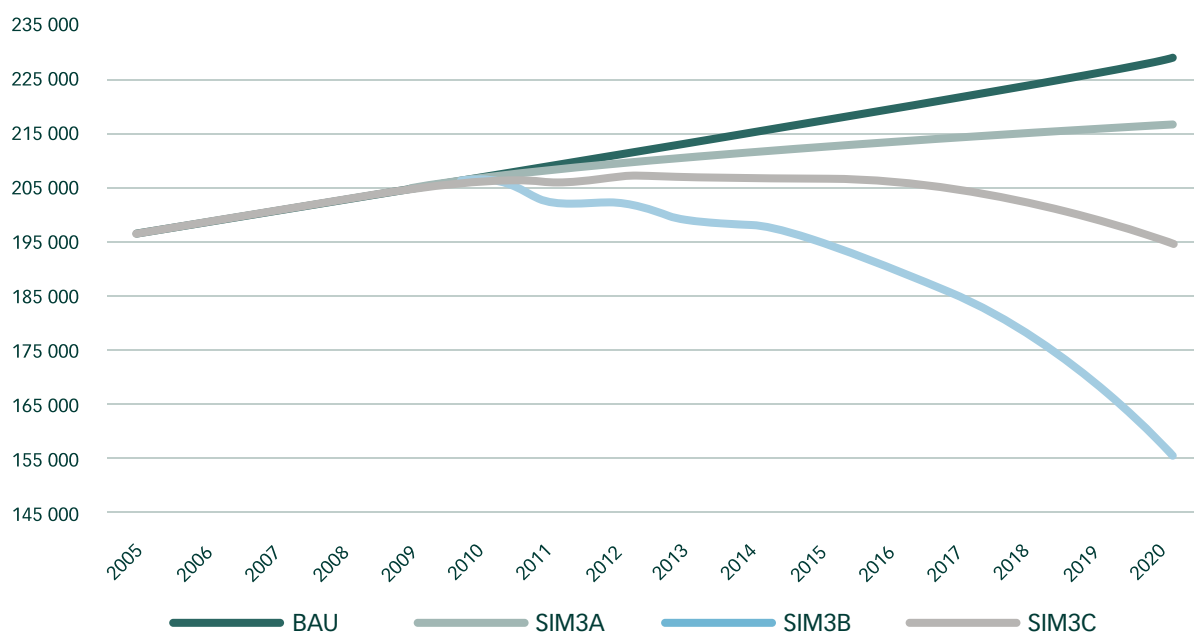
In the three scenarios, government income increases due to the fiscal mechanism set up.

Table 1.44. Impact on government (% to BAU)

	YGTR		TPRODN		TPRCTS		TDHT		TDFT		YG	
	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020	2012	2020
<b>Simulation 3A</b>	-0.51	-4.06	-0.79	-3.50	-0.61	-2.10	15.42		-0.59	-4.70	4.00	27.69
<b>Simulation 3B</b>	-3.93	-28.44	-0.54	-2.49	-0.28	-0.69	-1.31	-7.96	19.99		3.98	27.77
<b>Simulation 3C</b>	-1.24	-9.92	-1.11	-6.52	12.76	95.63	-1.37	-8.72	-1.44	-11.50	4.22	31.91

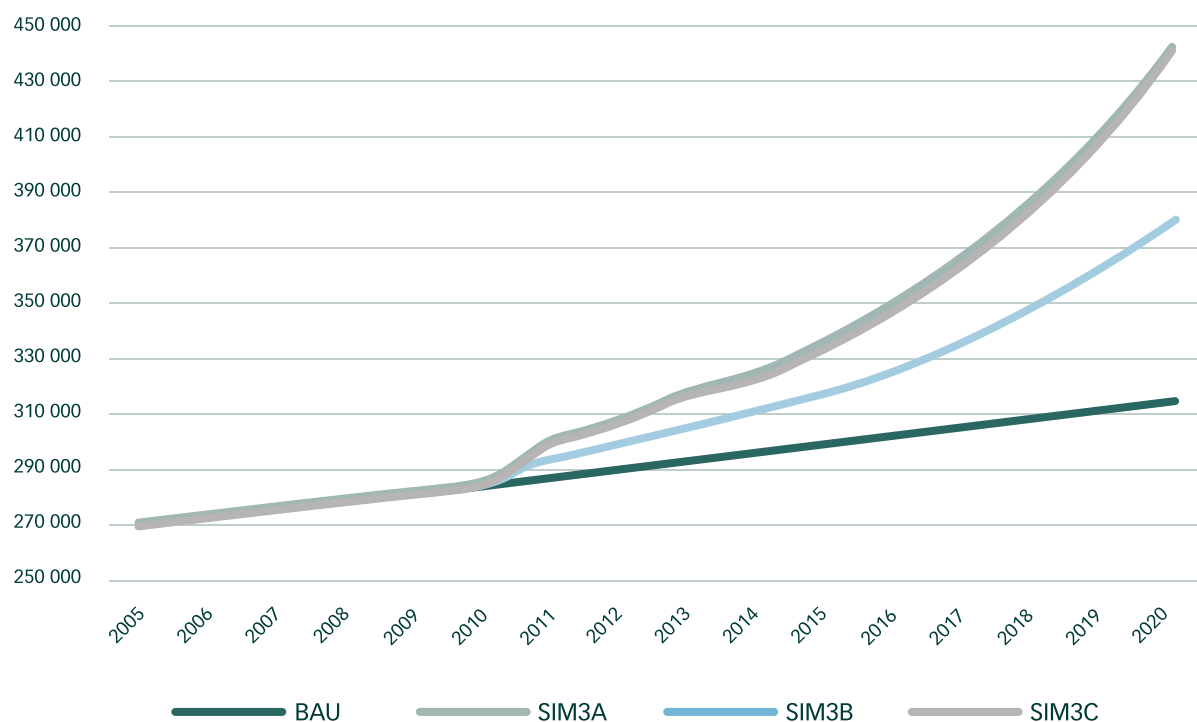
Private investment decreases and, like for Scenario 2, is worse when firms have to finance the policy. This is because firms contribute significantly to private investment.

Figure 1.23. Impact on private investment



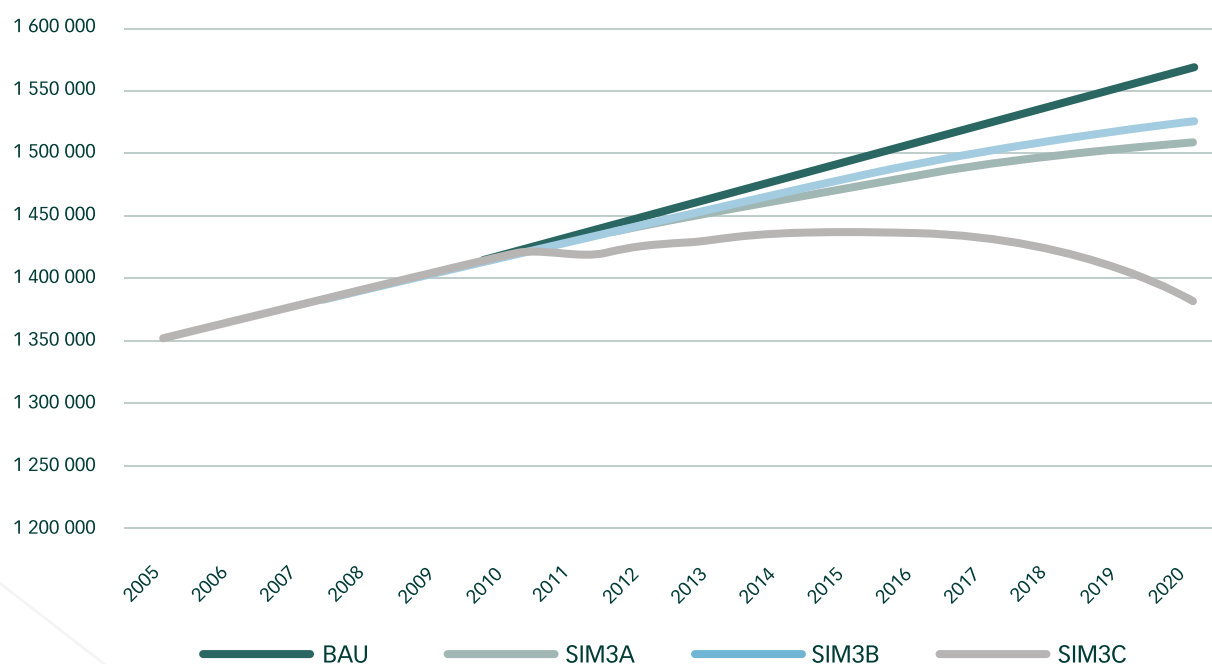
As public investment increases due to the policy, total investment also increases.

Figure 1.24. Impact on total investment



The policy is less harmful to GDP when financed by firms. Indeed, when households finance the policy, the impact on consumption and thus on GDP is too big. Needless to say, in Simulation 3C, the results are very bad. Financing the policy through an increase in indirect tax penalises the entire economy.

Figure 1.25. Impact on GDP (at basic prices)



## 1.6 Conclusion

This chapter has explored several job creation policy interventions. For all the simulations (except one), unemployment decreased for the entire period. Skilled and semi-skilled workers benefit more from proposed interventions, as government's activities are very intensive in these two types of labour. Three different ways of financing were analysed, as for government to let its deficit run unabated is unsustainable. None is neutral. Indeed, financing through household tax will affect households the most, as well as other activities, as the demand for commodities will decrease. Sectors such as food and footwear will be particularly affected. The scenario that finances by taxing firms will be more harmful for firms, as they will pay more direct taxes and will have an impact on total investment in the long run. The VAT financing scenario will negatively affect the whole economy, as the increase in the VAT will affect final and intermediate consumptions for agents and activities.

Financing the policy by increasing firms' direct taxes has negative impacts on investment in the long run, and so on growth. Financing through an increase in VAT has harsh results for the entire economy, as all the agents are negatively affected. Moreover, this fiscal policy would not be 'pro-poor' because all households (including the poor) are hit by an increase in VAT. Finally, the increase of direct tax for households seems to be the least harmful.

Building on these results, the chapter explored whether infrastructure-intensive expenditure will do a better job. The idea with this type of policy is to see what happens in the long run. In the short run, government's deficit increases a lot, but the question is whether this spending can create greater economic activity in order to generate new revenues in the long run. For instance, a policy that creates jobs will have an impact on the fiscal side, as new workers will get an income and pay new taxes (direct and indirect). In terms of unemployment, results are surprisingly very negative. It must be remembered that the unemployment level for skilled workers is very low at the base year, and thus variation is very high. In any case, unemployment increases whatever the scenario and the labour type.

In the last set of scenarios, the same simulations were presented but also took into account the effect of infrastructure productivity on the other sectors. Indeed, it is easily understandable that government investment in building a road (infrastructure spending), or in constructing/renovating a harbour, will have impacts on the other sectors: it will decrease their transport margins, and they will be able to trade more, using the same quantities of labour and capital. In short, the cost of doing business will be lowered. The impact on unemployment is better, and in the long run unemployment decreases for all types of workers under one of the scenarios. In the short run, only elementary occupation workers benefit from a decrease in unemployment; for the rest, unemployment rises.

Analysis has shown that fiscal policy actions intended to increase demand for goods and services can affect employment in three key ways: (1) by boosting households' disposable income, (2) by providing support to businesses and (3) by increasing grants or government spending on infrastructure. A 'J-curved' process of fiscal consolidation is quite feasible provided that the additional stimulus is carefully designed to maximise impact. A key condition is that the fiscal multiplier should be greater than one, that is, each rand of additional short-term stimulus should translate into *more* than one rand of additional aggregate demand. This condition typically exists in a downturn and should be present now as well. Initiatives that reduce the marginal cost to businesses of adding employees, or that target people most likely to spend the additional income (generally people with lower income), would have the greatest effect on employment per rand of budgetary cost. For instance, re-directing government spending towards activities such as health care, durable goods manufacturing, agriculture, community services, and hospitality and food service should complement government's expanded infrastructure expenditure plan, which traditionally has focused chiefly on construction activities (e.g. building highways, power plants, bridges, dams and flood control structures), in creating much-needed additional jobs. Unemployment can also be addressed by focusing on factors other than the weak demand for goods and services.

Despite the near-term economic benefits, such actions would add to the already large projected budget deficits that exist under current policies, either immediately or over time. Unless other actions are taken to reverse the accumulation of government debt, the nation's output and people's income would ultimately be lower than otherwise would have been. The analysis shows clearly that fiscal policy (infrastructure and current expenditures) alone is not going to solve job-creation problems unless complemented by other interventions. The negligible impact on growth of interventions, such as an expansive infrastructure strategy or expanded public expenditures, has important implications for fiscal policy. At the very least, the finding suggests government interventions that emphasise infrastructure alone will make little impression on employment. Infrastructure is only one aspect, but the government has pinned its entire strategy on infrastructure and virtually very little else. Therefore, rather than replacing ageing infrastructure, policy should target public investments that serve as a catalyst to shifts towards jobs and knowledge-intensive production and provision of government services (including maintenance of existing infrastructure). New investments are required that allow shifts

towards jobs and knowledge-intensive production and provision of government services. In all cases, fiscal policy needs to be consistent with long-term fiscal objectives and take into account the limits of direct public-sector employment.

## 1.7 Recommendations

With respect to unemployment and the intergovernmental transfer system, the Commission recommends that government should:

- Re-direct government spending towards those activities that directly or indirectly create jobs through implementing the expanded infrastructure strategy. Healthcare, durable goods manufacturing, agriculture, community services, and hospitality and food service should form the basis of much of that plan. By and large government should promote lower-paying positions, which have the highest potential for the most job gains, including those found in the informal service sector (which can help undo the losses felt by groups hardest hit by the recession of 2008–2009).
- Reduce unemployment by addressing factors other than the weak demand for goods and services. This should be done by:
  - o Re-designing the state procurement framework to incorporate and grow the informal economy and formal micro-enterprises, e.g. requiring recipients of large government contracts to include an informal sector partner in their tender submissions. In addition, the Department of Performance Monitoring and Evaluation should stringently monitor the outcomes of these contracts.
  - o Earmarking government procurement contracts for low-technology or service-oriented contracts (e.g. catering) for informal sector companies or micro-enterprises.
  - o Better targeting of supply-side interventions for re-skilling and mobility. These policies could be implemented using mechanisms such as block grants (e.g. transport subsidy for unemployed vulnerable groups such as women, youth and the disabled so that they are better connected to employment opportunities).
- Encourage, particularly through the relevant Departments of Labour and Performance Monitoring and Evaluation, those companies that are yielding the highest employment levels both directly and indirectly. This would entail:
  - o setting up an employment performance-reward scheme for enterprises that excel in job creation
  - o publicising the scheme widely and giving it a high profile.
- Develop and implement credible job plans for each sphere in collaboration with a broad set of actors – not only employers, but also unions, economic development agencies, Sector Education and Training Authorities (SETAs), secondary schools, colleges, universities, vocational training centres and business support providers. To unblock prisoner's dilemma scenarios and work towards amicable social compacts:
  - o Ensure collaboration happens, particularly at the level of relatively homogenous local interests.
  - o Use the criteria proposed in Box 1.1 in Chapter 1 to evaluate respective job plans.

### Box 1.1. Criteria for Evaluating Government Job Plans in South Africa

**Magnitude of policy change and debt implications.** There is no commonly agreed upon, optimal amount of national debt. Higher debt has a number of negative consequences that the Commission has discussed in its earlier work, but reducing debt or constraining its growth will imply alternatives forgone so that policy changes themselves can have negative consequences. Hence, government will need to make judgments about how much national debt is acceptable.



**Specificity of the policy.** This criterion asks whether a plan is explicit or not in how job creation would be achieved. Specificity is critical not only to evaluating a plan but also to the effects of the plan. Credible policy changes that would substantially reduce inflation in the coming decade and beyond could boost economic expansion in the next few years by holding down interest rates and increasing people's confidence in the nation's long-term economic prospects. Such an approach would be most effective if the future policy changes were sufficiently specific and widely supported by households, businesses, state and local governments, and if participants in the financial markets believed that the future fiscal restraint would truly take effect.

**Amount and composition of government spending.** Over time, government will need to collect revenues roughly equal to its expenditure. Hence, government will need to decide the size and composition of such expenditure. Since the 2009 recession, South Africa has experienced a future budget trajectory that looks very different from the past, and budget (job) plans have the opportunity to reinforce current trends or to reverse them.

**Short-term economic impact.** Government faces difficult trade-offs in deciding how quickly to implement policies to create sustainable jobs. On the one hand, immediate spending cuts or tax increases would represent an added drag on the current weak economic expansion. In addition, implementing spending cuts or tax increases abruptly would give families, businesses, and provincial and local governments little time to plan and adjust. On the other hand, cutting spending or increasing taxes slowly would tend to boost output and employment in the next few years, compared with what would happen if those changes were made rapidly. However, it would also lead to a greater government debt and might raise doubts about whether the longer-term deficit reductions would ultimately take effect.

**Medium- to long-term economic impact.** Beyond the next few years, budget plans could affect output and income by altering the size and skills of the labour force, the amount and composition of the capital stock, and the efficiency with which those inputs are combined. Smaller deficits would lead to higher national savings in the medium and long term, and higher national savings would lead to a larger capital stock.

**Distributional impact.** This criterion addresses the question of who would bear the burden of the proposed changes in tax and spending policies. Different sorts of spending cuts and tax increases would affect different people to different extents, both directly (who pays certain taxes or receives certain benefits or services) and indirectly (how the changes in policies affect the economy and thereby affect people's well-being).

## References

- Annabi, N, Decaluwé, B, and Cockburn, J. 2006, Functional forms and parameterization of CGE models, PEP, *MPIA Working Paper 2006-04*.
- Arora, V and Ricci, LA. 2005. Unemployment and the labor market. In Nowak, M. and Ricci, L.A. (eds.) *Post-apartheid South Africa: The First Ten Years*. Washington, DC: The International Monetary Fund, pp 23–47.
- Banerjee, A, Galiani, S, Levinsohn, J, McLaren, Z and Woolard, I. 2009. Why has unemployment risen in the New South Africa? *Economics of Transition* 16(4), pp 715–740.
- Behar, A and Edwards, L. 2004. Estimating elasticities of demand and supply for South African manufactured exports using a vector error correction model. *Working Paper 204*. The Centre for the Study of African Economies.
- Bogetic, Z and Fedderke, J. 2005. Infrastructure and growth in South Africa: benchmarking, productivity and investment needs. *ESSA Conference Proceedings 2005*. Available online <http://www.essa.org.za/>
- Burger, R and Woolard, I. 2005. The state of the labour market in South Africa after the first decade of democracy. *CSSR Working Paper No. 133*. Cape Town: University of Cape Town (Centre for Social Science Research).
- CIA. Unemployment Rates. In *CIA World Fact Book*. Available online <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2129rank.html>
- Chitiga, M and Mabugu, R. 2009. Liberalising trade in South Africa: a survey of computable general equilibrium studies. *South African Journal of Economics*, Vol. 77, Issue 3, pp445–464, September 2009.

- Decaluwé, B, Lemelin, A, Robichaud, V and Maisonnave, H. 2010. *PEP-1-t. Standard PEP Model: Single-country, Recursive Dynamic Version*. Québec: Université Laval, Politique économique et Pauvreté/Poverty and Economic Policy Network.
- Fedderke, J and Bogetic, Z. 2006. Infrastructure and growth in South Africa: direct and indirect productivity impacts of 19 infrastructure measures. *World Bank Policy Research Working Paper No. 3989*.
- Fedderke, J and Garlick, R. 2008. Infrastructure development and economic growth in South Africa: a review of the accumulated evidence. *Policy Paper No 12*. School of Economics, University of Cape Town and Economic Research Southern Africa.
- FFC (Financial and Fiscal Commission). 2010. Technical Report: Annual Submission on the Division of Revenue 2009/10. Midrand: FFC.
- Gibson, KL. 2003. Armington elasticities for South Africa: long- and short-run industry level estimates, trade and industrial policy strategies. *Working Paper 12-2003*.
- Heintz, J and Posel, D. 2008. Revisiting informal employment and segmentation in the South African labour market. *South African Journal of Economics*, 76(1), pp 26–44.
- Hodge, D. 2009. Growth, employment and unemployment in South Africa. *South African Journal of Economics*, 77(4), pp 488–504.
- Jung, H-S and Thorbecke, E. 2003. The impact of public education expenditure on human capital, growth, and poverty in Tanzania and Zambia: a general equilibrium approach. *Journal of Policy Modeling*, 25, pp 701–725.
- Kingdon, G and Knight, J. 2007. Unemployment in South Africa, 1995–2003: causes, problems and policies. *Journal of African Economies*, 16(5), pp 813–848.
- Kirstern, M and Davies, G. 2008. Asgisa – is the bar set high enough? Will the accelerated infrastructure spend assist in meeting the targets? Development Bank of Southern Africa. *Tips Conference*. 29–31 October 2008, Cape Town.
- Mabugu, R and Chitiga, M. 2009. Liberalising trade in South Africa: a survey of computable general equilibrium studies. *South African Journal of Economics*, Vol. 77, Issue 3, September 2009, pp 445–464.
- Mabugu, R, Chitiga, M and Rakabe, E. 2009. Public infrastructure investment. In FFC. 2009. Technical Report – *Annual Submission for Division of Revenue 2010/11*. Midrand: FFC.
- McCarthy, C. 2005. *Productivity Performance in Developing Countries, Country Case Studies: South Africa*. Vienna, Austria: United Nations Industrial Development Organisation.
- National Treasury. 2008. *Budget Review 2008*. Pretoria: National Treasury
- National Treasury. 2010. *Budget Review 2010*. Pretoria: National Treasury.
- Nattrass, N. 1998. Growth, Employment and Economic Policy in South Africa: A Critical Review. *CDE Focus*. 2.
- Nattrass, N. 2000. Is South Africa's High-Productivity Growth Strategy Appropriate in a Labour-Surplus Economy? *TIPS 2000 Annual Forum*. Muldersdrift, 18–20 September 2000.
- NYU. 2009. *Macro Time Series*. NYU Development Research Institute. Available online <http://nyudri.org/resources/global-development-network-growth-database/>
- Perrault, JF, Savard, L and Estache, A. 2010. The impact of infrastructure spending in Sub-Saharan Africa: a CGE modelling approach. *Policy Research Working Paper Series 5386*. Washington, DC: The World Bank.
- SARB (South African Reserve Bank). 2012. *Quarterly Bulletin (September)*. Pretoria: SARB.
- StatsSA (Statistics South Africa). 2008. Compendium of Industrial Statistics: Knowledge, Productivity and Innovation. 1st edition, *Discussion Document D0406*.
- StatsSA. 2009. Quarterly labour force survey (4th quarter). *Statistical Release P0211*. Pretoria: StatSA.
- The Presidency. 2010. *Development Indicators*. Pretoria: Government Printer.
- Trading Economics. *Unemployment Rates by Country*. Available online <http://www.tradingeconomics.com/unemployment-rates-list-by-country>
- World Bank. *African Development Indicators*. Available online <http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=1147>

# Chapter 2

## FINANCING E-EDUCATION AND ACHIEVING POLICY GOALS IN PUBLIC ORDINARY SCHOOLS IN SOUTH AFRICA

Lucienne Abrahams and Donald Sibanda

### 2.1 Introduction

This chapter presents the key issues for consideration with respect to financing e-education and lays the foundation for further research to be conducted for the next Annual Submission (2014/2015). Furthermore, in posing important questions about the financing of e-education in South Africa, this chapter contributes to a ten-year review of the White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (South Africa, 2004).

The world is shifting to a knowledge-based economy. South Africa's ability to promote inclusive growth depends on producing successive generations of well-educated young people contributing to socio-economic development. A South African society with a large, well-educated population will overcome more easily the many obstacles to social and economic equality experienced by the majority of households. One of many approaches to building the necessary long-term capacity is e-education, which uses Information and Communication Technologies (ICTs) to enhance the quality of the learning and teaching experience. The result is potentially greater completion rates and better educational outcomes, as learners can have access to a more complex knowledge base and engage in more self-learning, with the guidance of teachers.

This chapter reviews only the financing of e-education in public ordinary schools, which fall under the Department of Basic Education (DoBE). Financing of e-education has occurred mainly through the national budget and through two provincial budgets, Gauteng and Western Cape. Furthermore, a number of e-school initiatives and projects (Isaacs, 2007) are being run, including those promoted by the DoBE, the Department of Communications (DoC) and the Department of Science and Technology (DST). While cross-governmental collaboration on e-education is necessary and to be encouraged, the main focus of this chapter is financing of e-education from the DoBE budget.

### 2.2 View of the Problem: Schooling, e-Education and Financing

During their schooling years, the majority of the 12.1 million learners in 24 681 public schools in the nine provinces (DoBE, 2011) acquire only limited knowledge, and a very large proportion fail to complete 12 years of schooling (FFC, 2011):

In South African schools, gross enrolment rates are quite high at primary levels of education, which shows that the country has expanded access (not necessarily quality) to basic education and is on track to meet the MDG2 of achieving universal primary education (Jansen, 2008). The challenge facing basic education in South Africa is that completion rates are low at secondary level, where fewer than 20% of youths drop out before Grade 9 (Gustafson and Morduchowicz, 2008). Analysts support this point, noting that over 1.3 million learners began Grade 1 in 1999, but less than half of them reached Grade 12 and became the "2010 matriculants" (Bowie, 2011). This is due to various reasons including but not limited to high drop-out rates and high grade repetition levels. There is thus a critical and urgent need for attention by the developmental state.

This low level of education negatively affects South Africa's capacity to develop. It limits the ability to create economic value and to ensure that an increasing proportion of the population participate in economic production at reasonable rates of reward, often referred to by government as 'decent jobs'. The basic education systems requires many

interventions to increase capacity, including leadership, good school governance and greater access to knowledge for both teachers and learners.

South Africa does not have a comprehensive life-long learning programme for teachers. After their teacher training, most teachers are confined to the classroom and have limited access to new knowledge, based on changes in the curriculum and/or teaching guides and/or learner materials. As a result, opportunities are limited for teachers to become conversant with important educational content in a particular subject area or to stay abreast of trends in teaching language, science or mathematics.

The limitations affecting the knowledge base of the teaching fraternity also have a negative impact on learners, who are thus poorly prepared for further and higher education and for the world of work. Introducing and integrating ICTs, electronic and visual media into the educational process and culture can provide a platform for increasing access to knowledge for teachers and learners. This includes textbooks and other learner materials available online, free download of content, and access to text, visual media (graphs, maps), and audio-visual media (video, film, music). Devices such as electronic tablets and e-books can bring knowledge to the classroom and to the learner's desk. Many private schools and colleges have introduced e-books and tablets (the 'new blackboard') as learning devices in the classroom. E-books are a "game-changer" (Gray, 2011), and failure to make this shift over the next three to five years will further disadvantage and entrench the knowledge divide among South African learners, reducing their chances of becoming professionals, job creators and the next generation of teachers in a digital knowledge era.

Introducing e-education as a way of improving the quality of education does not require the most sophisticated and expensive equipment. An e-education business model can be designed that makes the widespread introduction of technology affordable. However, inhibiting factors in the public sector may include inefficiency and corruption in the delivery chain. A systematic approach is required, with a strategy, plan and adequate financing and risk management, to ensure that e-education is alive and makes an impact in schools. In reality, despite generally well-expressed policy goals, e-education is largely dormant and appears to be poorly financed, with only limited management and evaluation.

### 2.3 Policy Goals: e-Education and Quality in Basic Education

The Department of Education (DoE) was one of the first government departments to introduce public policy for integrating ICTs and to consider transforming the sector through the introduction of new technology. The policy goal of the White Paper on e-Education (South Africa, 2004, Section 2.23) states:

Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013.

This policy goal is supported by the Information Society and Development (ISAD) Plan 2006, which includes e-education as one of three priorities (DoC, 2006, Section 4.1.1) and states:

The education system of this country, therefore, has an obligation to support the development of a citizenry that can actively participate in this new (information) society and deliver on public expectations of delivering quality education for economic growth and social development.

Two of the main targets for e-education (DoC, 2006, p 58) are:

- All schools connected and using ICT for teaching and learning.
- All provinces have budget allocated for e-education.

Furthermore, the policy goal for e-education is in line with the strategic outcomes of the current administration for (a) improved quality of basic education and (b) a skilled and capable workforce to support inclusive growth.

The policy foundation for e-education appears to be relatively comprehensive and is located in various components of the government machinery. As the policy anniversary of 2014 approaches, this foundation will need reviewing and updating, as technology and digital content production has advanced considerably in the past decade, and many innovations are now available that can bring e-learning to schools at a lower cost.

## 2.4 Some Perspectives on Financing e-Education

The value of e-education is not contested, as shown by the adoption of the White Paper on e-Education with its focus on e-school development. This chapter looks at the financing of the e-learning component of e-education (the other component being e-administration). Financing of e-learning has been left to the discretion of provinces, which are in charge of the education function. Government has not yet introduced a specific intergovernmental financing mechanism for funding e-learning content and e-education infrastructure (DoBE, 2012). Schools differ widely across provinces, from those that have relatively good infrastructure to those where mud huts are used as classrooms. Given the great diversity of learning environments, an intergovernmental financing mechanism must address specific components of e-learning across all provinces. A gradual, progressive approach would encourage the evolution and equitable development of e-learning across provinces.

The e-learning components that require funding need to be clearly defined, so that funding allocations can be prioritised to ensure well-resourced e-learning. Virtual learning centres, such as computer laboratories, have advantages and disadvantages (Morse, 2010). Ideally e-learning should take place in the classroom, so that every subject area benefits from access to knowledge through online materials or electronic media. Some forms of e-learning require minimal expenditure of public funds, for example sending key learning points via sms or podcasts to mobile phones. E-learning can be introduced within the constraints of a particular budget allocation, emphasising low-cost initiatives where appropriate and more costly and beneficial approaches in the medium to long-term. For more advanced forms of e-learning, the design of future funding models will need to take into account the need for (a) broadband access to download or upload large documents, video or music files and (b) local content production and dissemination, to promote greater availability of, and access to, South African languages, culture and knowledge alongside global culture and knowledge.

As the majority of Internet connections are too slow for downloading useful content, the private's sector historical investment in providing Internet access to public schools may soon become obsolete. Traditionally, investment has been through universal access and service obligations that the telecoms sector regulator, ICASA, set for approximately 17 500 schools. The 'last mile' is broadband connectivity to the classroom, to facilitate access to web-based learner materials, e-books, e-education applications and/or Internet Protocol TV (IPTV).

Therefore, national, provincial and local governments will need to facilitate broadband connectivity across the country, through a combination of public and private initiatives, including funding. Linking schools to the government virtual private network (VPN) is one approach being considered in the DoBE feasibility study (DoBE, [Sa]). Another approach is to make use of the broadband networks built by the metropolitan municipalities of Cape Town, Ekurhuleni, Johannesburg and Pretoria, and the provincial government of Gauteng. The billions of rands invested in these broadband initiatives have been justified by referring specifically to schools as important users of the network infrastructures. These investments need to be made to work for South African schools. A third, possibly parallel, approach would be to make available, and give access to, mobile broadband networks (small WiFi or WiMax networks), especially in rural areas.

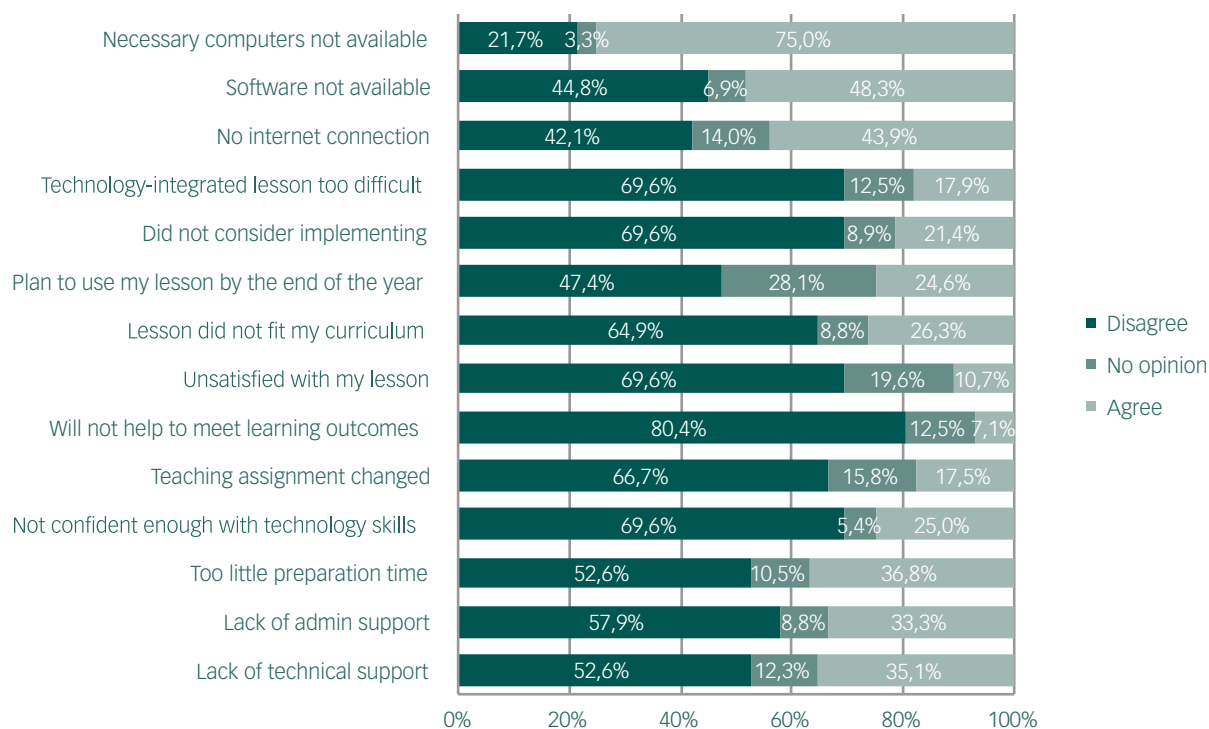
Various methods can be considered for the financing of e-learning (Intel Corporation, 2007), but these are merely measures supporting government financing:

- Combining education funding sources: the costs of educators' electronic equipment can be funded using both salary budgets and treasury funds, where teachers help to offset technology costs by sacrificing a small portion of their salaries.
- Public-private partnerships (PPP): private financing and risk management can be incorporated into the funding mix for e-learning. However, this model mainly applies to infrastructure components and is not a traditional PPP where the private sector gets a financial return.
- Forming consortia: schools can pool their purchasing power in order to get favourable prices from the suppliers.
- Philanthropy and grants from development agencies: grants can contribute to funding e-learning.

In South Africa, using public funds to fund the introduction of e-learning has proved difficult. The private sector's contributions to infrastructure financing and availability (based on regulated universal access and service obligations placed on the fixed and mobile telecoms operators) has led to limited Internet connectivity (BMI-Techknowledge, 2010) but has had little or no positive impact on ICT usage (Wilson-Strydom & Thomson, 2005).

Therefore, the funding of e-education must target aspects that hinder the delivery of e-education to schools and the integration of technology into everyday learning. Research by Wilson-Strydom and Thomson (2005) reveals the reasons for poor adoption of e-learning in the early years following adoption of the White Paper:

Figure 2.1. Reasons for not implementing technology-integrated lessons



Source: Wilson-Strydom and Thomson, 2005

An analysis of Figure 2.1 helps to identify the areas that need funding, so that e-learning can spread throughout ordinary schools. An important line item relevant to all budget allocation is computing hardware and software, using suitable electronic devices, possibly e-books or electronic tablet devices (often cheaper than laptops or desktops). Other requirements include adequate and relevant curriculum content, and adaptation to using electronic media and technological devices in the classroom — all of which need appropriate budget allocations. Too many e-education initiatives in South Africa have focused on technology as the solution, rather than the medium. Budgets have been exhausted building computer labs that are under-utilised. Electronic media for educational purposes should be about the daily application and use of educational technologies, which are continuously adapted by teachers and learners to their particular uses and needs. Hence, budget allocations should tend towards a learning-intensive rather than a technology-intensive approach. Financial modelling for e-education should take into account the whole school budget.

Funding e-learning is a challenge, as most funds are targeted at teaching and not at technology-integrated learning. According to the OECD (2005), the two main challenges for e-learning are (a) pricing and costing of e-learning and (b) sustainable funding for e-learning.

In the case of pricing and costing, most institutions have not clearly defined what e-learning entails and what aspects of e-learning need to be funded. The DoBE's feasibility study to better understand the costing and funding of e-learning found (DoBE, [Sa]):

1. Insufficient experience of e-learning to make a judgment on relative costs.
2. Considerable experience, but no firm evidence on relative costs.



3. Experience to date suggests e-learning is fundamentally more expensive than face-to-face delivery, but this is offset by other benefits.
4. Experience to date suggests that initial development and delivery costs are often more expensive than face-to-face delivery, but other factors have shown or suggest that e-learning will prove less expensive across the product cycle.

Funding e-learning sustainably is a challenge in many countries. To reap the benefits of e-learning, South Africa needs to find long-term, sustainable ways of financing e-learning in public ordinary schools. One way is to look at how each sphere of government can contribute to financing the required infrastructure (including broadband connectivity) and electronic content production to supplement the already available learner materials. For the purpose of this report, only the DoBE programme-level budgets have been examined, as data on provincial budget allocations for e-education and e-learning is limited and still needs to be compiled into a comprehensive report to facilitate analysis.

## 2.5 An Overview of Historical and Projected e-Learning Expenditure

Targeted funding will help to implement the goals set by the White Paper on e-Education. In addition to understanding the evidential basis for the successful introduction of e-learning (see Wilson-Strydom and Thomson, 2005), the historical expenditure on e-learning also needs to be considered in the context of total basic education expenditure (see Tables 2.1–2.4).

Table 2.1. Basic education expenditure

Programme	Audited outcome			Adjusted appropriation	Revised estimate	Medium-term expenditure estimate		
ZAR thousand	2007/08	2008/09	2009/10		2010/11	2011/12	2012/13	2013/14
Administration	106,101	121,429	154,617	257,981	257,981	301,740	320,787	339,977
Curriculum Policy, Support and Monitoring	295,037	540,949	564,228	1,351,950	1,071,950	1,835,137	1,901,347	2,013,482
Teachers, Education Human Resources and Institutional Development	176,126	283,284	497,507	495,026	495,026	521,989	747,195	973,163
Planning, Information and Assessment	2,808,135	3,320,132	4,030,416	4,928,102	3,376,852	6,387,529	8,405,342	11,614,737
Educational Enrichment Services	1,414,118	2,118,201	2,607,518	3,891,203	3,891,203	4,821,739	5,183,265	5,468,265
<b>TOTAL</b>	<b>4,799,517</b>	<b>6,383,995</b>	<b>7,854,286</b>	<b>10,924,262</b>	<b>9,093,012</b>	<b>13,868,134</b>	<b>16,557,936</b>	<b>20,409,624</b>
Administration	2%	2%	2%	2%	3%			
Curriculum Policy, Support and Monitoring	6%	8%	7%	12%	12%			
Teachers, Education Human Resources and Institutional Development	4%	4%	6%	5%	5%			
Planning, Information and Assessment	59%	52%	51%	45%	37%			
Educational Enrichment Services	29%	33%	33%	36%	43%			

Source: National Treasury, 2011

For the 2013/2014 financial year, the total national budget allocation for basic education is scheduled to increase to over R20 billion. Historically, over 80% of the budget has been spent on two programmes: the planning, information and assessment programme (51% in 2009/10) and the educational enrichment services programme (33% in 2009/10). These programmes should collectively contribute in significant ways to the introduction of successful e-learning across all provinces.

The national budget is directed towards policy design and review, while schooling is a provincial function. Therefore, the main budgets that would be used to build e-education lie in the provinces. Ideally, since e-education is a major long-term policy initiative, e-education should be a specific programme and a specific item in the national and provincial budget allocations.

Table 2.2. Computer services expenditure

Programme	Adjusted						
	Audited outcome			appropriation	Medium-term expenditure estimate		
ZAR thousand	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Administration	7,852	7,593	13,859	16,274	15,537	16,461	17,337
Curriculum Policy, Support and Monitoring	2,803	2,686	1,341	2,024	1,798	1,863	1,954
Teachers, Education Human Resources and Institutional Development	1	430	3,486	17	9	11	12
Planning, Information and Assessment	13,162	15,616	20,512	40,732	35,463	36,458	38,550
Educational Enrichment Services	5	5	2	–	4	4	4
<b>TOTAL</b>	<b>23,823</b>	<b>26,330</b>	<b>39,200</b>	<b>59,047</b>	<b>52,811</b>	<b>54,797</b>	<b>57,857</b>

Source: National Treasury, 2011

Expenditure on computer services is much higher in the planning programme than in any other programme. From 2007/08 to 2011/12, expenditure on computer services declined in the curriculum policy, support and monitoring programme. The education human resources and institutional development programmes show very small budgets. Yet a great proportion of the computer services budget would be expected to be allocated to these programmes if e-learning were a funding priority.

Table 2.3. Communications expenditure

Programme	Adjusted						
	Audited outcome			appropriation	Medium-term expenditure estimate		
ZAR thousand	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Administration	1,607	1,738	2,199	1,680	2,289	2,437	2,582
Curriculum Policy, Support and Monitoring	510	775	749	539	687	723	796
Teachers, Education Human Resources and Institutional Development	382	354	424	415	482	512	543
Planning, Information and Assessment	611	616	663	839	846	875	924
Educational Enrichment Services	258	215	267	304	311	311	326
<b>TOTAL</b>	<b>3,368</b>	<b>3,698</b>	<b>4,302</b>	<b>3,777</b>	<b>4,615</b>	<b>4,858</b>	<b>5,171</b>

Source: National Treasury, 2011



Delivery of e-learning pivots around efficient communication systems. The relatively low expenditure on communications indicates an environment in which the e-learning focus is very limited.

Table 2.4. Learner and teacher support material expenditure

Programme	Adjusted						
	Audited outcome			appropriation	Medium-term expenditure estimate		
ZAR thousand	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Administration	625	105	73	87	66	81	90
Curriculum Policy, Support and Monitoring	1,197	12,390	1,061	391	16	17	19
Teachers, Education Human Resources and Institutional Development	–	384	2	–	4	4	4
Planning, Information and Assessment	3	9,892	486	–	–	–	–
Educational Enrichment Services	43	–	–	–	2	2	3
<b>TOTAL</b>	<b>1,868</b>	<b>22,771</b>	<b>1,622</b>	<b>478</b>	<b>88</b>	<b>104</b>	<b>116</b>

Source: National Treasury, 2011

The support material expenditure pattern is not predictable, as over the years this expenditure in the different programmes has seen an overall decline. There is a paucity of data that suggests prioritisation of e-learning. Discussions with the DoBE indicate that, as yet, no dedicated budget exists for the promotion of e-learning or e-education. While policy is made at national level, certain aspects of policy implementation would need to be addressed at the provincial level, particularly the design of budgetary allocations, as a foundation for provincial level implementation.

## 2.6 Conclusion

The financing of e-education need not be high budget. While the initial investment may appear costly, cost containment measures can be explored within a medium to long-term budgetary perspective. Appropriate scoping of the requirements, contributing parties and budget design can lead to an elegant, yet effective, model for the advancement of e-education, specifically of e-learning. This exercise is vital to the future of e-education, as failure to invest introduces a significant opportunity cost. The DoBE is currently engaged in a relatively comprehensive feasibility study, and the Commission can provide useful comment to government on this study, its strengths and weaknesses.

It is necessary to understand why the e-education challenge is not being met, in order to present options for remedy. There are a few possible reasons, which require action: (a) the need for concerted cultural and technological adaptation; (b) the need for specific e-education knowledge and leadership at both national and provincial levels, as education is a concurrent function between national and provincial government; (c) a requirement for explicit budget allocations for e-education at national and provincial levels; (d) supporting strategies and funding from institutions such as the DoC and ICASA; (e) building public accountability for policy implementation into the education ecosystem.

## 2.7 Recommendations

With respect to financing e-education and achieving policy goals in public ordinary schools in South Africa, the Commission recommends that:

- The e-education policy should be funded as a part of government's operating budget for the programme, just like teacher salaries, school buildings and other teaching aids.
- A well-structured, inter-governmental financing mechanism should be established with explicit guidelines to provincial departments of education regarding the budget line items that must be prioritised in their annual budget allocations, as well as those budget line items that will be contained in the national budget allocation. Decisions

on the particular line items can be informed by a review of policy documents and various studies conducted on e-education over several years (Abrahams, Akinsanmi & Zimri, 2012; DoBE, no date; DoC, 2006; Isaacs, 2007; OECD, 2005; South Africa, 2004; Wilson-Strydom and Thomson, 2005), and by a broader review of the available knowledge of e-education financing across the globe. An initial set of line items can be extracted from Table 2.5.

Table 2.5. Guidelines for inter-governmental financing

Financial data (expenditure) on e-education spending by province	Value obtained
<ul style="list-style-type: none"> <li>• School Internet connectivity (dial-up) by province</li> <li>• School broadband connectivity by province</li> <li>• School mobile broadband connectivity by province (eg WiFi)</li> <li>• Learning devices (not necessarily desktops or laptops)</li> <li>• E-learning materials developed nationally and by province, including hosting online content</li> <li>• Accessing online content – nationally and by province</li> <li>• Development of teachers' e-skills</li> <li>• Adaptation of classrooms to incorporate electronic media</li> <li>• Introduction of lower-cost devices to the classroom/learner</li> <li>• Establishment of computer labs/computer libraries (should be very limited)</li> <li>• Research, monitoring and evaluation of policy goals of the 2004 White Paper on e-Education</li> </ul>	Progress in expenditure on e-learning and e-education in terms of the goals of the White Paper on e-Education

- The national and provincial education sector requires firm and expert guidance on designing e-education, and such expertise should relate to e-education, not merely to information technology. In order to promote advances in e-education, it may be necessary to consider the establishment of an e-Education Commission, constituted of government officials and e-education specialists to act as an advisory body.
- Limited data is available on e-education expenditure and specifically on e-learning expenditure, despite clear policy goals adopted in 2004 and targets established for 2013. This should be remedied through reporting on e-learning budget allocations and expenditure and, more broadly, on e-education in the annual reporting process. Such data can inform national and provincial planning, curriculum design and the development of education human resources. It can also inform the work of an e-Education Commission, enabling such a structure to advise government effectively. Furthermore, explicit reporting on financial data will enable a better analysis of the strengths and weaknesses relevant to achieving the policy goals of the White Paper on e-Education. As a baseline, the data set out in Table 2.6 would be required.

Table 2.6. Guidelines for analysing e-education financing

Broad Data Required	Analysis Required
<ul style="list-style-type: none"> <li>Total ordinary schools' budget by province</li> <li>Total budget spent on e-education by province</li> <li>Total budget spent on learner materials</li> <li>Total budget spent on e-learning materials</li> </ul>	<ul style="list-style-type: none"> <li>e-education spending as a proportion of total spending</li> <li>e-learning spending in comparison to spending on learner materials</li> </ul>
<ul style="list-style-type: none"> <li>Key elements of e-education as per DoBE policy</li> <li>Line items of e-education as per DoBE budget/financing plan</li> </ul>	Comparison of policy and financing approaches to e-education
<ul style="list-style-type: none"> <li>Total number of schools by province</li> <li>Number of public ordinary schools with desktop computers</li> <li>Number of public ordinary schools with laptop computers</li> <li>Number of public ordinary schools with e-books, tablets or other content-enabled devices</li> <li>Number of public ordinary schools with email access</li> <li>Number of public ordinary schools with Internet access (indicators for dial-up, total broadband and mobile broadband)</li> </ul>	Analysis of the foundations for e-education in terms of availability of infrastructure and resources
<ul style="list-style-type: none"> <li>Statistics on ICT usage by learners in public ordinary schools per subject per grade</li> <li>Statistics on ICT usage by teachers in public ordinary schools per subject per grade</li> </ul>	Analysis of the educational value created

- In addition to the above, the impact of e-education policy and financing should be continuously assessed, taking into account cross-departmental issues and supporting measures from a range of government departments and relevant public sector bodies (Department of Basic Education, Department of Higher Education and Training, Department of Labour, Department of Science and Technology, Department of Communications, metropolitan municipalities, ICASA and others).
  - Such assessment would consider both school-level and economy-wide impacts. From an analytical perspective, the requirements would be twofold:
    - To understand how e-education affects students' decisions about acquiring ongoing skills in the education system (econometric analysis coupled with case studies, repeated over time);
    - To consider interactions between e-education and the rest of the economy. Quantifying these interactions allows the value of various policy and financing options to be compared.
- When the delivery agreement on *Outcome 5: Build a skilled and capable labour force* is next reviewed, greater emphasis should be given to overseeing the implementation of the e-education policy, noting in particular the sub-output "Enhance research, development and innovation in human capital for a growing knowledge economy". Most of the relevant departments are already signatories to the agreement, and the delivery forum can be expanded to include other relevant role players such as those mentioned in (4) (b) above. Thus, using existing coordination structures, progress on e-education can be reported to Cabinet on a quarterly basis, thereby raising the profile of e-education.

## References

- Abrahams, L. Akinsanmi, T., and Zimri, P. 2012. Regulating spectrum for digital services markets: An e-education perspective, Paper presented at the *India Regional International Telecommunication Society (ITS) Conference*. New Delhi, 22–24 February 2012.
- BMI-TechKnowledge. 2010. Steady growth in Internet access and usage. *Press release*. BMI-TechKnowledge. 27 July 2010. Available online <http://www.bmi-t.co.za/?q=content/steady-growth-internet-access-and-usage>
- Bowie, L. 2011. Matric cheers, but still a long way to go. *Sunday Times*. 9 January 2011: 6.
- DoBE (Department of Basic Education). [Sa]. High-level summary of ICT in education initiative. *Feasibility Study*. Pretoria: DoBE.
- DoBE. 2011. *Report on the 2008 and 2009 annual surveys for ordinary schools*. Pretoria: DoBE.
- DoBE. 2012. Discussion with senior manager in the DoBE, 10 April 2012, Pretoria.
- DoC (Department of Communications). 2006. *Information Society and Development Plan 2006*. Pretoria: DoC.
- FFC (Financial and Fiscal Commission). 2011, *Annual Submission on the Division of Revenue 2012/2013*. Midrand: FFC.
- Gray, E. 2011. Interview on open access to knowledge in the classroom, Cape Town.
- Gustafsson, M. and Morduchowicz, A. 2008. What we can learn from a comparison of the schooling systems of South Africa and Argentina. *Stellenbosch Economic Working Papers: 17/08*. Stellenbosch: University of Stellenbosch
- Intel Corporation. 2007. Funding policies for e-learning: Financing the future. Santa Clara, CA: Intel
- Isaacs, S. 2007. ICT in education in South Africa, Survey of ICT and education in Africa. South Africa country report, June 2007. Accessed online 6 May 2012 [www.infodev.org/en/Document.429.pdf](http://www.infodev.org/en/Document.429.pdf)  
[https://www.google.co.za/search?hl=en&biw=1024&bih=536&q=related:www.infodev.org/en/Document.429.pdf+e-education+White+Paper+South+Africa&tbo=1&sa=X&ei=hFymT7O8KYPJhAenL\\_W8Ag&ved=0CEcQHZAf](https://www.google.co.za/search?hl=en&biw=1024&bih=536&q=related:www.infodev.org/en/Document.429.pdf+e-education+White+Paper+South+Africa&tbo=1&sa=X&ei=hFymT7O8KYPJhAenL_W8Ag&ved=0CEcQHZAf)
- Morse, B. 2010. Virtual education in Rhode Island's K-12 public schools: Current status and perceptions of administrators. Johnson & Wales University. Available online <https://www.lib.byu.edu/cgi-bin/remotearchive.pl?url=http://proquest.umi.com/pqdweb?did=2013976591&...>
- National Treasury. 2011. *Estimates of National Expenditure 2011*. Pretoria: National Treasury.
- OECD. 2005. *Funding, costing and pricing*. In *e-Learning in Tertiary Education: Where do We Stand?* Paris, France: OECD.
- South Africa. 2004. *White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (ICTs)*, Government Gazette No. 26734, 26 August 2004.
- South Africa. 2011. *Delivery Agreement for Outcome 5: Establish a credible institutional mechanism for skills planning*. 8 November 2011. Available online <http://www.info.gov.za/view/DownloadFileAction?id=135375>
- Wilson-Strydom, M. and Thomson, J. 2005. Understanding ICT integration in South African classrooms. Available: [www.schoolnet.org.za/research/Wilson-Strydom\\_Thomson.doc](http://www.schoolnet.org.za/research/Wilson-Strydom_Thomson.doc). Accessed 2 May 2012.

# Chapter 3

## BUDGET REVIEW OF PUBLIC UNIVERSITIES IN SOUTH AFRICA

### 3.1 Introduction

The main objective of the Financial and Commission (the Commission) was to examine and assess the current state of budgeting for the South African higher education system, framed within the broad themes of equity and development. Equity is concerned with widening access to and equalising participation in higher education, while development encompasses a range of issues linked to the productivity and efficiency of the higher education system.

This chapter is limited to a review of the public university system in South Africa because reliable national data on higher education programmes offered at further education and training (FET) colleges is not available. Estimates of students and staff in FET higher education programmes are only available for the years 2007–2009, and no financial statements are available for individual colleges, or for all FET colleges, within a province. The only readily available financial data appears in provincial budget statements and comprises estimates of proposed expenditure on FET colleges.

The chapter has the following structure:

Section 3.2 outlines the main features of the two funding frameworks employed in South Africa's public university system during 2000–2011. The first framework was introduced in 1983 for the historically white universities and gradually applied through the 1980s and 1990s to technikons (now universities of technology) and historically black universities. The life of the 1983 framework was extended to 2003, when it was replaced by a new framework that was implemented in 2004. The underpinning assumptions and principles of the two frameworks differ radically. The 2003 framework was designed as a goal-oriented steering mechanism to move the public university system away from its apartheid past. It links the funding of public universities to their performance in implementing the goals of Education White Paper 3: A Programme for Higher Education Transformation (DoE, 1997) and of the National Plan for Higher Education (DoE, 2001).

Section 3.3 discusses the principle of linking funding to performance. The analysis covers the period 2000–2010 because quantitative data for all universities for the 2011 academic year will only be available towards the end of 2012. It assesses the performance of the public university system in relation to the White Paper 3 and National Plan goals which deal with:

- Improving access opportunities
- Increasing participation of disadvantaged students and of women
- Ensuring that enrolments increase in academic programmes linked to economic development and in postgraduate programmes at master's and doctorate level
- Improving the quality of teaching and research through enhancing the qualifications of academic staff
- Increasing the numbers of graduates produced by the university system
- Increasing the outputs of high-level knowledge products in the form of doctoral graduates and research publications.

The section concludes by noting that comments about the performance of the public university system do not apply to all individual public universities. It shows that the South African public university system has become differentiated, and the performances of universities in relation to the goals of the White Paper 3 and the National Plan differ widely.

Section 3.4 reviews the total income of universities from government and other sources. The total incomes of universities are linked to their places in a performance-differentiated system. It begins to show that some of the principles adopted in the 2003 government funding framework have become strained.

Section 3.5 discusses the issues of (a) determining appropriate levels of government funding for public universities, (b) resolving funding inequalities between universities, and (c) making institutional differentiation a central feature of public higher education policies. Lastly, Section 3.6 provides the Commission's recommendations with respect to funding higher education and the post-school system as a whole.

## 3.2 South African University Funding Models

Over the past 30 years, two sharply contrasting government funding frameworks have been used in the South African public university system. The first framework was developed during 1983 primarily to address the needs of historically white universities; during the 1980s and 1990s, it was extended to technikons and historically black universities. The second framework was developed in 2002 and 2003, after Cabinet approved the 2001 National Plan for Higher Education.

A ministerial committee, set up by the minister of higher education and training is at present reviewing this second framework. This committee will submit its report to the minister of higher education and training on 31 August 2012. No findings or recommendations have been released.

### 3.2.1 Funding Framework of 1983

This framework has three key features:

- Students are considered to be agents who are able to respond rationally to the demands of the labour market in their choices of institutions, qualifications and fields of study. Under this model, the public university system is no more than a set of choices made by individual students. As a consequence, the role of government is to fund student demand and to correct any market failures that may occur.
- Government is seen as the funder of last resort. Further, the model assumes that higher education funding should be based on (a) determinations of the actual costs of reasonably efficient institutions, and (b) decisions about which of these costs should be covered by government subsidies.
- Government, students and their families must share the costs because higher education generates public as well as private benefits,

The 1983 framework divided academic programmes into two broad categories: (a) natural sciences (including the health sciences, engineering, the life and physical sciences, agriculture, mathematical and computer sciences), and (b) the humanities (a catch-all category for all other disciplines). In each of these categories a 'subsidy student' was taken to be a combination of 50% enrolled and 50% successful students, where success was defined as passing individual courses rather than full degrees or diplomas.

Then, based on actual institutional costs and assumptions about cost efficiencies, various cost units per humanities subsidy student and natural sciences subsidy student were calculated. These cost units covered staffing, operations, equipment, libraries, and building and equipment renewals. The assignment of rand values of the various cost units was adjusted each year, to take account of inflation and of changing costs. Once the rand values of the cost units had been determined for a given year, the units were applied to an institution's subsidy student data, thereby generating a rand figure of what the total income from all sources should be.

Table 3.1 below offers an example of how this framework was supposed to work.

Table 3.1. Example of government subsidy calculations in year N for University X under 1983 formula (rands millions)

(1) Ideal income total for University X	400
(2) Ideal government share	320
(3) Earmarked funds for X	40
(4) Institution X's subsidy expectations (rows 2 + 3)	360
(5) Final subsidy for X after government a-factor cut	192
(6) Actual funding from government (rows 3 + 5)	232

Source: DoHET, 2010; CHET, 2011b; Badsha & Cloete, 2011

Based on the data in Table 3.1, the 'ideal' income total in year N would have been R400 million (1) for university with X's number of students, and qualification and course shape. The next step would be to deduct X's student fees plus private income (assumed to be a total of 20%), leaving the balance of R320 million as the 'ideal' government share of the 'ideal' total (2). Various earmarked sums, assumed in the example to be R40 million, would be credited to X, making a total of R360 million (4), which would be X's final subsidy total in year N.

In effect, as similar calculations would have to be made for each public university, the 1983 framework operated from the bottom up to determine what government's public university funding commitment would be in year N. This funding commitment would be the total of all amounts for all institutions in row (2) of Table 3.1, plus the earmarked commitments in row (3). Soon after its introduction, the previous government found itself unable to meet the 'ideal' amounts generated by the 1983 framework. Therefore, limits to the 'ideal' government share totals were introduced early on, by applying 'a-factors'. In effect, these a-factors were the reductions needed to bring the 'ideal' income total less institutional share (the totals reflected in row (4)) in line with the government's actual budget for public universities. The final amounts paid by government to institutions became the government share multiplied by a-factor plus earmarked allocation; i.e. the sum of the amounts reflected in row (6) of institutional versions of Table 3.1.

In the 1980s and 1990s, problems increased when the 1983 framework was extended to technikons and historically black universities. Both the previous apartheid government and the new post-1994 democratic government found that they could not meet the 'ideal' government subsidy amounts generated by this framework. The history of the changes in a-factors (i.e. the subsidy levels that government could afford to fund) can be seen in Table 3.2. In 2004 a new funding framework was introduced, which meant that 2003 was the last year in which a-factors were calculated.

Table 3.2 illustrates the main problem of the 1983 funding framework for public universities. Public universities argued that the average a-factor of 64% for 1995–2003 indicated that their government subsidies had been cut substantially (by an average of 36%). As a consequence, they struggled to fulfil their teaching and research mandates. In 2003, the view of most institutions was that the principles and formulas of the 1983 funding framework should be retained, provided government committed to raising the subsidy levels represented by the a-factors.

Table 3.2. A-factors used to reduce government subsidy commitments under 1983 funding framework

	a-factor = subsidy level
1995	0.648
1996	0.682
1997	0.656
1998	0.650
1999	0.647
2000	0.634
2001	0.636
2002	0.635
2003	0.603

Source: DoHET, 2011a

### 3.2.2 Transition to 2003 Funding Framework

The 1997 Education White Paper and the 2001 National Plan for Higher Education accept that government and students should share the costs of higher education, which is a key principle outlined in the 1983 funding framework. However, the two documents reject two other key principles, asserting that (a) government's key responsibility to higher education is not to contribute to institutional costs, and (b) the choices of students cannot be the sole determinants of the enrolment size and shape of the higher education system.

The argument that higher education should equate to the sum of student choices is rejected on the grounds that it had not worked in South Africa and would prevent higher education emerging from its apartheid past. The White Paper



and the National Plan also stress that the role of government in higher education funding cannot be simply to meet the total cost generated by individual institutions' enrolment practices. In any new funding framework, government must first decide how much it can afford to spend on higher education and then allocate funds to institutions, according to national needs and priorities.

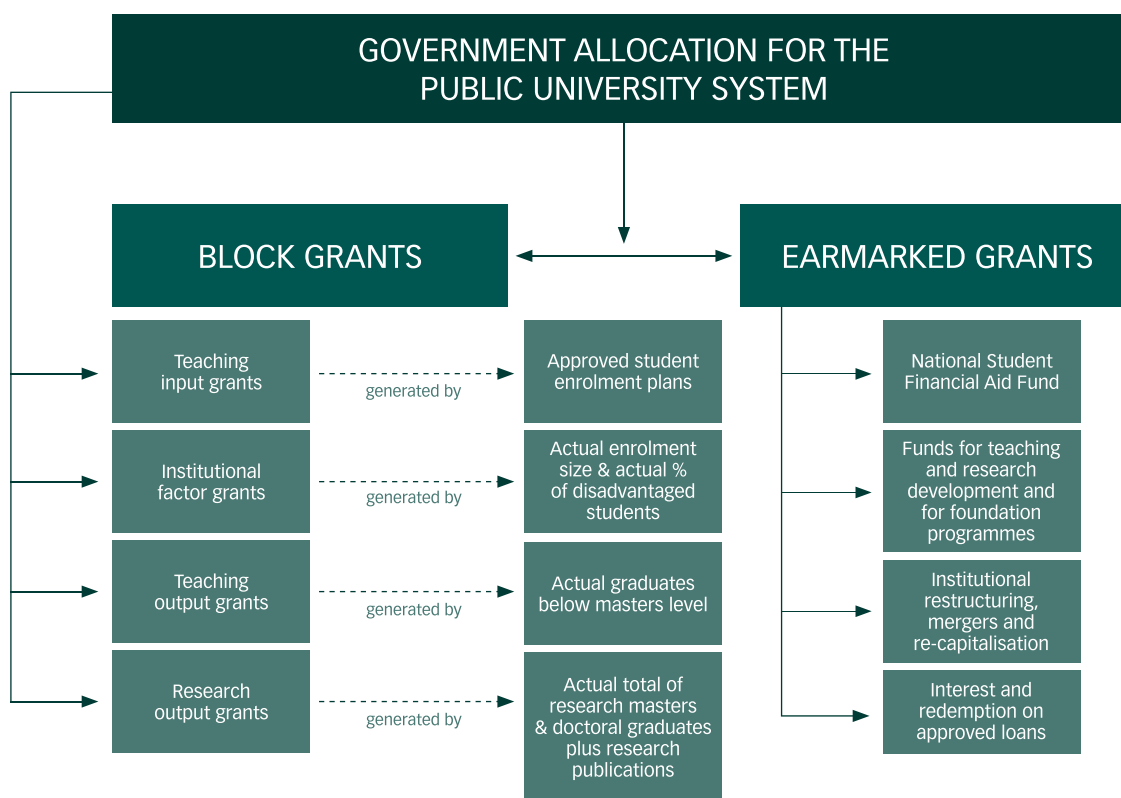
The White Paper stresses that government should take labour market signals into account but cannot adopt the 'hands-off' stance embedded in 1983 funding framework. The relevant minister must formulate policies and plans for the higher education system, approve plans for individual institutions, and implement them through the funding framework. As a consequence, the funding framework becomes a distributive mechanism for allocating government funds to individual institutions, in accordance with the available budget, government's policy priorities, and approved national higher education plans.

The mechanisms to be employed in the new framework were spelled out in a Government Gazette of November 2003 and are outlined in Figure 3.1.

### 3.2.3 Government Funding under the Two Frameworks

The 2003 Framework (shown in Figure 3.1) is a distributive but goal-oriented framework designed to operate in a top-down way. The various funding mechanisms would come into operation only after government had determined how much was to be spent on universities in a given year. The mechanisms were designed to allocate government funds to individual institutions in ways that would ensure that (a) government's policy priorities and plans were realised, and (b) the public university system satisfied national goals and targets approved by the minister of education.

Figure 3.1. 2003 Government Gazette on funding mechanisms in new framework



Source: based on DoE, 2003

During 2003–2011, government funding of public universities fell into three phases: (i) 2000–2003, funds were generated and allocated in terms of the 1983 framework's mechanisms; (ii) 2004–2006, a migration strategy was applied to ensure that the new 2003 framework implementation did not destabilise the funding of individual universities. The 2004 Ministerial Statement on Higher Education Funding (DoHET, 2004–2010) describes the operation of the three-year migration strategy for block grant payments to individual universities; (iii) 2007–2011, the implementation in full of the 2003 framework.



Table 3.3 summarises government funding totals during the three phases outlined above. The categories employed in the table are explained below:

- **Block grants** are funds generated by the formulas included in the 1983 framework and by the block grant elements described in Figure 3.1. They are called ‘block grants’ because they are not earmarked for any specific purpose and can be spent at the discretion of a university’s Council.
- **Direct earmarked funds** are transferred to individual universities for designated purposes. Before 2006, designated purposes included payments of municipal rates, interest and redemption on loans and small capital projects. After 2007, the use of direct earmarked funds included teaching and research development grants, recapitalisation grants, grants for foundation programmes, clinical training, veterinary sciences, infrastructure development, and institutional restructuring and redevelopment.
- **Funds which are not transferred directly to individual universities**, most of which are transferred to the statutory body that controls the national student financial aid scheme (NSFAS). For convenience, in the table these funds are labelled “NSFAS”, although by 2008 small amounts had been allocated directly to other bodies, such as the African Institute for Mathematical Studies and the national institutes in the Northern Cape and Mpumalanga.

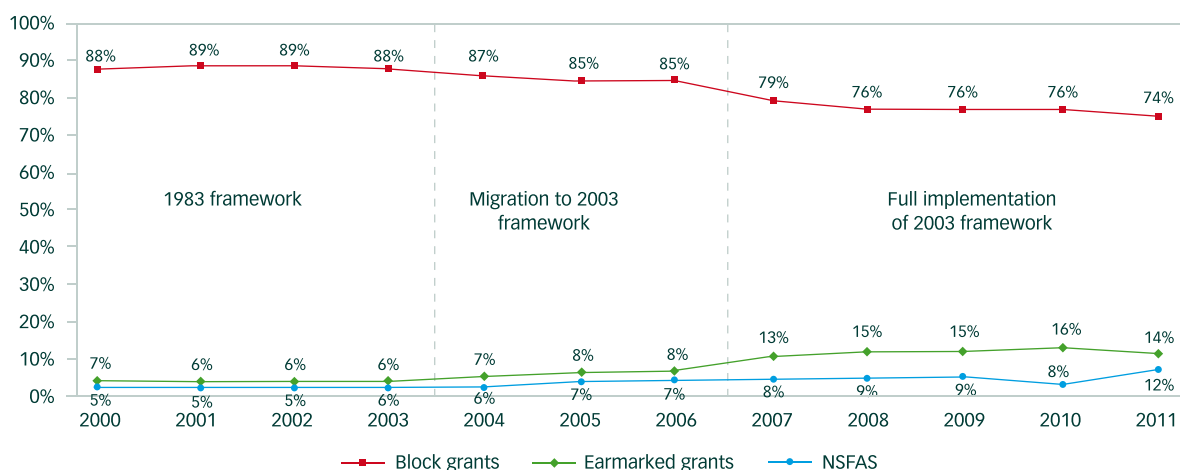
Table 3.3. Summary of government allocations to public universities (rands millions)

	Allocations under 1983 funding				Migration to 2003 framework				Allocations under 2003 framework			
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Block grants	6,204	6,718	7,123	7,818	8,568	9,145	9,956	10,233	11,550	12,767	14,533	16,387
Direct earmarked transfers	394	364	396	563	733	771	873	1,725	2,248	2,531	2,983	2,966
NSFAS	474	450	500	545	578	864	926	1,099	1,322	1,444	1,592	2,644
<b>TOTAL</b>	<b>7,072</b>	<b>7,532</b>	<b>8,019</b>	<b>8,926</b>	<b>9,879</b>	<b>10,780</b>	<b>11,755</b>	<b>13,057</b>	<b>15,120</b>	<b>16,742</b>	<b>19,108</b>	<b>21,997</b>

Source: DoHET, 2011a

In 2003, the initial split between the different funding categories was assumed to be 89% block grants, 5% direct earmarked transfers, and 6% NSFAS. Figure 3.2 shows how the actual proportions changed during the three funding phases. During the period of the 1983 funding framework, the shares of the three categories were close to those assumed during the design period of the framework. In particular, block grants remained above 88% for 2000–2003 but dropped to 85% by the end of the migration period in 2006. During the period of full implementation of the 2003 funding framework, a significant feature is the steady decline in the proportion government allocated for block grants: 74% in 2011 compared to 87% at the start of the migration period.

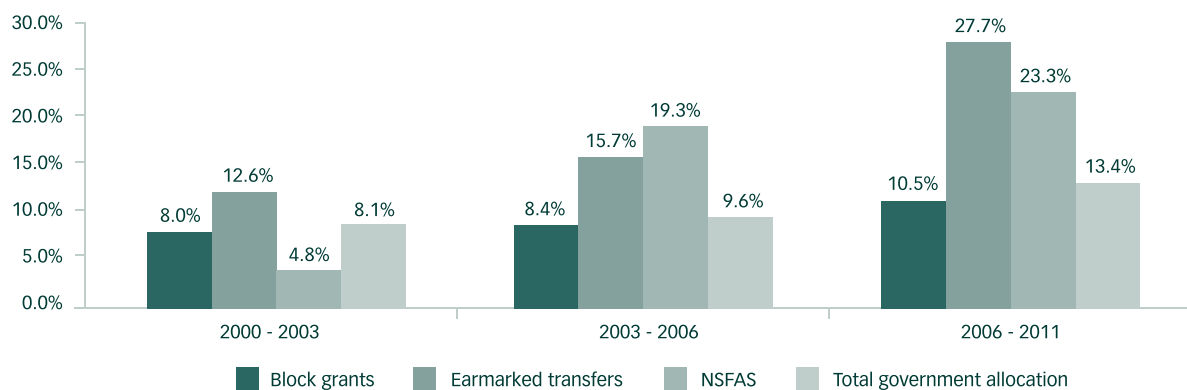
Figure 3.2. Shares by broad categories of government funding allocations to public universities



Source: DoHET, 2011a

Figure 3.3 shows that the changes in the proportions reflected in Figure 3.2 are the result of different average annual increases in the allocations made to each category. During each of the three phases, total block grants grew at slower rates than earmarked funds.

Figure 3.3. Average annual increases in government funding to public universities during funding phases



Source: DoHET, 2011a

Public universities have expressed disquiet at the proportional fall in block grant funding because they believe that their best interests are served by having large proportions of discretionary funds.

### 3.3 Review of the Performance of Public Universities

The full implementation of the 2003 funding framework implies that government funding should be linked to the performance of public universities. The section below reviews the performance of public universities during 2000–2010.

#### 3.3.1 Performance Goals and Targets

The 1997 Education White Paper 3 and the 2001 National Plan for Higher Education laid out a series of goals against which the performance of the higher education system was to be measured. Allocation of funding was to be the primary lever for ensuring that these higher education goals were met.

The Centre for Higher Education Transformation (CHET) has published a number of reports on higher education performance indicators for the South African public university system. A 2004 report, *Developing Performance Indicators for Higher Education: A South African Case Study* (CHET, 2004) included a number of tables listing performance goals that had been included in either the 1997 White Paper or the 2001 National Plan. These goals were linked to quantitative indicators and to targets, which could be extracted from the National Plan and other government documents published between 2001 and 2004.

Table 3.4 shows eight of the goals, indicators and targets used by CHET in 2004 and in later reports (CHET, 2004; CHET, 2010; CHET, 2012). These indicators and targets will be used to assess the performance of the higher education system during 2000–2010.

Table 3.4. Goals, indicators and targets for the public university system

Adapted 1997 White Paper goals for the public higher education system	Basis for goals	Targets for the public university system
<b>Student enrolments in the public higher education system</b>		
Goal 1: Opportunities for entry into the system must improve	Social and economic development require large numbers of students to enter public universities	Gross participation rate of 20% by 2010
Goal 2: The participation of disadvantaged students in the system must increase	Equity requires access to public higher education to be equalised	Gross participation rates are equalised
Goal 3: The participation of female students in the system must increase		
Goal 4: Science & technology (SET) and business/management (BUS) enrolments in the system must grow	SET, finance and management are important drivers of economic development	Enrolment proportions to be 30% SET and 30% BUS
Goal 5: Masters and doctoral enrolments in the system must grow	Knowledge economies require increasing numbers of citizens with high-level qualifications	15% of enrolments to be Master's plus doctoral students
<b>Academic staff in the public higher education system</b>		
Goal 6: The academic staff of the system must be well-qualified	There is a strong correlation between the quality of knowledge outputs and the qualifications of academic staff	50% of permanent academics to have doctorates, and 40% to have Master's degrees
<b>Teaching and research outputs of the public higher education system</b>		
Goal 7: The output of graduates of the system must improve	Increased levels of graduate outputs are needed to meet skills needs of the labour market	(a) Growth in total graduates must exceed growth in enrolments, and (b) cohort completion rate to be 65%
Goal 8: The high-level knowledge outputs of the system must improve	Research outputs in the form of doctoral graduates and research publications are critical if South Africa is to participate in the global knowledge economy	(a) Total research outputs must increase. (b) Ratios of doctoral graduates to permanent academics should be 0.15, and of research publications should be 1.0

Source: CHET, 2004; 2010; 2012

### 3.3.2 Goals 1 to 3: Participation Rates

A distinction is normally drawn between *net participation* rates and *gross participation* rates. A net participation rate is calculated by dividing the total population in a specified age group (e.g. 18–22 years) into the number of people in that age group who are registered in the higher education system. Higher education students who do not fall into the specified age group are excluded from the calculation. However, net participation rates are not normally used in comparative higher education statistics because (a) the differences among countries in the typical higher education age group and (b) difficulties in removing students who do not fall into the specified age group from the higher education total.

The standard way of calculating participation rates is to use a gross rate. A gross participation rate is calculated by dividing the total population in a five-year age band into the total number of students enrolled in the higher education system, regardless of their age. The age band usually selected for international comparative statistics (e.g. by UNESCO) is 20–24 years, as international population statistics are most likely to be presented this way. For example, Statistics South Africa presents its population estimates in age bands 15–19 and 20–24 years. The gross rate calculated under this method does not imply anything about the proportion of students who are 20–24 years old and who are registered in the higher education system.

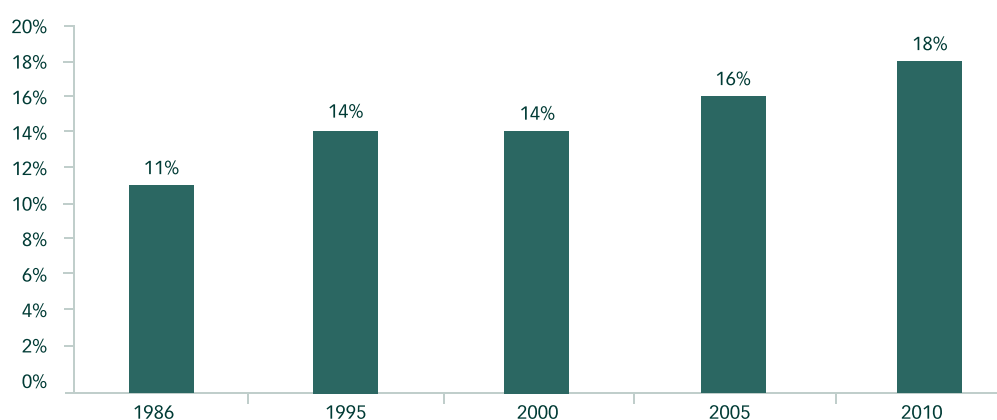
An example of the calculation of a gross participation rates for South Africa is:

$$\text{Gross participation rate in 2010} = \frac{893\,000}{5\,019\,000} = 17.8\%$$

The Statistics South Africa mid-2010 estimate of the population in the age group 20–24 was 5 190 000. The total head count enrolment in the public university system was 893 000.

The target for the public university system is a gross participation rate of 20% by 2010. Figure 3.4 shows that participation rates increased from 14% in 1995 and 2000, to 18% in 2010. If the estimates of post-secondary student enrolments in further education are added to the totals in the public university system, a 20% participation rate for the public higher education system would have been achieved in 2009.

Figure 3.4. Gross participation rates in public universities 1986–2010



Source: Calculations based on Statistics South Africa mid-year population estimates for 2003, 2006 and 2010, and student enrolment data for the same years from the national Higher Education and Management Information System (HEMIS)

However, despite an improvement in the overall participation rate, the equity requirement of equalised participation rates (Goal 2 in Table 3.4) has not been met, as Figure 3.5 shows.

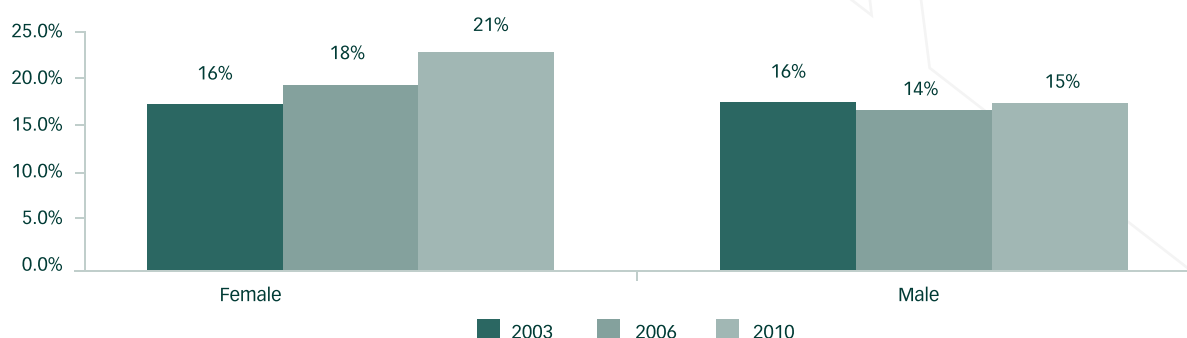
Figure 3.5. Gross participation rates by race group in the public university system



Source: Calculations based on Statistics South Africa mid-year population estimates for 2003, 2006 and 2010, and student enrolment data for same years from the national HEMIS

Figure 3.6 compares the gross participation rates of male and female students. During 2003–2006, the participation of female students increased and was 5% higher than that of male students by 2010.

Figure 3.6. Gross participation rates in the public university system by gender



Source: Calculations based on Statistics South Africa mid-year population estimates for 2003, 2006 and 2010, and student enrolment data for same years from the national HEMIS

### 3.3.3 Goals 4 and 5: Student Enrolments in the Public University System

Goal 4 is concerned with the proportions of student enrolments in what are considered key fields of study for economic development: (a) science and technology, covering agriculture and food technology, architecture and the built environment, computer and information sciences, engineering, health sciences, life and physical sciences, and mathematical sciences and (b) business and management, covering accounting, auditing, banking, public finance, investments and securities, taxation, insurance, marketing, human resource management, and other management services.

Table 3.5 summarises the public university system's enrolments in these fields, as well as in the humanities and the social sciences fields. The last is a broad field that encompasses the visual and performing arts, communication, education, languages and literature, psychology, philosophy and theology, social services, sociology, political studies, history and anthropology.

Table 3.5. Head count student enrolments in the public higher education system by broad field of studies (thousands)

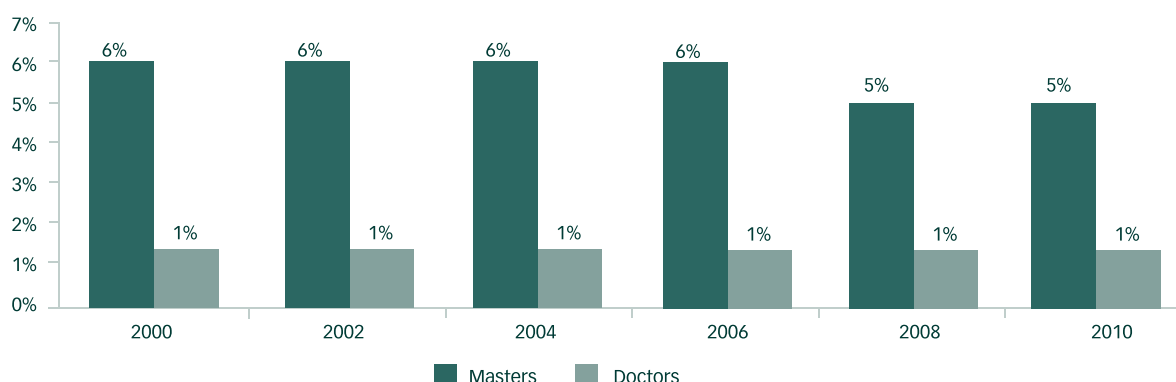
	2000	2002	2004	2006	2008	2010	Average annual increase
Science and technology	161 (29%)	172 (27%)	202 (27%)	212 (29%)	225 (28%)	251 (28%)	4.6%
Business and management	139 (25%)	197 (30%)	237 (32%)	223 (30%)	235 (29%)	279 (31%)	7.2%
Humanities and social sciences	255 (46%)	275 (43%)	305 (41%)	306 (41%)	340 (43%)	363 (41%)	3.6%
<b>TOTAL</b>	<b>555</b>	<b>643</b>	<b>745</b>	<b>741</b>	<b>799</b>	<b>893</b>	<b>4.9%</b>

Source: DoHET, 2010

Table 3.5 shows that the growth rates in science and technology enrolments did not meet the targets of Goal 4, and throughout 2000–2010 the proportion of students enrolled for science and technology majors remained well below 30%. However, enrolments in business and management met the target of 30%, while enrolments in the humanities and social sciences remained above the target of 40% over the same period.

Goal 5 deals with the proportion of master's and doctoral students enrolled in the public university system. As emerging knowledge economies require increasing numbers of citizens with high-level qualifications, the target is for 15% of enrolments to be master's and doctoral students. Figure 3.7 shows that the average for the system over the period 2000–2010 was only 1% for doctoral students and less than 6% for master's students.

Figure 3.7. Master's and doctoral enrolments as % of total head counts in the public university system



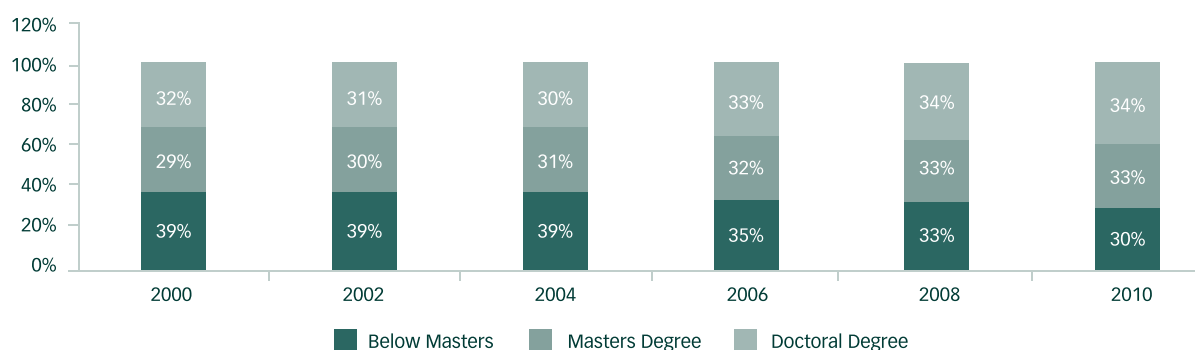
Source: DoHET, 2010

### 3.3.4 Goal 6: Academic Staff in the Public University System

The goal of a well-qualified academic staff is based on the important role that academics play in delivering the public university system's teaching and research mandates. The qualification requirement considers that (a) academics with doctoral degrees are the major producers of research outputs and the main supervisors of doctoral students, and (b) quality teaching at university level requires permanent academic staff to hold at least a Master's degree. Consequently, the targets set require that at least 50% of permanent academics in the public university system should have doctoral degrees, and at least 40% should have a Master's degree.

Figure 3.8 shows that the public university system fell short of these goals during 2000–2010, and a large proportion of the academic staff in public universities are under-qualified.

Figure 3.8. Highest formal qualifications of permanent academics in public higher education system



Source: DoHET, 2010

### 3.3.5 Goal 7: Graduate Outputs

Goal 7 is the first that deals with the knowledge outputs of the public higher education system. The goal requires increased productivity – the total of graduates produced must grow – and an improvement in the efficiency of graduate outputs.

For 2000–2010, a comparison of the total growth in graduates and the total growth in head count enrolments shows that the productivity aspects of the goal were met. As Figure 3.9 illustrates, the graduate total increased from 88 000 in 2000 to 153 000 in 2010, and graduate enrolments grew by 5.7% per annum compared to 4.8% per annum.

Figure 3.9. Total head count enrolments and graduates (thousands)



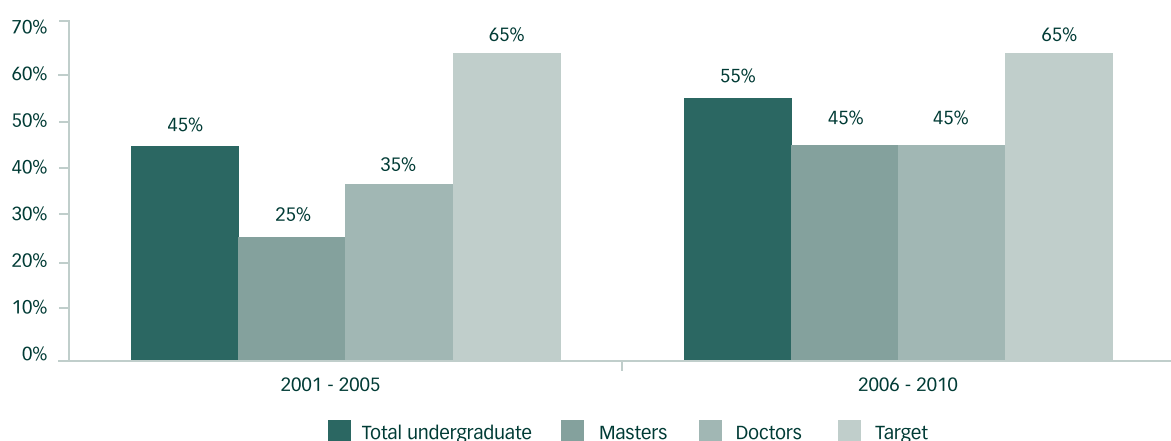
Source: DoHET, 2010

In South Africa, the standard measures of graduate output efficiency are the ratios between graduates in any given year and student enrolments in that same year, converted into cohort output equivalents, as set out in Figure 3.10. Cohort output equivalents indicate what proportion of student cohorts starting university can be expected to graduate.

The 2001 National Plan for Higher Education (DoE, 2001) set a cohort output target of 75%, signalling that a 25% drop out (or non-graduation) rate would be acceptable. The DoE later agreed that 75% was too high a target and modified the cohort graduation target downwards to 65%.

Figure 3.10 shows that in 2001–2010, the public higher education system failed to meet the revised target of 65% although the graduation rate of undergraduates entering the system did improve, from 45% for the first 5-year period to 55% for the second. The completion rate of cohorts of master's and doctoral students remained below 50% throughout the period.

Figure 3.10. Cohort output equivalents



Source: DoHET, 2010

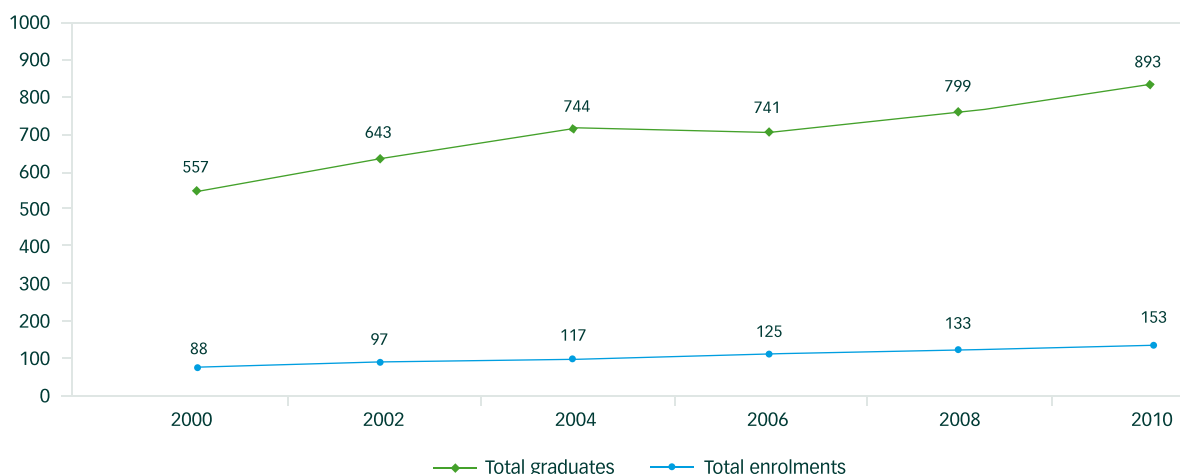
### 3.3.6 Goal 8: High-level Knowledge Outputs

High-level knowledge outputs are critical if South Africa is to participate in the global knowledge economy. Following the lead of the Human Sciences Research Council and the OECD, this goal is analysed using research publications and doctoral graduates as key outputs. Research publications are published articles in journals that are overseen by editorial boards of experts in a field and employ 'blind' review processes. If an approved article has (say) three authors from three different universities, then 0.33 of a publication unit is allocated to each university.

The targets set in Table 3.4 are one research publication per permanent academic per year and 0.15 doctoral graduates per year. The doctoral graduate target assumes that each permanent academic should produce at least one doctoral graduate every seven years.

Figure 3.11 shows the growth in the public university system's totals of high-level outputs between 2000 and 2010. The research publication total, which includes research articles, published research conference proceedings, and research (but not student textbooks) increased from 5 602 in 2000 to 9 748 in 2010, or an average annual increase of 5.2%. Doctoral graduates grew at a lower average annual rate of 3.6%.

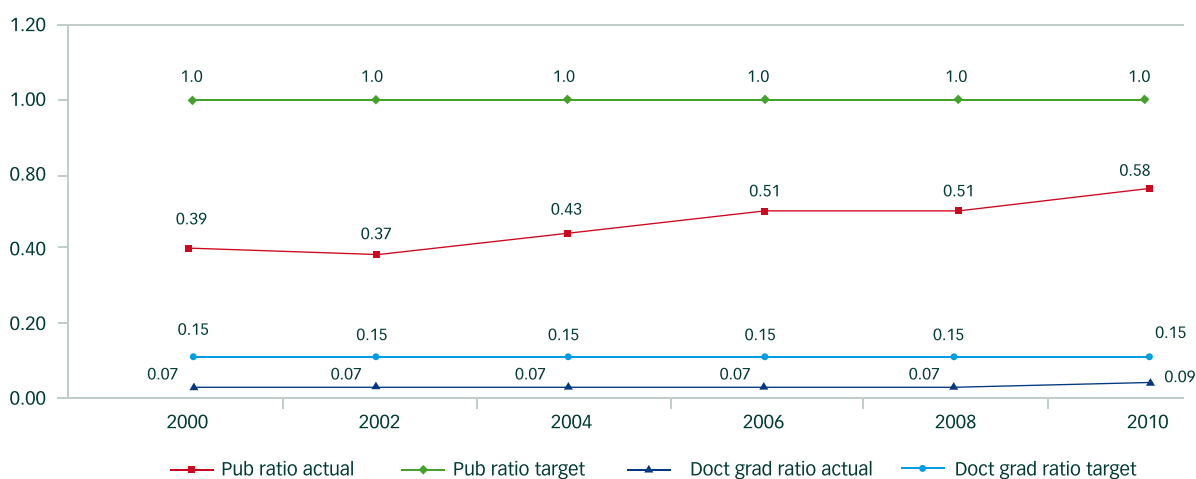
Figure 3.11. Totals of high-level knowledge outputs



Sources: DoHET, 2010; DoHET, 2011a

Figure 3.12 shows that the public higher education system failed to reach the targets for high-level knowledge outputs. However, the publication ratio did improve, from 0.39 per permanent academic in 2000 to 0.58 in 2010. The doctoral output ratio remained below half of the target ratio throughout the period, apart from in 2010.

Figure 3.12. Ratios of high-level research outputs to permanent academic staff



Sources: Derived from data in Figure 3.11 and staff data (DoHET, 2010)



### 3.3.7 System Performance and Individual Institutional Performance

The analysis of the performance of the public university system does not apply to all individual public universities as their individual performances differ widely. The funding implications of this differentiated public university system will be discussed later in this chapter.

The CHET has argued that performance of any university must be judged within its 'academic core', which consists of two elements: (a) the inputs that the university has available for the delivery of teaching and research, and (b) the outputs produced on the basis of these inputs (CHET, 2011a).

CHET's most recent focus has been on the high-level knowledge production of the academic cores of South African universities. At input level, these aspects are:

- The proportions of enrolments in science and technology (SET),
- The proportions of enrolments in business and management (BUS),
- The proportions of master's and of doctoral students of total enrolments,
- The ratio of doctoral enrolments to permanent academic staff,
- The highest formal qualification of permanent academic staff.

At output level, the aspects of the academic core concerned with knowledge production are:

- The ratios of undergraduate bachelors and diploma graduates to undergraduate enrolments, which indicate completion rates;
- The ratios of master's and doctoral graduates to master's and doctors enrolments, which also indicate completion rates;
- The ratios of doctoral graduates to permanent academic staff, which indicate research productivity;
- The ratios of research publications to permanent academic staff, which further indicate research productivity.

Table 3.6 below includes values for these academic core indicators from data that universities are required to submit annually to the national HEMIS. The data values are three-year averages for 2008–2010. The targets in the final row are based on the targets employed for the public university system (in Table 3.4), together with further adaptations by CHET.

The 23 public universities are grouped into three clusters, based on a comparison of each university's average to the targets. The methodology used was simple but possibly controversial. A four-point rating scale was used:

- 4 = meets or exceeds target
- 3 = average is in range 75% to 99% of target
- 2 = average is in range 50% to 74% of target
- 1 = average is less than 50% of target

Then for each university, separate average rating scores were calculated for its five input and five output indicators. These scores were sorted first by average for the five output indicators and then by the combined average for input plus output indicators.

Finally, the universities were placed in a cluster according to these criteria:

- Cluster 1: either an output average above 3, or an input plus output average above 3.
- Cluster 2: output or input averages above 2, and an overall average of 2.
- Cluster 3: either an output or input average below 2.

These three clusters are used in the financial analysis that follows.

Table 3.6. Public universities clustered on basis of academic core indicators

	Input indicators: averages for 2008 – 2010					Output indicators: averages for 2008 – 2010				
	SET majors as % of total head count enrolments	BUS majors as % of total head count enrolments	Masters + doctors as % of total enrolments	% of permanent academics with doctorates	Ratio of doctoral enrolments to permanent academics	Ratio of bachelors and diploma graduates to undergraduate enrolments	Ratio of masters graduates to master enrolments	Ratio of doctors graduates to doctors enrolments	Ratio of doctors graduates to permanent academics	Ratio of research publications to permanent academics
<b>CLUSTER 1</b>										
University of Cape Town	41%	23%	19%	61%	1.1	20%	27%	15%	0.17	1.2
Stellenbosch University	43%	21%	23%	53%	1.1	20%	22%	14%	0.16	1.2
Rhodes University	24%	18%	15%	56%	0.9	22%	26%	12%	0.11	1.0
North West University	18%	12%	7%	49%	0.8	26%	25%	15%	0.12	0.5
University of Pretoria	36%	14%	13%	40%	0.9	22%	21%	13%	0.11	0.7
University of KwaZulu-Natal	36%	18%	13%	40%	0.8	20%	16%	13%	0.11	0.7
University of the Witwatersrand	45%	17%	23%	53%	1.1	17%	16%	11%	0.11	0.9
<b>CLUSTER 2</b>										
University of Johannesburg	31%	39%	5%	22%	0.6	20%	21%	12%	0.07	0.5
University of the Western Cape	33%	15%	11%	49%	0.9	17%	20%	11%	0.10	0.5
University of the Free State	30%	17%	10%	44%	0.8	18%	22%	13%	0.10	0.6
Nelson Mandela Metropolitan University	33%	29%	8%	38%	0.7	19%	19%	13%	0.09	0.4
University of Fort Hare	24%	18%	9%	33%	0.7	17%	22%	12%	0.08	0.4
Durban University of Technology	48%	35%	2%	11%	0.1	22%	19%	10%	0.01	0.1
Tshwane University of Technology	39%	34%	2%	19%	0.2	20%	14%	12%	0.02	0.2
Cape Peninsula University of Technology	49%	30%	3%	12%	0.2	24%	12%	10%	0.02	0.2
Central University of Technology	46%	29%	2%	27%	0.2	20%	13%	7%	0.00	0.1
<b>CLUSTER 3A</b>										
University of Zululand	14%	10%	4%	34%	0.6	16%	15%	11%	0.07	0.3
University of Limpopo	47%	13%	11%	20%	0.2	18%	12%	9%	0.02	0.1
Vaal University of Technology	52%	40%	1%	14%	0.1	16%	10%	11%	0.01	0.1
University of Venda	39%	20%	4%	32%	0.3	21%	10%	6%	0.02	0.2
UNISA (University of South Africa)	11%	42%	2%	32%	0.6	7%	9%	8%	0.05	0.5
Walter Sisulu University	26%	29%	1%	11%	0.0	15%	4%	4%	0.00	0.1
Mangosuthu University of Technology	58%	33%	0%	6%	0.0	14%	0%	0%	0.00	0.0
<b>CHET TARGETS FOR ACADEMIC CORE</b>	<b>30%</b>	<b>30%</b>	<b>15%</b>	<b>50%</b>	<b>1.0</b>	<b>20%</b>	<b>25%</b>	<b>15%</b>	<b>0.15</b>	<b>1.0</b>

Source: indicator, targets and notion of academic core derived from CHET, 2010; CHET, 2011a; CHET, 2012; DoHET, 2010; DoHET, 2011a

### 3.3.8 Issues Arising from Analysing the Performance of Public Universities

When assessed against the goals and targets in Table 3.4 the public university system has under-performed during the period 2000–2010. Some of the main issues that arise are:

- Gross participation rates in the public university system have been low and have missed the target of 20% for 2010, as set by the 2001 National Plan.
- Gross participation rates have also been unequal. The participation rate for white students has been close to 60%, whereas the participation rate for African students (which increased over the period) was less than 15% in 2010.
- Student enrolments in the major fields of study and proportions of research students did not meet the targets set. For 2000–2010, humanities and social science majors were over-represented, with an average enrolment of 42% compared to the target of 40%. Enrolment in science and technology majors was 28% compared to the target of 30%. The proportions of master's and doctoral students remained less than half of the targets set throughout the period.
- Academic staff are under-qualified. During the period 2000–2010, the highest formal qualification of over a third of permanent academics was below master's level compared to the target of less than 10%.
- Throughout the period 2000–2010, the output performance of the system was poor. Student drop-out rates were high, resulting in less than 50% of any cohort of students who entered the system graduating. High-level outputs in the form of research publications and doctoral graduates were also well below the targets set.

### 3.3.9 Performance at Individual University Level

Table 3.6 shows that the public university system can be differentiated using a number of key input and output variables related to the academic core of individual institutions. Yet the three clusters represented are not the result of deliberate government decisions. Government did not intend three distinct clusters to result from implementing its higher education goals and the 2003 funding framework.

A basic thread running through the block grant components of the 2003 funding framework was not to have separate funding streams for different universities. Institutions were treated equally, other than based on enrolment size and numbers of disadvantaged students. Universities with large enrolments did not receive part of the institutional component of the block grants because they had the advantage of economies of scale. Universities that recruited large proportions of disadvantaged students received additional funding under the institutional component of the block grant.

A review of the total income of the public university system (government funding + student fees + private income) will show why the three differentiated clusters emerged as an unintended consequence of the 2003 funding framework.

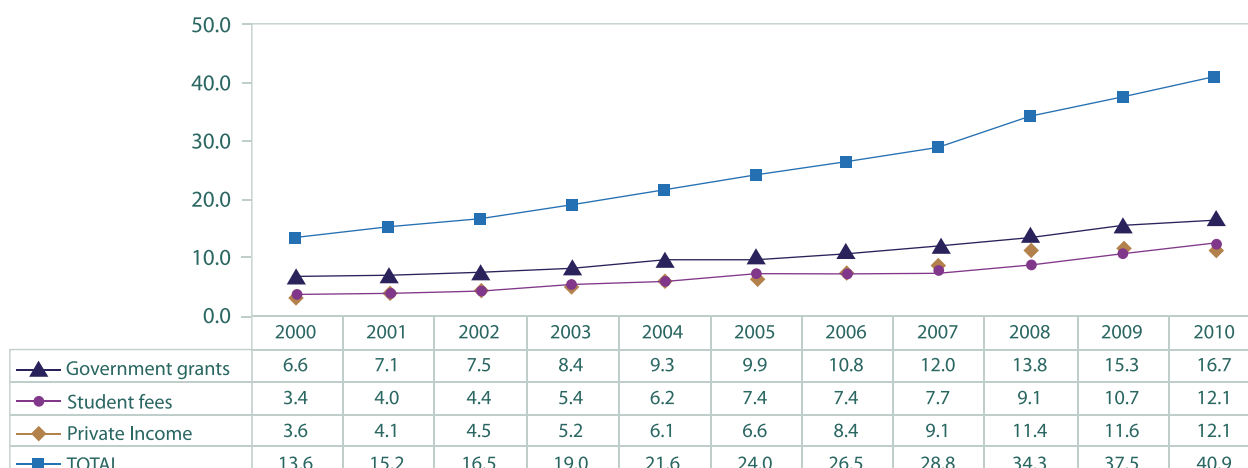
## 3.4 Review of the Income of Public Universities

### 3.4.1 Total Income of the System

Figure 3.13 gives an overview of the total income of all institutions in the public university system for 2000–2010. The sources of the data collected for the table are: (a) the DoE's annual publication Information on the State Budget of Higher Education, (b) the annual Ministerial Statements on Higher Education Funding, and (c) the summaries of the annual financial reports of public higher education institutions produced by the DoE/DoHET. The data ends with 2010, which is the latest year for which full financial reports are available.

This section contains data and analysis originally prepared in 2011 for a report on higher education funding (Bunting, 2011). The analysis is updated with financial and enrolment data for 2010, which was not available when the 2011 report was prepared.

Figure 3.13. Total income of public universities (rands billions)



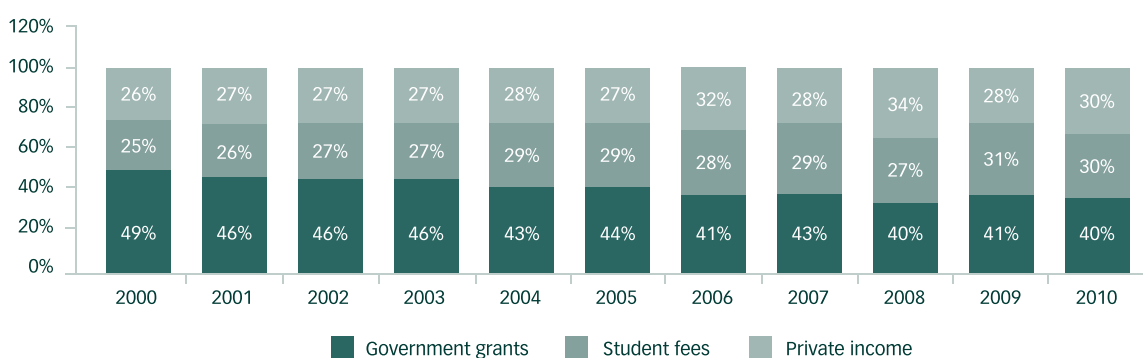
Source: DoHET: summaries of financial statements included in annual reports of each university

With regard to Figure 3.13, the following should be noted:

- (i) The category of government grants (see Figure 3.1) includes all block but not all earmarked grants. These grants are not recorded as institutional income because national student financial aid funds are transferred to a statutory body, which then allocates funds to students.
- (ii) The student fees category includes all tuition and class fees, and accommodation or residence fees.
- (iii) The private income category includes donations, investment income, and income from non-government contracts for research or the delivery of other services.

Figure 3.14 summarises the income sources recorded in Figure 3.13. It shows that the share of government grants as a proportion of the total income of the public higher university system fell from 49% in 2000 to 40% in 2010. This drop in government funding was met by student fees and private funds. As a proportion of total income, student fees rose from 25% in 2000 to 30% in 2010, while private income increased from 26% in 2000 to 30% in 2010.

Figure 3.14. Summary of income sources of public universities



Source: DoHET: summaries of financial statements included in annual reports of each university

During 2000–2010 the total income of public universities grew at an average annual rate of 11.6% in nominal terms and 5.2% in real terms, as Table 3.7 shows. However the growth rates in the three main funding categories differed. In real terms, government grants increased at an average annual rate of 3.3% which was about half the increases of 7.1% in student fees and 6.4% in private income.

Table 3.7. Income in 2000 compared to 2010 income (rands millions)

	2000	2010		Average annual growth: 2000 – 2010	
		Nominal	Real	Nominal	Real
Government grants	6,628	16,655	9,210	9.7%	3.3%
Student fees	3,381	12,132	6,709	13.6%	7.1%
Private income	3,591	12,090	6,686	12.9%	6.4%
<b>TOTAL</b>	<b>13,600</b>	<b>40,877</b>	<b>22,605</b>	<b>11.6%</b>	<b>5.2%</b>

Sources: (1) Nominal rands: DoHET summaries of financial statements included in annual reports of each university; (2) Real rands: calculations based on nominal rands totals and consumer price index data from Statistics South Africa

Table 3.8 divides the income totals in Table 3.4 by the university system's full-time equivalent (FTE) enrolled student totals, which were 386 000 in 2000 and 600 000 in 2010. These totals do not take into account the weightings in the funding grid for teaching input units.

Table 3.8. Income per FTE-enrolled student (rands thousands)

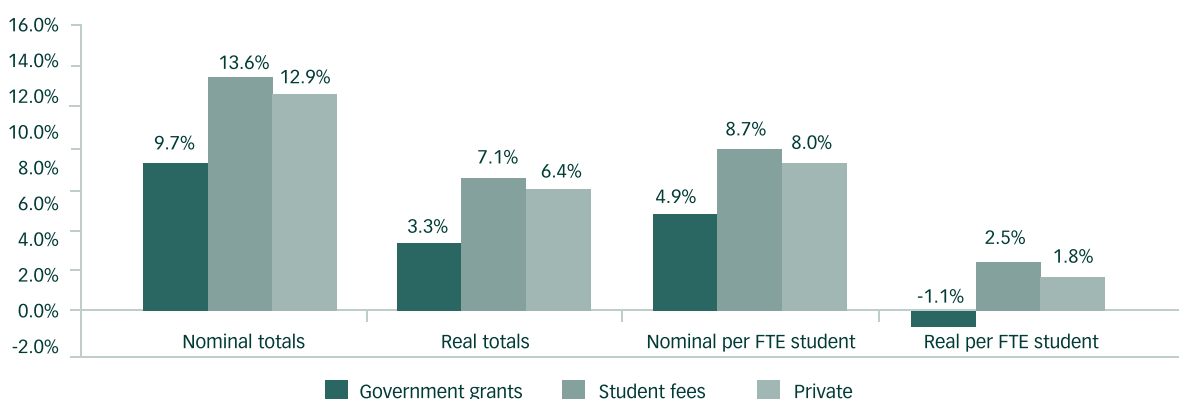
	2000	2010		Average annual growth: 2000 – 2010	
		Nominal	Real	Nominal	Real
Government grants	17.2	27.8	15.4	4.9%	-1.1%
Student fees	8.8	20.2	11.2	8.7%	2.5%
Private income	9.3	20.2	11.1	8.0%	1.8%
<b>TOTAL</b>	<b>35.2</b>	<b>68.1</b>	<b>37.7</b>	<b>6.8%</b>	<b>0.7%</b>

Sources: (1) Nominal and real rand data in Table 3.7; (2) FTE student data from the national HEMIS

Table 3.8 shows that government grants per FTE enrolled student rose from R17,200 in 2000 to R27,800 in 2010 in nominal rands. Student fees per FTE enrolled student, also in nominal rands, rose from R8,800 in 2000 to R20,200 in 2010. These average growth rates show that, in real terms, government funding per FTE enrolled student fell by 1.1% annually between 2000 and 2010, while student tuition fees per FTE enrolled increased by 2.5% per year.

Figure 3.15 summarises the real and nominal increases in income for 2000–2010.

Figure 3.15. Average annual increases in income (2000–2010)



Source: Data in Tables 3.7 and 3.8

Following this analysis of the total income of public universities, the key points are:

- (i) For the purposes of this analysis, government university allocations have been divided into block grants plus direct earmarked transfers to universities. Indirect allocations are not included in the income calculations.
- (ii) The share of government university allocation (block grants plus earmarked transfers), as a percentage of the total income of the public university system, dropped during 2000–2011. The share was 49% in 2000 and 40% in 2010.
- (iii) During 2000–2010, student fee income (tuition plus accommodation) per FTE-enrolled student grew in real terms, at an average annual rate of 2.5%. In contrast, real government grants (block plus direct earmarked transfers) per FTE-enrolled student fell at an average annual rate of 1% – a clear indication that the increased costs of higher education have been transferred to students and their parents.

### 3.4.2 Amendment to Institutional Clusters

The analysis uses the three clusters of universities identified in Table 3.6, with one amendment. The University of South Africa (Unisa) is not included in Cluster 3 because of the size of its enrolments (293 000 in 2010, or 33% of the enrolments of the public university system), and because it is the country's distance education institution. In Table 3.9, the amended Cluster 3 will be labelled Cluster 3A, and Unisa will be treated as a separate entity and appear as UNISA.

Table 3.9 adjusts the clusters which appeared in Table 3.6 and adds additional information about their government planning categories and their historical classifications. The planning categories are university, university of technology, and comprehensive university. A university is defined as an institution that offers general formative and professional academic programmes. Universities of technology are defined as institutions that offer primarily career-focused programmes. Before 2005, universities of technology had been classified as technikons, and so the programmes they offer are described as technikon-type programmes. A comprehensive university is defined as an institution that offers both university- and technikon-type programmes.

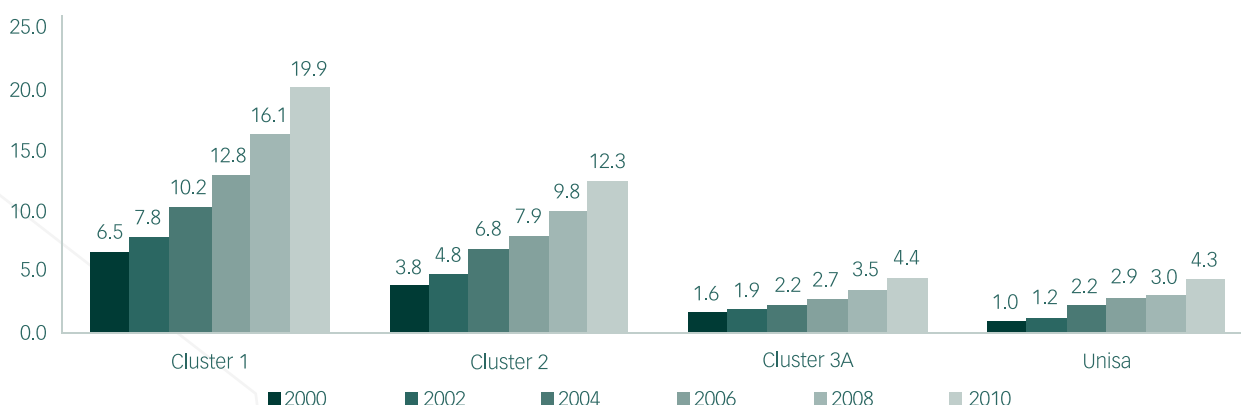
In the history column, the descriptions are based on pre-1994 governance structures, in particular the tri-cameral parliament system and the 'independent republics' (Transkei, Bophutatswana, Venda, Ciskei). 'Historically white' higher education institutions are those that fell under the control of the chamber for Whites (House of Assembly). Historically black institutions were controlled by the four 'republics' and by the departments and chambers responsible for the education of Africans, Coloureds and Indians.

The mergers occurred during 2004–2005, and for the purposes of the figures which follow institutional data for pre-merger years has been consolidated under the name of the new institution.

### 3.4.3 Total Income of Public Universities by Amended Institutional Clusters

Figure 3.16 shows the total income of public universities during 2000–2010, including all government grants, student fees and private income. Figure 3.17 compares the shares which each cluster had of (a) the total income of the public higher education system, and (b) the full-time equivalent student enrolment.

Figure 3.16. Income from all sources by cluster (rands billions)



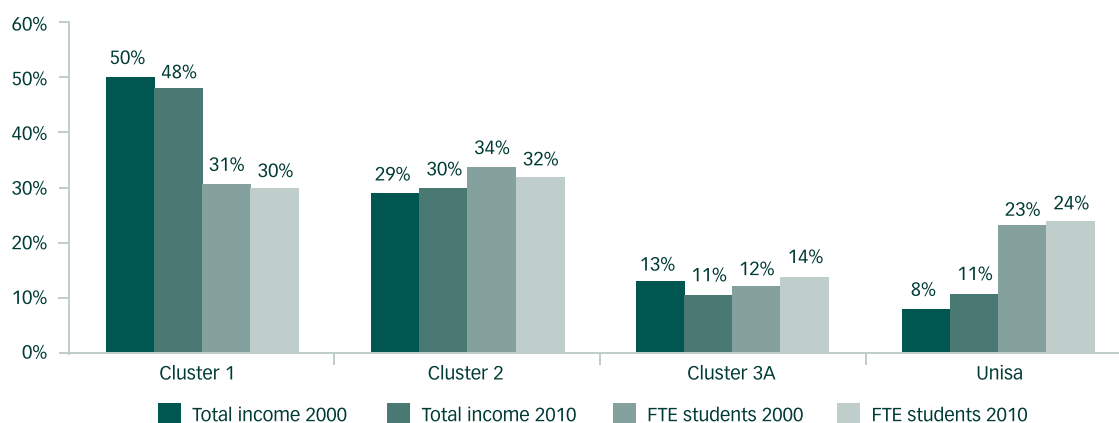
Sources: (1) Income totals in Figure 3.13; (2) DoHET: summaries of financial statements included in annual reports of each university.

Table 3.9. Public higher universities by institutional cluster

	Category	History
<b>CLUSTER 1</b>		
University of Cape Town	University	Historically white university
Stellenbosch University	University	Historically white university
Rhodes University	University	Historically white university
North West University	University	Merger of historically white and historically black universities
University of Pretoria	University	Historically white university
University of KwaZulu-Natal	University	Merger of historically white and historically black universities
University of the Witwatersrand	University	Historically white university
<b>CLUSTER 2</b>		
University of Johannesburg	Comprehensive university	Merger of historically white university and historically white technikon
University of the Western Cape	University	Historically black university
University of the Free State	University	Historically white university
Nelson Mandela Metropolitan University	Comprehensive university	Merger of historically white university and historically white technikon
University of Fort Hare	University	Historically black university
Durban University of Technology	University of technology	Merger of historically white and historically black technikons
Tshwane University of Technology	University of technology	Merger of historically white and historically black technikons
Cape Peninsula University of Technology	University of technology	Merger of historically white and historically black technikons
Central University of Technology	University of technology	Historically white technikon
<b>CLUSTER 3A</b>		
University of Zululand	Comprehensive university	Historically black university
Vaal University of Technology	University of technology	Historically white technikon
University of Limpopo	University	Historically black university
University of Venda	Comprehensive university	Historically black university
Walter Sisulu University	Comprehensive university	Merger of historically black university and historically black technikons
Mangosuthu University of Technology	University of technology	Historically black technikon
UNISA (University of South Africa)	Comprehensive university	Merger of historically white university and historically white technikon

Sources: (1) Institutional clusters in Table 3.6; (2) Categories and historical descriptions of universities are those used by the DoHET.

Figure 3.17. Cluster shares of income and FTE student enrolments: 2010 compared to 2000

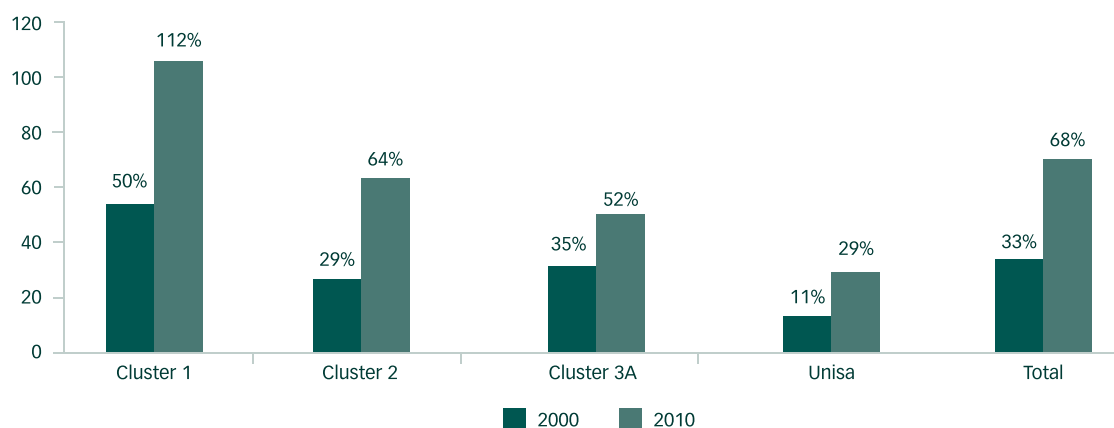


Sources: (1) Institutional clusters in Figure 3.16; (2) FTE student data from the national HEMIS

The income distribution in the public university system was seriously unequal. For example, in 2010 the seven universities in Cluster 1 had 48% of the total public university system income but only 30% of the total FTE student enrolment. In the same year, the nine institutions in Cluster 2 (three universities, two comprehensive universities, and four universities of technology) had 32% of the system's FTE student enrolment but only 30% of its total income.

Figure 3.18 represents these income inequalities in a different way and shows each cluster's average income from all sources per FTE-enrolled student. In 2010, the average income per FTE student in Cluster 2 was 57% of that of Cluster 1. The proportion for Cluster 3A was 46% and for UNISA 26%.

Figure 3.18. Total income from all sources per FTE-enrolled student by cluster (rands thousands)



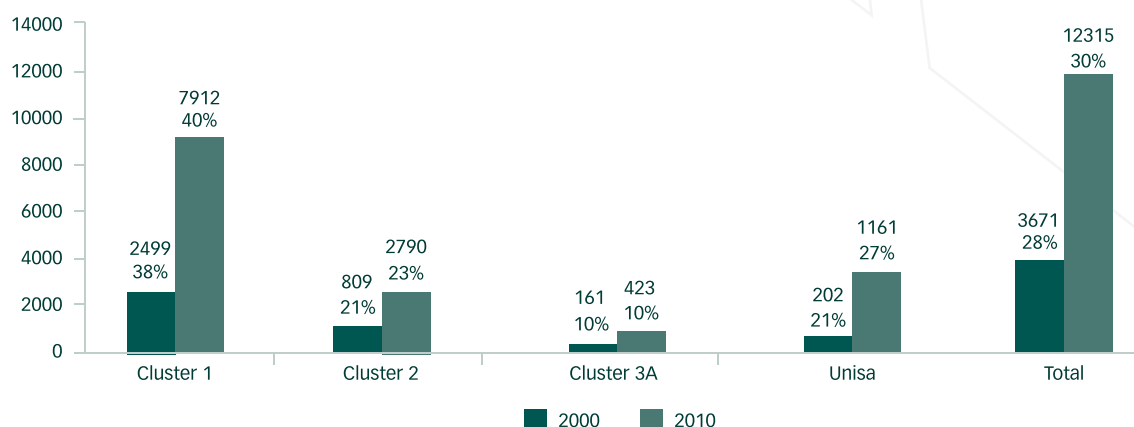
Sources: (1) Income totals in Figure 3.13; (2) FTE student data from the national HEMIS

### 3.4.4 Private Income of Public Universities by Amended Institutional Clusters

The income inequalities referred to in Figures 3.15–3.17 stem in part from the clusters' different levels of private income. As indicated earlier, the private income category includes donations, investment income, and income from non-government contracts for research or the delivery of other services. Figure 3.19 summarises the private income generated by the clusters of public universities.



Figure 3.19. Total private income by cluster (rands millions)

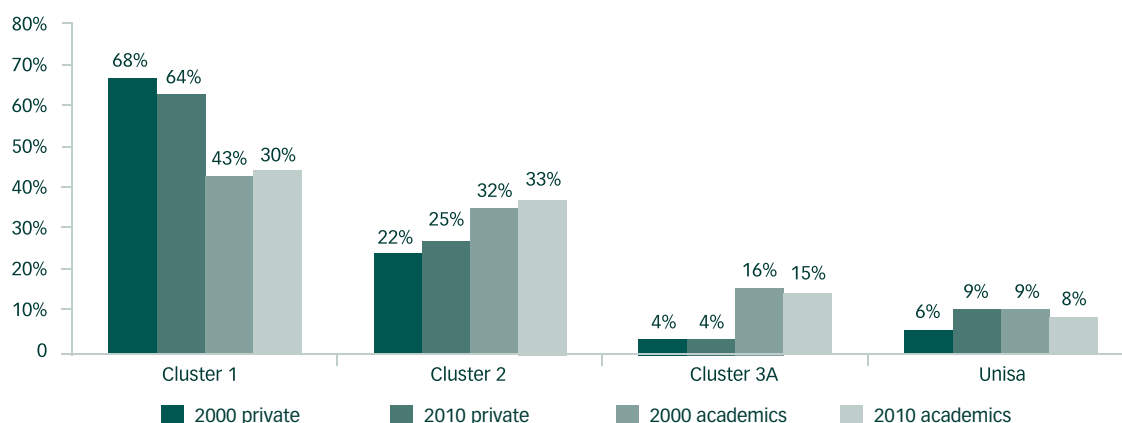


Source: DoHET: summaries of financial statements included in annual reports of each university

In 2010 the seven institutions in Cluster 1 generated a total of R7,912 million in private income, or 40% of their total income. In comparison, the nine institutions in Cluster 2 generated R2,790 million, or 23% of their total income in the same year. The six institutions in Cluster 3A (one university, three comprehensive universities, two universities of technology) generated a total of R453 million in private income, or 10% of their total income.

Permanent academics play a major role in generating private income for public universities, as they raise large amounts through research grants and activities, enhance the reputation of a university and generate donations and (indirectly) investment income. Figure 3.20 shows that in 2010 the seven institutions in Cluster 1 raised 64% of the public university system's total of R12,315 million from private sources and employed 44% of the system's permanent academics. The nine institutions in Cluster 2 had 33% of the public university permanent academics, but only 25% of the system's private income. The six institutions in Cluster 3A had 15% of the system's permanent academics and only 4% of its private income.

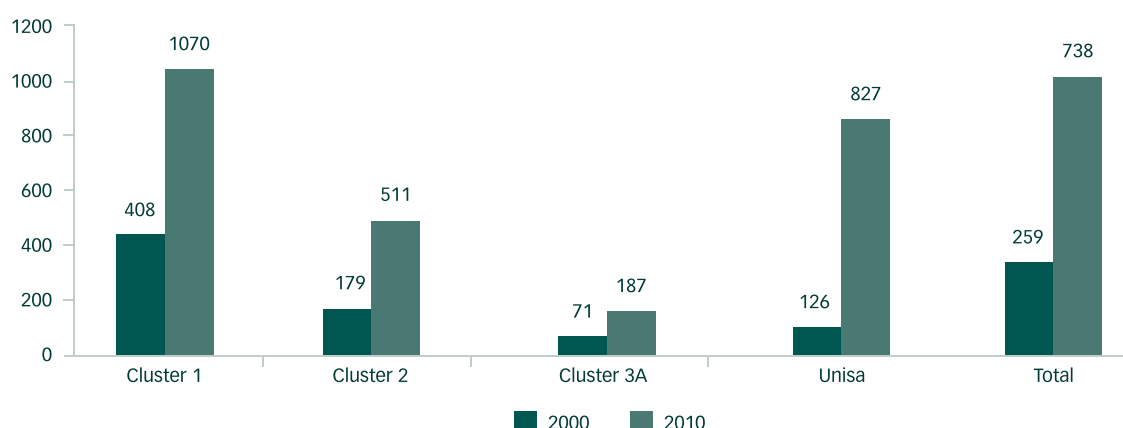
Figure 3.20. Shares of total private income and permanent academic totals



Source: Figure 3.19 and staff data from the national HEMIS

Figure 3.21 compares the 2000 and 2010 averages of private income per permanent academic for each cluster. In 2010, the average for Cluster 2 was 48% of Cluster 1, while Cluster 3A's average stood at 17%. In 2000, UNISA's average was 63% of Cluster 1, rising to 69% in 2010.

Figure 3.21. Private income per permanent academic staff member (rands thousands)



Source: Figure 3.19 and staff data from the national HEMIS

### 3.4.5 Issues Arising from Income Review

Government funding (block grants plus earmarked transfers) as a share of the total income of the public university system dropped from 49% in 2000 to 40% in 2010. Over the same period, student fee income (tuition plus accommodation) per FTE-enrolled student grew in real terms at an average annual rate of 2.5%. In marked contrast, real government grants (block + direct earmarked transfers) per FTE-enrolled student fell at an average annual rate of 1%. The different increases in fee income and in government grants imply that the amount of government funding is insufficient to meet the needs of the system. This suggests that, when the 2003 funding framework replaced the 1983 one, no mechanisms were put in place to determine how much government funding would be appropriate for public universities. In other words, the issue is whether a government funding requirement should be generated by a framework based on planning and institutional performance?

As subsections 3.4.3 and 3.4.4 show, the public university system contains major inequalities in income distribution. For example, in 2010, the seven high-performing universities in Cluster 1 had 48% of the total income but only 30% of the total FTE student enrolment. In contrast, the nine institutions in the second cluster had 32% of the public university system's FTE student enrolment in 2010 but only 30% of its total income, while the six institutions in Cluster 3A had 14% of the FTE enrolments, but only 11% of the total income.

Such inequalities may be seen as inevitable consequences of mechanisms built into the 2003 funding framework. However, it is not clear that these unequal distributions of income were the intended outcomes of the 2003 funding framework. This raises the question: if income inequalities were unintended consequences of the 2003 funding framework, should any of its basic principles be reviewed?

A final issue is the differentiation within the public university system. As subsections 3.3.7 and 3.4.2 show, universities can be divided into at least three distinct clusters, each with different levels of input and outputs. Each cluster is defined by input indicators (relating to student enrolments by major fields and qualification, academic staff qualifications, and ratios between academic staff and doctoral enrolments) and output indicators (the ratios of graduate and research outputs to student enrolment and academic staff) that measure efficiency and productivity. Productivity in terms of outputs produced could be considered for differentiated funding.

Table 3.10 and Figure 3.22 show total output data for the three clusters for 2008–2010. The first column in Table 3.10 shows numbers of all graduates in bachelor's degree programmes, all undergraduate and postgraduate certificates and diplomas and all honours degrees. The second column lists all master's graduates, including research and non-research components.

Table 3.10. Output totals for 2008–2010

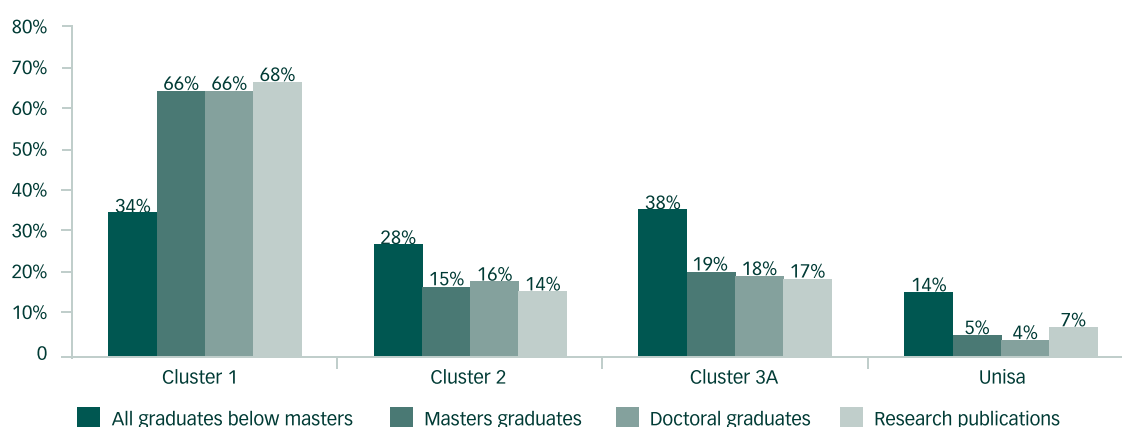
	All graduates below masters	Masters graduates	Doctoral graduates	Research publications
CLUSTER 1	159,221	17,910	2,968	19,944
CLUSTER 2	132,666	4,163	702	4,225
CLUSTER 3	178,741	5,088	822	5,056
UNISA	65,217	1,261	193	1,931
<b>OVERALL TOTAL</b>	<b>470,628</b>	<b>27,161</b>	<b>4,492</b>	<b>29,225</b>

Sources: (1) FTE student data from the national HEMIS; (2) DoHET, 2011a

Figure 3.21 shows what proportion of these qualifications are produced by the three clusters. During 2008–2010, Cluster 1 produced 66% of all master's and doctoral graduates and 68% of all research publications. Therefore this cluster was both the most efficient and most productive group of universities for higher-level knowledge output.

This raises the issue of whether institutional differentiation should be a central feature of public higher education policies?

Figure 3.22. Distribution of outputs by cluster – averages for 2008–2010



Source: Table 3.10

### 3.5 Reconsidering Funding Policies for Public Universities

In reconsidering funding policies for public universities, this section explores possibilities for:

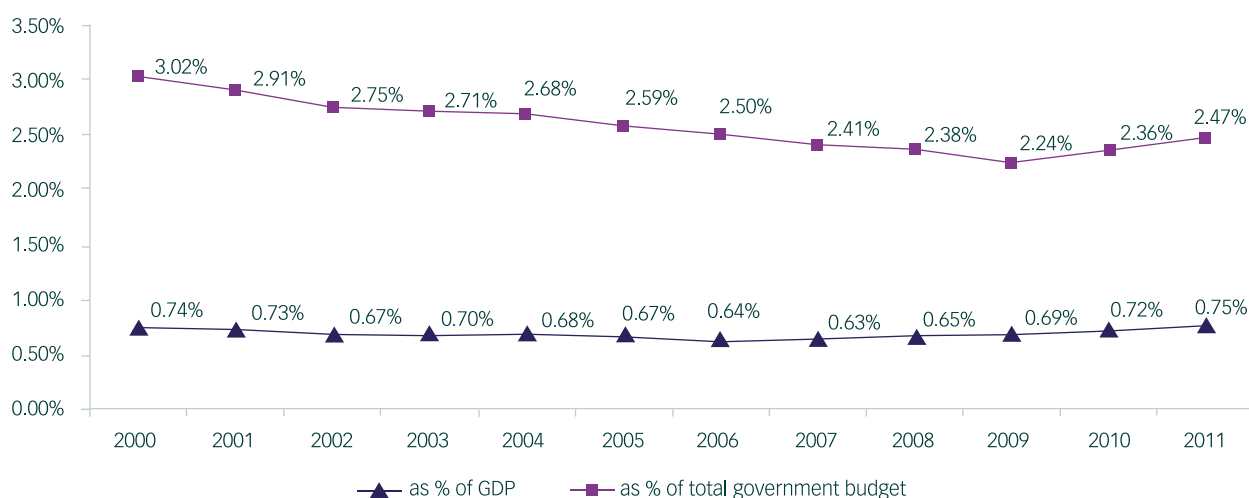
- determining the levels of government funding to be allocated to public universities
- resolving income inequalities
- making institutional differentiation central to higher education policies.

#### 3.5.1 Determining Government Funding Levels

One argument is that government funding of a public university system should be linked to predetermined proportions of either GDP or total government expenditure. However, what these proportions should be, or whether lessons could be learned from practices adopted by other countries, is unclear.

GDP and total government expenditure indicators in South Africa can be tracked over specific periods. Figure 3.23 shows the changes in these indicators (divided into the implementation phases first discussed in Figure 3.2), for 2000–2010.

Figure 3.23. Total government allocations to public universities as % of GDP and total government expenditure



Source: DoHET, 2011a

During the 1983 framework and migration phases (2000–2006), funding for public universities as a proportion of total government funding fell. It dropped further during the implementation of the 2003 framework and reached its lowest point in 2009. In 2007, government funding of public universities as a proportion of GDP reached its lowest point but then increased over the next four years. The proportion of 0.75% in 2011 was the highest during the 12-year period.

Any analysis of the appropriate amount of government funding for public universities must be based on the important features of the 2003 framework, (highlighted in section 3.2 of this report). As the 2003 framework is not based on actual institutional costs, it cannot be used to generate a total funding allocation for public universities. Therefore, *planned* rather than actual student enrolments must be used to distribute teaching funds to universities. These planned enrolments must start with ministerially approved institutional enrolment targets, which are then aggregated into targets for the public university system.

The first system-wide *student enrolment targets* were published in October 2007 in a *Ministerial Statement on Student Enrolment Planning* (DoHET, 2007) that covered the academic and financial years 2005–2010. A further set of student enrolment targets were published in April 2011 in a second *Ministerial Statement on Student Enrolment Planning* (DoHET, 2011b) that dealt with academic and financial years up to 2015.

The 2007 *Ministerial Statement on Student Enrolment Planning* expressed two main concerns about the use of planned enrolment data in the calculation of teaching input grants. First, if institutions enrolled higher numbers of students than the approved targets, large proportions of unfunded students would be in the system. Second, unless planned growth in the public university system was linked to increases in government grants, there could be no guarantee that the ministry's growth plans for higher education could be implemented without a loss of quality.

Resolving this second concern requires a mechanism that links planned growth in student enrolments (and in graduate and research outputs) to the government budget allocation for public universities, while noting that universities can access private or third-stream income. Planning targets could be expressed as volumes of activity, which would be composites of the key inputs of the system (student enrolments in different fields and at different levels) and of its outputs (graduates and research publications). Government could then approve weighted average annual increases in volumes of activity over a period of time and, at the same time, commit to making funds available to support the approved increases in volumes.

The annual increases in total government funds would then be: previous year's allocation + inflation-based increase + approved increase in volumes of activity. Total government funds available through this mechanism could then be distributed to individual universities in terms of a revised funding framework.

### 3.5.2 Resolving Income Inequalities

Figure 3.1 briefly sketches out the main features of the 2003 funding framework. A fuller picture of actual allocations made under the framework can be found in Tables 3.11 and 3.12.

Table 3.11. Details of government transfers to universities (rands millions)

	Migration to 2003 framework				Full implementation of 2003 framework				Average annual increases: 2004–2011
	2004	2005	2006	2007	2008	2009	2010	2011	
<b>BLOCK GRANTS: COUNCIL CONTROLLED FUNDS</b>	<b>6,069</b>	<b>6,465</b>	<b>6,912</b>	<b>7,478</b>	<b>8,110</b>	<b>9,382</b>	<b>10,643</b>	<b>11,857</b>	<b>10.0%</b>
Teaching inputs	5,496	5,855	6,260	6,772	7,345	8,497	9,793	10,910	10.3%
Institutional factors	573	610	652	705	765	885	850	947	7.4%
Teaching outputs (excluding teaching development)	1,074	1,157	1,235	1,385	1,498	1,778	2,054	2,305	11.5%
Research outputs (excluding research development)	845	919	1,024	1,237	1,245	1,540	1,837	2,225	14.8%
<b>EARMARKED TRANSFERS</b>	<b>1,313</b>	<b>1,375</b>	<b>1,558</b>	<b>1,841</b>	<b>2,573</b>	<b>2,558</b>	<b>2,940</b>	<b>2,853</b>	<b>11.7%</b>
Interest & redemption on loans	146	130	100	85	70	41	31	20	-24.7%
Infrastructure & efficiency projects	0	0	0	445	1,245	1,462	1,585	1,615	
Teaching development grants	300	306	329	307	337	345	393	420	4.9%
Research development grants	280	279	256	148	257	197	166	7	-41.0%
Foundation programmes	85	91	105	114	131	146	185	177	11.0%
Clinical training of health professionals	0	0	0	8	200	300	330	350	
Veterinary Sciences	0	19	50	54	58	67	102	116	
Multi-campus	0	0	0	0		0	148	148	
Developing former Vista campuses	0	0	150	80	40	0	0	0	
Institutional restructuring	502	550	568	600	235	0	0	0	-100.0%
<b>BLOCK GRANTS + DIRECT EARMARKED TRANSFERS</b>	<b>7,382</b>	<b>7,840</b>	<b>8,470</b>	<b>9,319</b>	<b>10,683</b>	<b>11,940</b>	<b>13,583</b>	<b>14,710</b>	<b>10.4%</b>

Source: DoHET, 2011a

Table 3.12. Proportion of government grant in each category

	Migration to 2003 framework			Full implementation of 2003 framework				
	2004	2005	2006	2007	2008	2009	2010	2011
<b>BLOCK GRANTS: COUNCIL CONTROLLED FUNDS</b>	<b>86%</b>	<b>86%</b>	<b>85%</b>	<b>85%</b>	<b>81%</b>	<b>83%</b>	<b>83%</b>	<b>85%</b>
Teaching inputs	59%	59%	58%	57%	55%	56%	56%	57%
Institutional factors	6%	6%	6%	6%	6%	6%	5%	5%
Teaching outputs (excluding teaching development)	12%	12%	12%	12%	11%	12%	12%	12%
Research outputs (excluding research development)	9%	9%	10%	10%	9%	10%	11%	12%
<b>EARMARKED TRANSFERS</b>	<b>14%</b>	<b>14%</b>	<b>15%</b>	<b>15%</b>	<b>19%</b>	<b>17%</b>	<b>17%</b>	<b>15%</b>
Interest & redemption on loans	2%	1%	1%	1%	1%	0%	0%	0%
Infrastructure & efficiency projects	0%	0%	0%	4%	9%	10%	9%	8%
Teaching development grants	3%	3%	3%	3%	3%	2%	2%	2%
Research development grants	3%	3%	2%	1%	2%	1%	1%	0%
Foundation programmes	1%	1%	1%	1%	1%	1%	1%	1%
Clinical training of health professionals	0%	0%	0%	0%	1%	2%	2%	2%
Veterinary Sciences	0%	0%	0%	0%	0%	0%	1%	1%
Multi-campus	0%	0%	0%	0%	0%	0%	1%	1%
Developing former Vista campuses	0%	0%	0%	0%	0%	0%	0%	0%
Institutional restructuring	0%	0%	1%	1%	0%	0%	0%	0%
<b>BLOCK GRANTS + DIRECT EARMARKED TRANSFERS</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Source: Calculations from Table 3.11

The proportions in Table 3.11 do not match those in Figure 3.2, as Figure 3.2 reflects the total government budget for public universities, including earmarked funds, such as NSFAS, which are not transferred directly to universities. The amounts involved in these additional earmarked funds are shown in Table 3.13.

Table 3.13. Details of other government earmarked funds for universities (rands millions)

	Migration to 2003 framework				Full implementation of 2003 framework				Average annual increases: 2004–2011
	2004	2005	2006	2007	2008	2009	2010	2011	
NSFAS	578	864	926	1,233	1,355	1,445	1,591	1,970	19.1%
National Institutes	0	0	0	0	30	35	39	41	
African Institute for Mathematical Studies	0	0	0	3	3	3	4	4	
Establishment on new universities	0	0	0	0	0	0	0	50	
Not allocated	0	0	0	0	0	0	0	19	
<b>TOTAL NOT TRANSFERRED DIRECTLY</b>	<b>578</b>	<b>864</b>	<b>926</b>	<b>1,236</b>	<b>1,388</b>	<b>1,483</b>	<b>1,634</b>	<b>2,084</b>	<b>20.1%</b>

Source: DoHET, 2011a

The main features of the amounts and proportions reflected in Tables 3.11 and 3.12 are:

- Block funds represented R16,387 million (or 85%) of the 2011 total of direct transfers to universities and were allocated as undesignated funds, which may be spent at the discretion of the university's council.
- Direct earmarked transfers amounted to R2,583 million in 2011 and were spread over a range of projects, the major ones being grants for improving the physical infrastructure of universities.
- Planned and actual student enrolment inputs generated R11,857 million of the total block grant for 2011, representing 72% of the block grant total and 62% of the overall total of block grants and direct transfers.
- Graduates and research outputs generated R4,530 million of the block grant total for 2011, representing 28% of the block grant total and 24% of the overall total of block grants and direct transfers.

The recently published *Green Paper for Post-School Education* (DoHET, 2012) makes clear that (a) income inequalities of the kind discussed in subsections 3.4.3 and 3.4.4 were unintended consequences of 2003 funding framework, and (b) changes will have to be made to the framework. The Green Paper says this about the 2003 funding framework (DoHET, 2012, 6.7, pp 46-47):

- (1) Instruments within the 2003 funding framework are inadequate for promoting inter-institutional equity. The current funding mechanisms entrench and accentuate inequalities between previously advantaged and previously disadvantaged institutions.
- (2) Earmarked funding is an important steering mechanism to address some of the serious problems faced by the public university system. Consideration is being given to the increase in such funding for developing key infrastructure programmes to achieve greater institutional equity in the system.
- (3) The affordability of fees must be examined carefully and consideration given to whether government should regulate fees charged by universities.
- (4) A funding regime is needed that does justice to current individual institutional realities and accepts the need for redress funding in the poorly resourced institutions.

Major adjustments to the principles and assumptions of the 2003 funding framework would be required if the four points from the 2012 Green Paper are implemented. In particular:

*Principle of a unitary system.* For the purposes of funding, the 2003 framework assumes that all universities are the same and makes only minor provision (through the institutional factor grants) for special features of different groups of universities. As the 2012 Green Paper suggests, this framework takes no account of the institutional realities in South Africa. This is particularly evident in the cluster analyses in section 3.4 of this report, and in the summary which is set out in Table 9 of subsection 3.4.2.

*Principle of autonomy in the setting of student fees.* The 2003 framework gives universities financial autonomy to adjust student fees. Student fees have been rising at rates above inflation, and heavy financial burdens are being placed on students and their families. Furthermore, the total fees collected by universities have risen at rates higher than NSFAS allocations, implying that government's increasing commitment to NSFAS funding has had limited success for disadvantaged students gaining access to universities. It is noted, however, that the operational costs for universities are increasing, and finding the appropriate balance between costs, fees and other income is a difficult exercise.

*Principle of council discretionary funding.* The 2003 framework gives universities high levels of financial autonomy in two other ways: by enabling university councils to spend block grants at their discretion, and by limiting the proportion of designated or earmarked funds allocated to universities.

### 3.5.3 Higher Education Policies and Institutional Differentiation

The 2012 *Green Paper for Post-School Education* has in effect proposed dropping the 2003 funding framework's assumption that the public university system is a unitary one for funding purposes (DoHET, 2012). The Green Paper adds that other higher education policies must now recognise that public universities are part of a formally differentiated system.

The Green Paper makes a number of points about differentiation in the public university system (DoHET, 2012, 6.2, pp 39-41).

A differentiated public university system is needed because not all institutions can or should fulfil the same role. Differentiation would enable institutions to find their niches in ways that enhance their ability to meet national needs, to provide a diversity of academic programmes, to provide for flexibility and innovation throughout the system, and to increase overall participation rates in higher education in South Africa.

The development of a differentiated system for university education must take account of historical inequalities between institutions and (in some cases) between campuses within institutions. It must also include the existing institutional types of universities, universities of technology and comprehensive universities. The differentiation process must ensure that meaningful and sustainable roles are given to the historically black institutions. These roles must allow for their history, the particular academic and developmental needs of their regions, and their institutional ambitions for development.

The university system contains a few research-intensive universities, which are responsible for most of the postgraduates in the system and are engaged in cutting-edge research and innovation. These universities are clearly a valuable national asset and must continue to develop their capacities. However, their needs should not divert attention from the requirements that all universities, and particularly the poorer ones, have sufficient resources such as adequate libraries, laboratories and lecture rooms, and sufficient staff to fulfil their functions as effective institutions in a differentiated system. This future university system is reliant both on effective funding approaches and good institutional and financial governance.

Some of the principles which should be applied to the creation of a formally differentiated public university system are:

- a. The current categories of universities, universities of technology and comprehensive universities must continue to be used. A variety of institutions is required in order to ensure that the public university system serves national interests.
- b. The public university system should comprise a continuum of institutions, ranging from specialised, research-intensive universities to largely undergraduate institutions, with various levels of research focus and various postgraduate niches at master's and/or doctoral level.
- c. The mix and level of academic programmes offered at any institution should not be fixed but be capable of being developed over time to take in more or fewer postgraduate programmes or new fields of study.
- d. All institutions in the public university system must offer high-quality undergraduate education.
- e. The university system must become an integral part of the post-school system, interfacing with FET and other vocational colleges, Sector Education and Training Authorities (SETAs), employers, labour and other stakeholders. Such cooperation should be taken into account when developing an institution's programme mix and planning.
- f. Differentiation needs to be based on a revised funding system for higher education.

Table 3.6 placed the 23 public universities in South Africa into three clusters based on their performance in meeting targets linked to national policy goals. The three clusters were amended in Table 3.9 by removing Unisa from the third cluster. The "history" column in Table 3.9 shows that the clusters are to a large extent functions of institutions' origins. The first cluster consists of five historically white universities and new institutions which were formed by the merger of a historically black university with a larger historically white university.

The clusters in Table 3.9 could form the basis for developing a differentiated system along the lines of the Green Paper principles summarised previously. However, more detailed analysis would be needed to develop the model further.

What is clear is that policies on institutional differentiation are an essential first step towards establishing a new funding framework for public universities in South Africa. If the principle of a unitary funding system is dropped, (as the 2012 Green Paper proposes), then a revised funding framework is needed to (a) overcome funding inequalities, (b) ensure that all universities offer high-quality degree programmes and qualifications, and (c) strengthen those universities that produce the high-quality knowledge outputs, which South Africa needs to complete in the global knowledge economy.



### 3.6 Conclusion

This chapter deals only with the public university system, due to inadequate data on the full post-secondary sector. No analysis, for example, has been offered of the FET college sector.

The chapter covers data and funding policies for the public university sector during 2000–2010 (and to 2011 in the case of government funding). As the funding framework currently in place takes government funding to be a mechanism that is designed to steer the public university system to realising national policy goals, the performance of the public university system and of clusters of universities within the system was analysed.

The report reviewed the total income of the entire public university system and of the identified clusters of institutions. A number of issues relating to the total government funding of the public university system and of income inequalities are raised and discussed in the context of views and proposals contained in the 2012 *Green Paper for Post-School Education*.

In conclusion, a number of the fundamental principles that underpin the current government funding framework will have to be reviewed and opened for debate. A new framework, based on different funding principles and on a policy of institutional differentiation, will have to be introduced for South Africa.

### 3.7 Recommendations

With respect to funding higher education and the post-school system as a whole, the Commission recommends that:

- Government should introduce a differentiated funding framework for a differentiated public university system, by shifting from a unitary system to three funding frameworks – one for each cluster.
  - For Cluster 1: this funding framework would reward further advances in equity, development and improved performance in the input and output indicators;
  - For Cluster 2: this funding framework would reward improved performance in the input and output indicators, and moving up into Cluster 1; and
  - For Cluster 3: this funding framework would reward improved performance in the input and output indicators, and moving up into Cluster 2, pushing for performance in order to win rewards.
- In order to better understand and analyse the performance and funding of the further education training (FET) sector, government should expand the HEMIS system to incorporate FET sector data, or introduce a parallel system to collect relevant data for analysis of the FET sector, a FEMIS (further education management information system). Readily available financial, funding and performance data is needed to inform a future funding framework and annual funding allocations, and to support decision making by FET colleges.

## References

- Bunting, IA. 2011. Report prepared for Funding Strategy Group of Higher Education South Africa. Pretoria: Department of Higher Education.
- CHET (Centre for Higher Education Transformation). 2000. *Higher Education Transformation: Assessing Performance in South Africa*. Cape Town: CHET.
- CHET. 2004. *Developing Performance Indicators for Higher Education: A South African Case Study*. Cape Town: CHET.
- CHET. 2010. *Performance Indicators: South African Higher Education 2000–2008*. Cape Town: CHET.
- CHET. 2011a. *Universities and Economic Development in Africa*. Cape Town: CHET.
- CHET. 2011b. *A Statistical Overview of Further Education and Training Colleges*. Cape Town: CHET.
- CHET. 2012. *Cross-national Performance Indicators: A Case Study of Eight African Universities*. Cape Town: CHET.
- DoE (Department of Education). 1997. *Education White Paper 3: A Programme for Higher Education Transformation*. Pretoria: DoE.
- DoE. 2001. *National Plan for Higher Education*. Pretoria: DoE.
- DoE. 2003. *Funding of Public Higher Education*. Pretoria: DoE.
- DoE. 2004. *A New Funding Framework: How Government Grants are Distributed to Public Higher Education Institutions*. Pretoria: DoE.
- DoHET (Department of Higher Education and Training). 2004–2010. *Ministerial Statements on Higher Education Funding (2004 to 2010)*. Pretoria: DoHET.
- DoHET. 2007. *Ministerial Statement on Student Enrolment Planning*. Pretoria: DoHET.
- DoHET. 2010. *Higher Education and Management Information System: data on students and staff (2000 to 2010)*. Pretoria: DoHET.
- DoHET. 2011a. *Information on the State Budget for Higher Education (2000 to 2011)*. Pretoria: DoHET.
- DoHET. 2011b. *Ministerial Statement on Student Enrolment Planning*. Pretoria: DoHET.
- DoHET. 2012. *Green Paper for Post-School Education*. Pretoria: DoHET.

## Part 2

# CLIMATE CHANGE AND ENVIRONMENTAL SUSTAINABILITY: OPPORTUNITIES AND RISKS FOR INCLUSIVE GROWTH AND INNOVATION

# Chapter 4

## THE IMPACT OF CLIMATE CHANGE ON SOUTH AFRICA'S RURAL AREAS

Jane Turpie<sup>1,2</sup> and Martine Visser<sup>2</sup>

*Africa is likely to be the continent most vulnerable to climate change. Among the risks the continent faces are reductions in food security and agricultural productivity, particularly regarding subsistence agriculture, increased water stress and, as a result of these and the potential for increased exposure to disease and other health risks, increased risks to human health.* Intergovernmental Panel on Climate Change (IPCC) 4.

### 4.1 Introduction

In 2000, the world's leaders adopted the Millennium Development Goals, which provide a framework for the international community to work together to ensure that human development reaches everyone, everywhere, with the ultimate aim of cutting poverty by half by 2015. South Africa still faces numerous challenges in meeting these goals and has developed a set of national goals outlined in the Medium-Term Strategic Framework (MTSF), which was adopted in July 2009, and stated through the twelve priorities and their associated outcomes identified during the January 2010 Lekgotla. In South Africa, about 40% of the country's underprivileged population resides in rural areas and depends either directly or indirectly on land as a source of livelihood.

Agriculture plays a significant role in the country's economy, contributing about 2.9% of GDP, 10% of formal employment and 10% of the total value of exports in 2000 (Benhin, 2008). Thus one of the 12 outcomes is the development of "vibrant, equitable and sustainable rural communities and food security for all". In response to this, the Department of Agriculture, Forestry and Fisheries (DAFF) has embarked on an ambitious sector plan (DAFF, 2012), which addresses rural development in South Africa, focusing on improving equity and transformation, competitiveness and sustainability. The plans include supporting the fast-tracking of land reform and providing support to smallholder farmers, including facilitating access to markets.

Now government efforts to alleviate poverty and fast-track development in rural areas face further challenges in the form of global climate change. Although limited, statistical evidence suggests that South Africa has been getting hotter over the past four decades (Benhin, 2008). Kruger and Shongwe (2004) analysed climate data from 26 weather stations across the country and found that, between 1960 and 2003 the country's average annual temperatures increased by about 0.13°C per decade, with varying increases across the seasons. Climate change will result not only in higher temperatures but also sporadic rainfall patterns and frequent droughts. These more extreme weather conditions, coupled with the country's already scarce water resources, are expected to have a significant effect on all sectors of the economy.

South Africa is particularly vulnerable to climate change because of its dependence on climate-sensitive economic sectors, high levels of poverty and the inter-related impacts of HIV/AIDS (Madzwamuse, 2010). The poor typically have limited opportunities and, consequently, are disproportionately affected by the negative impacts of climate change. This is especially true, as climate change will directly affect the sectors upon which the poor are dependent, namely agriculture, biodiversity, ecosystems and water supplies.

Agriculture is particularly vulnerable because it is highly dependent on climate variables, and also because of the country's semi-arid nature. The impacts of climate change on agricultural activities have been shown to be significant for low-input farming systems in developing countries in Africa (Rosenzweig and Parry, 1994; Reilly and Schimmelpfennig, 1999; Kates, 2000; McGuigan *et al.*, 2002). Climate change could lead to severe reductions in agricultural productivity if no adaptation measures are taken (El-Shaer *et al.*, 1997, Kurukulasuriya and Rosenthal, 2003). Both commercial and subsistence farming will be affected. Compared to commercial agriculture, smallholder farmers are less adapted to

<sup>1</sup> Anchor Environmental Consultants, Cape Town

<sup>2</sup> Environmental-Economics Policy Research Unit, University of Cape Town

climate change and usually do not have access to financial instruments such as credit and insurance to hedge against climatic risk, thereby leaving the poor and the marginalised exposed and more vulnerable. Adaptation also involves a combination of various individual responses at the farm level and assumes that farmers have access to alternative practices and technologies available in the region.

The impacts of climate change on agricultural output can be expected to have not only direct impacts on rural communities (in the form of reduced income and employment), but also knock-on effects for rural economies as a whole. This may put considerable strain on rural local governments, which provide services and promote development at a local level.

Local municipalities will need to plan for these and other impacts. The burden on municipalities will grow because of the expected increases in natural disasters, water scarcity and disease, and reduced agricultural production and food security. Some municipalities will be more sensitive to these changes than others, and many municipalities may lack the adaptive capacity because of existing developmental challenges, such as low incomes, weak institutions, low levels of education and primary health care, lack of markets and infrastructure and already-degraded ecosystems. Rural communities and local municipalities will need to find appropriate and efficient ways of developing resilience to climate change through adaptation measures. These measures will need to be supported at a systemic level, including through intergovernmental finance mechanisms.

#### 4.1.1 Objectives of the Study

The overall aim of this study is to make the case for introducing fiscal mechanisms that support rural development objectives by facilitating increased resilience to climate change in rural areas. Within the limitations of a desk-top analysis, the objectives of this study are:

1. To establish the impact of climate change on agricultural productivity and thus on rural economies.
2. To establish the vulnerability of municipalities to climate change in South Africa.
3. To assess and provide recommendations on financial and fiscal policy measures and instruments that can be used to ameliorate the impact of climate change in the rural areas.

These objectives form the three parts of this paper.

## 4.2 The Impact of Climate Change on Agricultural Productivity

Climate change is one of the biggest challenges constraining smallholder agriculture in sub-Saharan Africa because of extreme weather conditions associated with climate variability. The region's agricultural sector is highly sensitive to future climate shifts and increasing climate variability. Agriculture remains an important livelihood source for most rural sub-Saharan communities, providing employment for over 60% of its inhabitants and accounting for about 30% of its GDP. The region is already experiencing high temperatures and low (and highly variable) rainfall, the economies are critically dependent on agriculture, and adoption of modern technology is still low (Kruger and Shongwe, 2004).

In South Africa, the agricultural sector plays a significant role in the country's economy. Anecdotal evidence suggests that climate change could lead to a fall of about 1.5% in the country's GDP by 2050 – a fall roughly equivalent to the total annual foreign direct investment in South Africa at present. In addition, climate change has severe consequences on other economic sectors that are either directly or indirectly linked to the agricultural sector. Thus, volatility in one sector may cause other sectors to be highly volatile through backward and forward linkages, especially for economies that are directly dependent on exports of primary commodities. For example, climate change and the resulting loss of biodiversity could do irreversible damage to the country's tourism industry, which is worth an estimated R100 billion per annum (UCT, 2008).

Today, South Africa is not only self-sufficient in virtually all major agricultural products, but is also a net food exporter. Farming remains vitally important to the economy and the development of the southern African region.

These catastrophic weather events will not spare South Africa's smallholder sector, if sound adaptation strategies and policies are not implemented as a matter of urgency. Ignoring the effect of climate change in agricultural productivity may actually dampen the impact of government policy and interventions to grow rural economies.

The analysis of climate data from 26 weather stations in South Africa (Kruger and Shongwe, 2004) indicated that during the 43 years to 2003, temperatures increased by an average of 0.13° per decade. This is expected to increase further by 1.2°C in 2020, 2.4°C in 2050 and 4.2°C by the year 2080. On the other hand, rainfall is expected to decrease by 5.4% in 2020, 6.3% in 2050 and 9.5% in 2080. Agriculture is the most vulnerable sector of the country's economy because of its direct dependence on climate variables such as temperature and precipitation. The semi-arid nature of the country, coupled with the already scarce water resources, will worsen the situation.

Climate change is also expected to increase food insecurity, exacerbating poverty among the rural communities in South Africa. Climate change will affect all four dimensions of food security – food availability, food accessibility, food utilisation and food systems stability (FAO, 2008). Empirical evidence suggests that developed countries will be less affected by climate change than developing countries. However, little research has been carried out to evaluate climate change impacts on third-world economies (Gbetibouo and Hassan, 2005).

The impacts of climate change on agriculture have been estimated using two main approaches:

- a. Structural modelling of crop and farmer response that combines crop agronomic response with economic or farmer management decisions and practices
- b. Spatial analogue models or cross-sectional models that measure observed spatial differences in agricultural production (Adams, 1999).

Examples of agronomic models include the CERES models and the computable general equilibrium models (CGE). On the other hand, the Ricardian approach (which is a spatial analogue model) uses farm-level data to explore the impact of climate change on the agricultural sector (Gbetibouo and Hassan 2005). This approach has been used to study the relationship between net revenues from crops and livestock and other key variables including climate in selected countries in low latitudes (Kumar and Parikh 2001; Kurukulasuriya and Ajwad 2006). During the last decade, another method developed to evaluate the impact of climate change on agriculture is the production-function approach, which relies on empirical or experimental production functions to predict environmental damage (Rosenzweig and Iglesias, 1994).

This study used the Ricardian approach<sup>3</sup> to establish the impact of climate change on small-scale subsistence and larger-scale commercial agricultural productivity in South Africa. This method takes advantage of the fact that economic rents derived from using land reflect net productivity of farmland, which is influenced by many factors, including climate variables. This method has been applied extensively in Africa and elsewhere (e.g. Gbetibouo and Hassan, 2005; Mendelsohn *et al.*, 2000; Benhin, 2008; Kurukulasuriya and Mendelsohn, 2006).

#### 4.2.1 Climate Change Impacts on Agriculture in Africa

During the past decade, a growing body of research has emerged because of increasing concerns about the impacts of climate change on the agricultural sector in Africa. Current evidence suggests that tropical and sub-tropical countries will be vulnerable to global warming because they are already experiencing high temperatures (Benhin, 2008).

The smallholder sector in Sub-Saharan Africa is already vulnerable to environmental degradation and rainfall variability. Climate change adds to other developmental stresses, notably poverty, HIV/AIDS and food insecurity (FAO, 2008). Agronomic studies predict a sharp fall in yields for most African crops in the absence of technological change. Without adaptation, increased heat is expected to reduce crop yields for plants, *ceteris paribus* (Kurukulasuriya and Mendelsohn, 2006).

While the smallholder sector is predicted to suffer from climate variability, large-scale commercial agriculture in some parts of Africa may benefit through global warming, since increased temperatures could increase irrigated crop yields through enhanced photosynthesis. However, despite these relative gains, commercial agriculture would be likely to incur additional costs because of increased water requirements.

Climate change is a potential threat to the world food security agenda because of its strong and negative impact on dry-land crop cultivation or rain-fed agriculture, which forms the basis of smallholder agriculture. An estimated three

3 David Ricardo (1815) was the first to observe that land rents reflect the net revenue value of farmland. The Ricardian method's strength is its ability to capture the adaptation responses of farmers. The use of net revenues in the analysis reflects the benefits and costs of implicit adaptation strategies.

million primary food producers meet their family needs through subsistence farming.<sup>4</sup> Climate change could exacerbate rural poverty in South Africa (StatsSA, 2007). Analysing the response of net farm revenue from crops and livestock farming across various systems in Africa, Nhemachena *et al.* (2010) showed that warmer and drier climates adversely affect net farm revenues, thereby translating into severe food security problems in the region. People who are already vulnerable and food insecure are likely to be affected more severely.

In a global-scale analysis, Nelson *et al.* (2010) predicted that climate change will result in losses in agricultural productivity and that rising food prices will lead to reduced food availability and increased malnourishment in children. Nevertheless, few economic studies have been done in Africa to estimate the magnitude and potential impacts of climate change on agriculture (Mendelsohn *et al.*, 2000; Kurukulasuriya and Rosenthal, 2003).

Kurukulasuriya and Mendelsohn (2006) studied the effect of climate change on net revenues from crop agriculture, based on a survey of 9 000 farmers in 11 African countries. They included hydrological variables (specifically water flow) among the normal range of variables. Net revenues were negatively related to temperature and positively related to precipitation, with elasticities of -1.3 and 0.4, respectively. As Table 4.1 shows, the respective elasticities were greater for dryland crops (-1.6 and 0.5) than for irrigated crops (0.5 and 0.1), suggesting that irrigation plays a very important role in ameliorating the impact of climate change.

Table 4.1. Temperature and rainfall elasticities (with regional dummies)

Annual	Africa regression	Irrigated regression	Dryland regression
Temperature	-28.5** (-1.4)	35.04 (0.6)	-26.7** (-1.9)
Precipitation	3.28** (0.44)	3.82 (0.13)	2.7** (0.63)

\*\* Significance at 1% level

Source: Kurukulasuriya and Mendelsohn (2006)

Kurukulasuriya and Mendelsohn (2006) estimated that a temperature increase of 2.5°C (and 5°C) would result in \$23 billion (\$38 billion) of losses for African agriculture. Decreases in precipitation of 7% (and 14%) would in turn result in losses of \$4 billion (and \$9 billion) in net revenues. The overall effect of climate change would vary significantly between countries, with more severe impacts for countries that are already hot and dry. Working in parallel to the above study, but using farmers' perceptions of the value of their land as an independent variable in their analysis, Maddison *et al.* (2007) predicted that countries like South Africa will only lose 3% of agricultural productivity.

The study by Seo and Mendelsohn (2006), conducted in parallel with Kurukulasuriya and Mendelsohn's 11-country study (2006), focused only on livestock or animal husbandry. Their findings suggested that climate change bodes well for small farms that have the opportunity to substitute animals (such as goats) that are heat tolerant, whereas large farms (which are typically less flexible and more reliant on cattle farming) will be much more severely affected (see Table 4.2). Wetter scenarios seem to be more harmful for grazing animals if, for example, vegetation shifted from grasslands to forests. Also, the resultant increase in diseases affecting livestock would probably lead to a shift from livestock to crop farming.

Using the same dataset, Seo *et al.*, (2009) analysed crop and livestock cultivation in different agro-ecological zones in Africa (see Table 4.2). Since large farms tend to dominate the African agricultural landscape, the impacts of climate change are likely to have negative effects on net revenues. However, livestock may be a good substitute for crops if the climate is becoming drier, since the net revenues from livestock in drier climates are predicted to be larger. For South Africa, the impact of different future scenarios (under the Canadian Climate Centre – CCC – and Parallel Climate Model – PCM) is not as severe as for many other African countries (Seo *et al.*, 2009). However, as Table 4.3 shows, the effect of the CCC scenarios is more significant than those of the PCM predictions.

4 Subsistence farming is a livelihood strategy where the main output is consumed directly, few if any inputs are purchased and only a minor proportion of output is marketed.



Table 4.2. Marginal climate effects and elasticities for livestock farming in Africa

	Current livestock income (\$/farm)	Marginal temperature impact (\$/C°)	Marginal precipitation impact (\$/mm)	Irrigated regression	Dryland regression
<b>Net revenue per farm</b>					
Small	104.6	111.32	-26.05*	24.60	-16.63*
Large	3291.03	-397.09*	-59.98*	-2.74*	-1.11*
<b>Value of livestock owned</b>					
Small	259.24	238.55	-49.20*	21.27	-12.68*
Large	7794.62	-441.28*	-87.46*	-1.28*	-0.68*
<b>Net revenue per livestock value</b>					
Small	0.37	-0.02*	0.00*	-1.06*	-0.69*
Large	0.39	-0.03*	-0.01*	-1.68*	-1.03*

\* Significance at 1% level

Source: Seo &amp; Mendelsohn (2006)

Table 4.3. Change in revenue from crop and livestock production for different AOGCM predictions (\$/farm)

	Impact per small farm (\$/farm)	% of livestock income	Impact per large farm (\$/farm)	% of livestock income
<b>2020</b>				
Change _CCC	151	24%	-290	-9%
Change _CCSR	259	42%	-317	-10%
Change _PCM	-26	-4%	-545	-17%
<b>2060</b>				
Change _CCC	332	53%	-639	-20%
Change _CCSR	180	29%	-750	-24%
Change _PCM	40	6%	-709	-23%
<b>2100</b>				
Change _CCC	720	116%	-722	-23%
Change _CCSR	945	152%	2	0%
Change _PCM	194	31%	-842	-27%

Note: Small farms have a baseline income of \$623 per farm. Large farms have a baseline income of \$3142 per farm

Source: Seo et al. (2009)

The predicted impacts vary with the type of model used. For example, Seo *et al.* (2009) found that an OLS model predicted a 12% and 27% increase in net revenue under the PCM and CCC scenarios respectively, whereas a fixed effect model predicted a 19% and 2% increase for the corresponding scenarios. One of the reasons for the less severe predicted impacts (than those of other studies) could be that the effects on mixed farming strategies were examined, not only on crop agriculture. For the PCM and CCC scenarios indicate that the impact on South African agriculture would be losses



in net revenues of -14% to 0% in south-western South Africa and gains in the north-eastern parts of the country of more than 60% or between 15% and 30% for the two scenarios, respectively (Seo *et al.*, 2009).

Nhemachena *et al.*, (2010) also examined mixed crop-livestock strategies as a coping mechanism for farms from three southern African countries (South Africa, Zambia and Zimbabwe). Their analyses controlled for the effects of key socio-economic, technological, soil and hydrological factors influencing agricultural production. They found that specialised crop cultivation was more sensitive to warmer and drier climates, whereas small-scale mixed crop and livestock farming predominant in large parts of southern Africa is better adapted to such climates.

#### 4.2.2 Climate Change Impacts on Agriculture in South Africa

Like many countries in the region, South Africa has a dual agricultural economy comprising well-developed commercial farming and small-scale, largely subsistence production. The country has seven climatic regions, ranging from semi-desert to Mediterranean and subtropical conditions. Rainfall is distributed unevenly across the country, with humid subtropical conditions in the east where about 1 000mm of rain falls per year and some dry desert-like conditions in the west with less than 100mm of rainfall. The country's average annual rainfall is 450mm/year, which is well below the world's average of 860mm. Evapo-transpiration is relatively high, with potential evaporation estimated at 1 500 mm/year, resulting in only 8.5% runoff and a combined runoff of 42mm/year compared with the average for the whole continent of 139mm/year and the world average of 330mm/year. The runoff in the country is not only extremely low, but also varies from year to year and from region to region (DWAF, 2002).

Agricultural activities range from intensive crop cultivation, mixed livestock and crop farming in winter rainfall and high summer rainfall areas, to cattle ranching in the bushveld and sheep farming in the semi-arid regions. Maize is the most widely grown crop, followed by wheat, oats, sugar cane and sunflowers. While 13% of South Africa's land can be used for crop production, only 22% is high-potential arable land. Water and rainfall are limiting factors, and the irrigable soil and overall irrigation potential are very limited. Almost 50% of South Africa's water is used for agriculture, with about 1.3 million hectares under irrigation.

The few studies, which have looked at the impacts of climate change on agriculture in South Africa, have focused mainly on maize production. Gbetibouo and Hassan (2005) studied seven field crops (maize, wheat, sorghum, sugarcane, groundnut, sunflower and soybean) and found that both season and location were important in determining the potential impacts of climate change on crop production. As with many other studies, they found that temperature increases had a negative effect and precipitation increases had a positive effect on net revenue (see Table 4.4). Irrigation presented a viable form of adaptation in the face of climate change, to the extent that the negative impacts of climate change can be harnessed to achieve positive changes in net revenue. However, the potential to use irrigation as an adaptive mechanism would be limited.

Table 4.4. Impacts of changing temperature and rainfall on crop net revenue in percentage (%)

	Climate scenario	Winter season		Summer season		Both seasons	
		No adaptation	With adaptation	No adaptation	With adaptation	No adaptation	With adaptation
Temperature	+2 °C	-11	26	26	63	12	47
Rainfall	-5%	-4	26	-1	34	-2	27

Source: Gbetibouo and Hassan (2005)

Based on a study of 416 crop farms from nine provinces, of which 53% were large-scale (50–1537 ha) and 47% small-scale farmers (1–40 ha), Benhin *et al.* (2010) suggested that the predicted impacts of climate change could be much more severe than those indicated by Gbetibouo and Hassan (2005) if hydrological variables are included in the analysis (Table 4.5). While Benhin *et al.* (2010) focused on crop farming (29%), livestock (27%) and mixed farming (44%) were controlled for in the sample.

Table 4.5. Impacts of selected climate scenarios on net revenues (\$/ha)

	CGCM2	CGCM2	HadCM3	HadCM3	PCM	PCM
	2015	2100	2015	2100	2015	2100
Change in temperature (°C)	35	9	3.9	9.6	23	5.5
Change in precipitation (%)	-4	-8	-8	-15	-2	-4
Impact	Actual (%)	Actual (%)	Actual (%)	Actual (%)	Actual (%)	Actual (%)
	-12.88	-40.79	-16.26	-93.24	-5.14	-29.99
Full sample	(-4.22)	(-26.65)	(-5.32)	(-30.52)	(-1.68)	(-9.82)
	-15.91	-113.99	-20.23	-134.55	-5.34	-41.16
Irrigated	(-3.4)	(-24.43)	(-4.34)	(-28.84)	(-1.15)	(-8.82)
	-43.2	-55.24	-44.1	-59.06	-41.63	-46.29
Dryland	(-27)	(-34.74)	(-27.74)	(-37.44)	(-26.18)	(-29.12)
	-43.11	-220.16	-49.39	-248.21	-20.65	-92.99
Large scale	(12.01)	(-61.41)	(-13.78)	(-69.23)	(-5.76)	(-25.94)
	-47.29	-204.6	-52.73	-227.2	-25.05	-93.86
Small scale	(18.61)	(-80.49)	(-20.74)	(-89.39)	(-9.86)	(-36.93)

Source: Benhin et al. (2010)

These results indicate that the impact of climate change may be dramatic, depending on the scenario considered, and that dryland farming is much more vulnerable than irrigated agriculture. The findings further suggest that small-scale farmers would be hit much harder, with losses in net revenue ranging from -36% to -89% for 2100 predictions, although even for large farmers net revenue losses would range from -26% to -70%.

The studies incorporating the effects of both crop farming and livestock for South Africa generally predict less severe impacts of climate change for South Africa than Benhin's study. Controlling for hydrological variables such as flow and run-off, Seo *et al.* (2009) finds that impacts on agricultural productivity for South Africa range from -30% to 0% depending on the scenario used. This is the only study in South Africa that has considered the effects of climate change on crop, horticultural, livestock and mixed farmers and, furthermore, analyses the effects of climate on both subsistence farmers and large commercial farmers.

## 4.3 Methods

Measuring the likely magnitude of the economic impact of climate change on African agriculture has been a challenge because of non-availability of data. This is despite dramatically improved quantitative estimates of climate impacts over the past decade (Mendelsohn and Williams, 2004). To date there have been relatively few studies (Kurukulasuriya and Rosenthal, 2003).

### 4.3.1 Data Sources

Data for this study is based on two sources: the 2008 National Income Dynamics Study (NIDS),<sup>5</sup> which is collected by the Southern Africa Labour and Development Research Unit and the 2007 agriculture census<sup>6</sup> conducted by Statistics South Africa (StatsSA, 2007). The NIDS dataset consists of a total of 7 301 households in nine provinces of South Africa. NIDS is primarily conducted to collect information on expenditure and income of South Africans, implying that a section is devoted to collecting information on agricultural activities and thus determining agricultural revenue. This section of NIDS is used to analyse the impact of climate change on subsistence farmers. The total sample size of the households

<sup>5</sup> [www.nids.uct.ac.za](http://www.nids.uct.ac.za)

<sup>6</sup> [www.statssa.gov.za/agriculture/CensusSample2007.asp](http://www.statssa.gov.za/agriculture/CensusSample2007.asp)

that participated in agricultural activity in the NIDS dataset is 1 280, of which 1 221 were non-commercial (subsistence) farmers. Agriculture is traditionally divided into crop, livestock and mixed farming, and so these are the three categories used in the analysis.

The agriculture census is based on a national representative sample of enterprises that participate in farming activities in South Africa (StatsSA). StatsSA conducts a census every five years to collect agriculture-specific information by post, email, telephone, Internet and personal visits to individuals or groups (enterprises) engaged in commercial farming across South Africa. The sample size for the 2007 Census of commercial agriculture comprised approximately 23 280 commercial farming units in South Africa. Table 4.15 shows the descriptive statistics of the commercial farmers who are subdivided into crop, horticultural, livestock and mixed farmers in this sample.

### 4.3.2 Definition of Concepts and Variables

#### **Net revenue**

Net revenue is defined as the difference between total revenues and the costs of transportation, storage, hired labour and machinery, fertilisers, seed, chemicals, postharvest losses etc. Due to land market imperfections and weak documentation of agricultural farm values in South Africa, literature suggests using net revenue per hectare rather than land values as the response variable (Gbetibouo and Hassan, 2005). Across South Africa, farmers use a combination of crop cultivation and livestock rearing. By examining net revenues of these farming activities separately, the study estimates Ricardian models for each category: crop, horticulture, livestock and mixed farmers. Estimating separate regression models is important in this case because each activity is assumed to respond to climate differently.

This study is not without caveats. The response variable was net revenue and not revenue per hectare. The Ricardian framework is based on a profit-maximising principle, which expects land rent per hectare to be equal to net revenue per hectare. This approach of incorporating land size into the framework captures the operating efficiency of a business entity. However, the available data only permitted measurement of net revenue, as information on the farm sizes could not be obtained. Hence our proxy measure for net revenue per hectare was net revenue.

#### **Soil variable**

The study controls for different soil types, which is particularly important for different types of farming (Mendelsohn and Dinar, 2003). The soil data was obtained from the Institute for Soil, Climate and Water. A geographic information system (GIS) was used to categorise the soil type by local municipality throughout South Africa. Overall the soil data has 15 different types of soil:

A1	AR	E1
• Humic Acrisols, Ferralsols, Umbrisols and Dystric Regosols	• Arenosols	• Leptosols, Regosols, Calcisols and Durisols;
A2	B1	F1
• Well drained Ferralsols, Acrisols and Lixisols	• Ferralsols, Acrisols, Lixisols and Plinthosols	• Arenosols and Podzols;
A3	B2	G1
• Well drained Ferralsols, Acrisols and Lixisols and one or more of Regosols, Leptosols, Calcisols and Durisols	• Lixisols, Cambisols, Luvisols and Plinthosols	• Leptosols, Regosols, Durisols, Calcisols and Plinthosols;
A4	C1	H1
• Well drained Lixisols, Cambisols, Luvisols;	• Luvisols, Planosols and Solonetz and some traces of Plinthosols, Vertisols and Cambisols	• Fluvisols, Cambisols, Luvisols and Gleysols;
A5	D1	SC
• Well drained Lixisols, Cambisols, Luvisols and one or more of Regosols, Leptosols, Calcisols and Durisols	• Vertisols, Phaeozems, Kastan-ozems and Nitisols;	• Solonchaks and Arenosols

### Climate variable

Most Ricardian studies done for Africa have used climate scenarios based on Atmospheric Oceanic General Circulation Models (OAGCMs). Kurukulasuriya and Mendelsohn (2008) used predictions from three different climate scenarios: CCC, CCSR and PCM. These three scenarios have also been used in a number of other studies including Seo *et al.* (2009) and Maddison *et al.* (2007). In the current study, the climate variables were obtained from a dataset from the World Climate<sup>7</sup> data based on the HadCM3 model, and GIS was used to summarise the data by municipalities. The data contains the current climate data and predicted data for 2020, 2050 and 2080 as illustrated in Table 4.6.

Table 4.6. South Africa climate change scenarios

	Current	2020	2050	2080
Change in temperature (°C)		1.2	2.4	4.2
Change in rainfall (%)		-5.4	-6.3	-9.5
Actual temperature	17.3	18.4	19.6	21.4
Actual rainfall	53.8	50.9	50.4	48.7

South Africa has two major farming seasons, so the marginal impacts of temperature and precipitation changes were estimated for both the summer (December–May) and winter (June–November) seasons. Seasonal averages were computed for temperature and precipitation variables. The Ricardian model relies on a quadratic formulation for both temperature and rainfall, implying diminishing marginal products for both variables.

### Farm and household characteristics variable

Various farm and household characteristics have been identified, which influence the variability of farm net revenue. The characteristics used in this study used are motivated by data availability and include farm size, whether the farm uses labour and mitigation strategies deployed.

#### 4.3.3 Empirical Model Specification

To measure the impact of climate change on agriculture in South Africa, the study used the Ricardian approach, which includes climatic variables through an econometric analysis of cross-sectional data (Mendelsohn *et al.*, 1994). This approach has been used extensively in the literature to investigate the relationship between farmland value and climate, soil and other control variables. The Ricardian method's strength is its ability to capture the adaptation responses of farmers. The use of net revenues in the analysis reflects the benefits and costs of implicit adaptation strategies. Following Kurukulasuriya and Mendelsohn (2008), farmland net revenue ( $V$ ) reflects the net productivity and costs of individual crops and livestock as follows:

$$V = \sum P_i Q_i(X, F, H, Z, G) - \sum P_X X \dots \dots \dots (1)$$

where  $P_i$  is the price of crops  $i$ ,  $Q_i$  is output of crop  $i$ ,  $X$  is a vector of purchased inputs (other than land),  $F$  is a vector of climatic variables,  $H$  is hydrology variable or water flow,  $Z$  is a vector of soil variables,  $G$  is a vector of economic variables, such as market access and access to capital, and  $P_X$  is a vector of input prices. The model assumes that:

- The land values have attained the long-run equilibrium associated with regional climates
- Climate change has shifted the production function for crops and livestock through changes in temperature and rainfall, assuming that adaptation costs are not important
- The farmer has chosen inputs  $X$  to maximise net revenues, given the characteristics of the farm and market prices.

<sup>7</sup> [www.worldclimate.com](http://www.worldclimate.com)

The model is based on the observed response of farmers and crops to varying climates, i.e. it uses actual observations of farm performance in different climatic regions or agro-climatic zones (Mendelsohn and Dinar, 1999). It is also a measure of how long-term farm profitability varies with local climate (Benhin, 2008). Therefore, the main focus of the analysis is measuring the impact of exogenous changes in the climate, soil variables and economic indicators (i.e. marginal contributions of each variable) on land values, as captured by changes in net revenue across different environmental conditions. The standard Ricardian model relies on a quadratic formulation of climate.

$$V = \beta_0 + \beta_1 F + \beta_2 F^2 + \beta_3 Z + \beta_4 G + \beta_5 \log[H] + \varepsilon \dots \dots \dots (2)$$

The model includes an error term ( $\varepsilon$ ) which captures unobservable factors affecting farmland value in addition to those stated above. This formulation captures the expected nonlinear shape of the relationship between net revenues and climate (Mendelsohn *et al.*, 2001; Mendelsohn and Dinar, 2003). The net revenue function is U-shaped (hill-shaped) when the coefficient on the linear term is negative (positive) and the quadratic term is positive (negative). The possibility of several other shapes cannot be ruled out, depending on the relative signs of the linear and quadratic terms (Kaufmann, 1998). However, based on evidence from previous studies, the expectation is that land value has a hill-shaped relationship with temperature and precipitation.

Given equation (2), the marginal impact of each of the climate variables ( $f_i$ ) on crop or livestock net revenue evaluated at the mean is:

$$E\left[\frac{\partial V}{\partial f_i}\right] = \beta_{1,j} + 2\beta_{2,j}E[f_i] \dots \dots \dots (3)$$

Taking into account the logarithmic nature of the water-flow variable, its marginal impact on net revenues is given by:

$$E\left[\frac{\partial V}{\partial H}\right] = \frac{\beta_5}{H} \dots \dots \dots (3)$$

These marginal effects can be evaluated at any level of climate, but the focus is on showing effects at the mean climate levels for South Africa (see Kurukulasuriya and Mendelsohn, 2006).

## 4.4 Results

The Ricardian regression outputs for subsistence and commercial farmers are described in Section 4.6.1 and Section 4.6.2 respectively.

### 4.4.1 Subsistence Farmers

Table 4.7 depicts the descriptive statistics of the subsistence farmers. The majority of households practice mixed farming methods (408), followed by crop farming (397) and livestock farming (306). Livestock farmers appear to earn the highest agriculture net revenue (R677.21) while crop farmers earn the least (R97.15). As expected, the households that produce crops are found in areas with relatively high yearly rainfall (61.2mm monthly average), this pattern is also observed among those who engage in mixed farming (62.1mm monthly average), while those who participate in livestock keeping are found in slightly drier areas (57.9mm monthly average).<sup>8</sup>

8 Throughout this paper rainfall figures are monthly averages, and not annual averages.

Table 4.7. Descriptive statistics – subsistence farmers

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
<b>All farmers</b>					
Net revenue	1,128	367.39	3,425.00	-44,040.30	42,992.00
Type of soil	1,128	4.9	3	1	7
Av rain – monthly	1,128	60.5	10.1	29.9	90.2
Av rain – winter	1,128	27.9	7.0	15.4	50.8
Av rain – summer	1,128	93.2	16.4	40.6	129.5
Av temp – monthly	1,128	17.4	0.9	15.2	19.6
Av temp – winter	1,128	14.3	1.2	11.2	17.0
Av temp – summer	1,128	20.4	0.8	19.1	22.4
<b>Mixed Farmers</b>					
Net revenue	408	413.81	3,832.92	-44,040.30	42,992.00
Type of soil	408	5.1	3	1	7
Av rain – monthly	408	62.1	10.1	39.5	90.2
Av rain – winter	408	29.2	7.2	15.4	50.8
Av rain – summer	408	94.9	16.1	50.0	129.5
Av temp – monthly	408	17.5	0.7	15.2	19.6
Av temp – winter	408	14.5	1.0	11.2	17.0
Av temp – summer	408	20.4	0.7	19.1	22.4
<b>Crop Farmers</b>					
Net revenue	397	97.15	684.80	-3,110.00	8,632.00
Type of soil	397	4.5	3	1	7
Av rain – monthly	397	61.2	10.6	38.9	90.2
Av rain – winter	397	27.5	7.7	15.4	50.8
Av rain – summer	397	94.8	16.8	48.6	129.5
Av temp – monthly	397	17.6	1.0	15.2	19.6
Av temp – winter	397	14.5	1.3	11.2	17.0
Av temp – summer	397	20.6	0.9	19.1	22.4
<b>Livestock Farmers</b>					
Net revenue	306	677.21	4,788.53	-27,500.00	39,394.00
Type of soil	306	5.3	2	1	7
Av rain – monthly	306	57.9	8.8	29.9	90.2
Av rain – winter	306	26.5	4.7	15.4	50.8
Av rain – summer	306	89.4	15.3	40.6	129.5
Av temp – monthly	306	17.0	0.9	15.2	19.3
Av temp – winter	306	13.9	1.1	11.2	16.3
Av temp – summer	306	20.1	0.8	19.1	22.3

In this sample, the main reason households participate in agriculture is to supplement their household income and to satisfy the household dietary requirements. Table 4.8 shows the distribution of gross revenue by household needs. A large proportion of the output from crop agriculture is clearly used for households' own dietary needs (57.8%), while only 30.1% is sold to generate revenue to supplement household income. In livestock farming, a relatively larger proportion of livestock output is sold to generate revenue (48.9%) rather than kept for the households' own consumption (26.7%). A relatively large number are also given away as gifts (24.3%), since livestock is used in a number of African ceremonies.

Table 4.8. Distribution of total gross revenue by household needs – subsistence farmers

Type of farming Activity	Percentage of total gross revenue
<b>Crops</b>	
Crops sold	30.1
Crops given away as gifts	12.0
Crops retained for own consumption	57.8
<b>Livestock</b>	
Livestock sold	48.9
Livestock given away as gifts	24.3
Livestock retained for own consumption	26.7

Table 4.9 shows the results of the Ricardian model. A separate model was estimated for each type of farmer. In Panel A, Column 1 is based on the results that include all farmers; Column 2 contains the findings of the mixed farmers, i.e. both crop production and livestock keeping. The farmers that only produce crops are shown in Column 3, while the results for livestock farmers are in Column 4. In Columns 5 to 8 (Panel B) household and farm characteristics are introduced: whether the household employs any labour; whether any mitigation strategy such as use of fertilisers and vet services are employed; and whether agricultural revenue is the main source of household income.

Consistent with current studies, the impact of climate change on net revenue will vary according to the type of farmer (Nhemachena *et al.*, 2010). Furthermore, all the models in Table 4.9 show that climate and soil variables have significant impacts on different types of farmers, although they are more significant for the crop and livestock farmers. In addition, the climate variables' significant linear and quadratic coefficients confirm the non-linear relationship between climate and net farming revenue as is evident in current literature (For example, the most recent work of Mendelson and Dinar, 2003; Kurukulasuriya and Mendelsohn, 2006; Benhin, 2008).

The positive sign on the quadratic rainfall coefficient in summer and winter reveals a 'U-shaped' relationship between rainfall and net farming revenue in both seasons and is consistent with current literature. For example, in their OLS specification of the Ricardian model, Seo *et al.*, (2009) found a positive coefficient in both winter and summer. Kurukulasuriya and Mendelsohn (2006) found similar results, although these were sensitive to whether the farms were dryland or irrigated farms. The negative sign on the quadratic summer temperature shows a 'hill-shaped' relationship between summer temperature and net revenue, although the quadratic coefficients are not significant. These findings are also similar to the work of Kurukulasuriya and Mendelsohn (2006) and Seo *et al.*, (2009) for Africa generally. However, the relationship between winter temperature and net revenue remains significant and 'U-shaped' for livestock farmers and 'hill-shaped' and significant for crop farmers.

Another notable outcome is the difference in the size of the coefficients between Panels A and B of Table 4.9, where in Panel B the farming characteristics are introduced. That is, the Ricardian models in Panel B have smaller coefficients (for example, the rainfall in the winter coefficient among livestock farmers is -991.6 in Panel A, but -667.5 in Panel B), which indicate that, although climate conditions have a significant effect on net farm revenue, various farming characteristics (employing labour; using fertilisers, manure or pesticides) play a critical role in mitigating these effects. Also worth noting is that the R-squared statistics are higher among the models in Panel B than in Panel A, indicating that the additional variables in Panel B do belong in the model.



Table 4.9. Ricardian regressions of net revenue model – subsistence farmers

Dependent variable	Panel A				Panel B			
	Without household and farm characteristics				With household and farm characteristics			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Net farming revenue	All Farmers	Mixed Farmers	Crop Farmers	Livestock Farmers	All Farmers	Mixed Farmers	Crop Farmers	Livestock Farmers
Rain – winter	-227.5 (139.0)	29.59 (315.0)	-58.14 (54.61)	-991.6** (480.3)	-203.6* (118.5)	-19.97 (272.3)	-47.26 (54.33)	-667.5* (383.9)
Rain – winter2	2.024 (1.989)	0.0263 (4.869)	0.964 (0.774)	9.373 (7.097)	2.104 (1.693)	1.304 (4.195)	0.834 (0.771)	5.649 (5.679)
Rain – summer	-147.1* (82.09)	20.91 (241.0)	-18.39 (35.01)	-483.3** (207.9)	-133.4* (70.03)	129.2 (208.0)	-14.44 (34.72)	-454.2*** (167.3)
Rain – summer2	0.608 (0.454)	-0.241 (1.300)	0.0685 (0.197)	2.257* (1.207)	0.519 (0.387)	-0.819 (1.122)	0.0532 (0.195)	2.151** (0.970)
Temperature – winter	-574.8 (2,972)	-1,820 (7,616)	2,536** (1,021)	-20,511* (11,008)	327.2 (2,535)	1,186 (6,574)	2,247** (1,021)	-16,635* (8,793)
Temperature – winter2	55.54 (106.9)	79.75 (266.3)	-85.02** (36.59)	814.3** (395.8)	20.10 (91.23)	-35.52 (230.1)	-75.53** (36.58)	671.2** (316.3)
Temperature – summer	69.58 (9,454)	-25,962 (23,851)	-2,626 (3,664)	31,673 (50,265)	4,317 (8,071)	-14,713 (20,645)	-1,804 (3,648)	25,422 (40,238)
Temperature – summer2	-19.18 (234.9)	644.6 (590.4)	66.56 (90.33)	-834.5 (1,264)	-121.7 (200.5)	363.0 (511.1)	47.00 (89.95)	-668.9 (1,012)
Soil 2. A4-lixisols, cambisols, luvisols	95.25 (672.6)	1,765 (1,507)	-120.8 (257.1)	1,240 (2,528)	-184.0 (571.9)	1,632 (1,294)	-165.8 (255.9)	70.63 (2,021)
Soil 3. AR-arenosols	-2,292** (1,063)	-4,898* (2,830)	-394.0 (411.1)	-5,031 (6,366)	-1,365 (907.5)	-2,411 (2,457)	-399.0 (411.3)	-4,723 (5,081)
Soil 4. B1-ferralsols, acrisols, lixisols	303.2 (1,591)		280.8 (376.6)	290.5 (6,366)	506.0 (1,354)		163.3 (375.6)	1,167 (5,083)
Soil 6. C1-luvisols, planosols and solonetz	351.1 (447.2)	648.8 (934.7)	330.2* (199.8)	-397.2 (1,188)	99.67 (382.2)	418.5 (803.8)	173.9 (205.8)	-415.8 (949.7)
Soil 7. E1-leptosols, regosols, calcisols	-502.8 (411.4)	-1,211 (1,022)	-195.3 (198.7)	-1,161 (936.2)	-415.6 (351.6)	-712.0 (880.2)	-241.3 (201.5)	-1,227 (745.9)
Livestock mitigation strategy <sup>1</sup>					4,236*** (829.1)	4,353*** (1,169)		4,680** (2,188)



Panel A					Panel B			
	Without household and farm characteristics				With household and farm characteristics			
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Net farming revenue	All Farmers	Mixed Farmers	Crop Farmers	Livestock Farmers	All Farmers	Mixed Farmers	Crop Farmers	Livestock Farmers
Crop mitigation strategy <sup>2</sup>					706.3	-457.5	-206.6	
					(730.2)	(1,235)	(263.8)	
Agriculture main income					12,776***	11,664***	926.0*	15,880***
					(656.3)	(1,164)	(524.0)	(1,263)
Employ labour					991.6***	2,026***	-336.0**	-120.3
					(366.1)	(616.8)	(146.0)	(1,542)
Land type, commercial- rented	326.0	-601.5	-143.4	1,073	1,021	708.8	-151.4	1,806
	(896.6)	(2,084)	(383.8)	(2,026)	(763.3)	(1,794)	(382.2)	(1,616)
Land type, land reform project	-1,778	-904.3	-1,765***		-1,101	703.2	-1,607***	
	(1,777)	(4,049)	(543.0)		(1,517)	(3,486)	(541.6)	
Land type, equity share scheme	209.1	-1,178			987.0	642.3		
	(1,749)	(2,568)			(1,487)	(2,221)		
Land type, communal area	1,095**	-488.5	106.4	2,652**	1,626***	1,159	74.81	2,566***
	(553.7)	(1,225)	(239.6)	(1,139)	(474.5)	(1,082)	(239.4)	(909.2)
Land type, land near dwelling	-78.63	-1,396	13.55	485.5	612.2	212.6	-20.08	1,259
	(498.8)	(1,125)	(198.3)	(1,087)	(426.1)	(990.9)	(197.1)	(872.2)
Land type, other	38.15	-984.6	116.7	531.2	702.2	516.0	86.93	947.9
	(539.6)	(1,257)	(207.9)	(1,171)	(461.4)	(1,105)	(206.8)	(933.4)
Eastern Cape	-27.28	-1,008	627.9	-285.3	155.1	-1,459	580.9	307.8
	(1,472)	(4,468)	(596.2)	(3,783)	(1,252)	(3,840)	(592.8)	(3,024)
Northern Cape	7,470***	2,195	842.6	9,645**	6,106***	415.1	782.4	6,838**
	(1,834)	(6,903)	(723.5)	(4,235)	(1,560)	(5,953)	(718.1)	(3,382)
Free State	903.1	-1,697	1,170*	642.5	1,784	-932.3	1,128*	1,477
	(1,743)	(5,318)	(678.5)	(4,851)	(1,482)	(4,566)	(673.3)	(3,879)
KwaZulu-Natal	1,036	-290.2	592.6	3,555	1,279	-559.4	545.7	2,860
	(1,459)	(4,444)	(571.2)	(3,956)	(1,240)	(3,816)	(566.5)	(3,168)
North West	28.90	1,577	354.1	-2,130	300.7	1,623	344.6	-1,451
	(1,634)	(4,772)	(684.1)	(4,361)	(1,388)	(4,104)	(678.5)	(3,483)

	Panel A				Panel B			
	Without household and farm characteristics				With household and farm characteristics			
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Net farming revenue	All Farmers	Mixed Farmers	Crop Farmers	Livestock Farmers	All Farmers	Mixed Farmers	Crop Farmers	Livestock Farmers
Gauteng	457.8 (1,888)	-754.9 (6,036)	485.0 (689.8)		969.6 (1,605)	-526.7 (5,184)	497.4 (684.8)	
Mpumalanga	1,651 (1,486)	180.6 (4,463)	932.2 (580.9)	4,861 (3,990)	1,738 (1,264)	-490.3 (3,835)	902.6 (577.0)	4,063 (3,190)
Limpopo	-266.4 (1,685)	-2,287 (4,788)	429.2 (679.9)	-1,795 (5,055)	605.0 (1,432)	-1,915 (4,117)	410.7 (674.4)	-300.1 (4,032)
Constant	16,119 (87,728)	272,733 (227,669)	8,526 (34,605)	-129,596 (524,899)	-40,763 (74,910)	130,806 (196,941)	1,988 (34,422)	-109,727 (419,950)
Observations	1,128	408	397	306	1,128	408	397	306
R-squared	0.066	0.042	0.084	0.179	0.328	0.302	0.108	0.484

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 • Soil dummy reference: AR-arenosols, acrisols and lixisols • Province dummy reference: Western Cape • Land type dummy reference: commercial – HH owned

<sup>1</sup> The livestock mitigation strategy includes the use of vet services, pesticides and dips

<sup>2</sup> The crop mitigation strategy includes the use of manure, fertilisers and pesticides

Interestingly, Panel B shows that the use of livestock mitigation strategies (such as vet services, pesticides and dips) are significant and positively related to net revenue. This is represented by the livestock mitigation dummy coefficient, which is positive and significant, showing that practicing such mitigation is likely to increase net revenue. However, the use of crop mitigation strategies (such as manure, fertilisers and pesticides) is not significant in the model, as shown by the dummy coefficient.

Panel B of Table 4.9 considers another household farming characteristic: whether agricultural revenue is the main source of household income (30% or more of total household income). This characteristic is positive and significant for net revenue, as shown by the coefficient of the dummy variable: agriculture main source of income. Another characteristic included in the regression model is the type of land that the household uses for agriculture. The dummy coefficient shows that crop farming earns more revenue when the farm is owned by the household as opposed to being part of a land reform project. In the case of livestock, more revenue is earned when the land is communal land than when the land is owned, which is as expected and implies that increasing marginal net benefits are derived by communal access to large tracts of grazing lands.

Table 4.10 shows the marginal effects<sup>9</sup> and elasticity based on models 1 to 4 of Table 4.9. The marginal effects are calculated so that the overall effect of the climate variable to net revenue can be interpreted. For example, the marginal effect of the climate variable rainfall is the derivative of the coefficient of rainfall and the coefficient of rainfall squared estimated at the means. Therefore, the marginal effect of the rainfall coefficient shows that a marginal decrease in rainfall increases net revenue, with the only exception being the mixed farmers, where the relationship is positive. The rainfall elasticity<sup>10</sup> is negative for both seasons, with the only exception being for the mixed farmers in the winter season. Benhin (2008) analysed climate change impacts on the crop farmers in South Africa and also found a negative relationship between rainfall and crop farming among small farmers.

In the case of temperature, a marginal increase in temperature decreases net revenue in summer but increases revenue in winter. The elasticity for winter is positive and negative for summer temperatures, indicating that an increase in temperature has detrimental effects on net farming revenue in summer. Looking at farm-specific activity, a marginal

<sup>9</sup> The marginal effect values were calculated using STATA nlcom, which allows the calculation of marginal effects for models with interaction

<sup>10</sup> The elasticity was calculated using the following formula: marginal effects \*  $\frac{\text{climate variable mean}}{\text{net revenue mean}}$ , see among others Benhin (2008) who has adopted this formula.

increase in summer temperatures reduces net revenue for livestock farmers, which is consistent with the literature that has highlighted the fact that livestock do not perform well in high temperature, (for example Seo and Mendelsohn, 2006). Similarly, in the case of crop production, Benhin (2008) found that an increase in temperature will lead to an increase in net revenue, which is consistent with the crop farmers' results.

Table 4.10. Marginal effects and elasticity – subsistence farmers

		Marginal effects	Elasticity	Marginal effects	Elasticity
		Winter		Summer	
All farmers	Rainfall	-114.41 (44.73807)	-8.7130	-33.80 (14.65023)	-8.5921
	Temperature	1016.17 (310.5052)	39.6997	-713.56 (357.4547)	-39.7334
Mixed Farmers	Rainfall	31.13 (79.04899)	2.2047	-24.83 (32.95091)	-5.7115
	Temperature	486.58 (641.5055)	17.0565	395.94 (830.5744)	19.6175
Crop Farmers	Rainfall	-5.04 (19.83918)	-1.4274	-5.39 (5.960523)	-5.2610
	Temperature	64.21 (123.8368)	9.6089	120.78 (159.3299)	25.6539
Livestock Farmers	Rainfall	-494.781 (161.2729)	-19.4347	-79.714 (43.57942)	-10.5647
	Temperature	2061.024 (893.1736)	42.3337	-8.71 (1044.325)	-54.6974

These are calculated at the mean using the OLS coefficient of the models 1 to 4 in Table 4.9

The standard errors are in parenthesis

Table 4.11 depicts the impact that climate change will have on the net revenue of subsistence farmers. Future climate change scenarios are used to highlight these changes in net revenue. Future farming revenue is predicted based on three scenarios: (1) an increase in temperature alone; (2) a decrease in rainfall alone; (3) a simultaneous change in both rainfall and temperature. In all predictions the estimated coefficients of Table 4.9 and the 2020, 2050 and 2080 climate change predictions are used.

Table 4.11 shows that a simultaneous decrease in rainfall and an increase in temperature will have adverse effects on both crop farmers and livestock farmers, and that the effects will be higher among the crop farmers (a decrease of net revenue by 144% by the year 2080), than livestock farmers (decrease of 127.7% by 2080). However, the mixed farmers are less likely to feel the impact of this concurrent increase in temperature and decrease in rainfall, as the percentage change in net revenue remains positive (30.4%) by the year 2080. As indicated earlier, mixed farmers appear to be immune to climate change because participating in crop production and owning livestock is an adaptation strategy common among African farmers in response to anticipated undesirable farming seasons (Seo *et al.*, 2009; Nhemachena *et al.*, 2010). This could explain why the mixed farmers appear to be less affected by climate change.

Table 4.11. Climate change impact by type of farmer – subsistence farmers

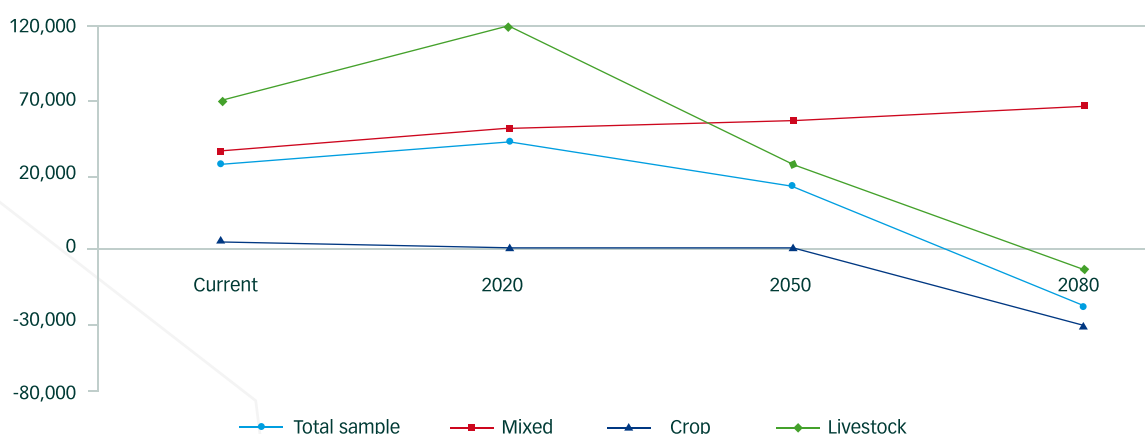
	2020		2050		2080	
	Δ in revenue	% Δ	Δ in revenue	% Δ	Δ in revenue	% Δ
Change in temperature and rain						
All farmers	16,000.68	43.7	-16,200.02	-44.1	-55,300.89	-150.7
Mixed farmers	6,000.75	14.7	7,500.85	18.3	12,500.81	30.4
Crop farmers	-5,500.93	-57.6	-6,000.99	-62.8	-13,900.94	-144.0
Livestock farmers	47,600.02	70.2	-31,100.17	-45.9	-86,500.47	-127.7
Change in temperature						
All farmers	-3,000.81	-8.4	-20,000.15	-54.5	-65,100.42	-177.2
Mixed farmers	6,100.93	15.0	9,900.32	24.0	18,500.82	44.9
Crop farmers	-100.57	-1.6	-6,800.67	-70.7	-13,500.76	-139.7
Livestock farmers	800.20	1.2	-25,200.87	-37.3	-98,500.24	-145.4
Change in rain						
All farmers	19,100.49	52.1	3,800.13	10.4	9,700.52	26.5
Mixed farmers	-100.18	-0.3	-2,300.47	-5.7	-6,000.01	-14.5
Crop farmers	-5,400.36	-55.9	700.68	7.9	-400.18	-4.3
Livestock farmers	46,700.82	69.0	-5,800.30	-8.6	11,900.77	17.7

Based on an increase in temperature and a decrease in rainfall. The predictions are based on the regression models 1–4 of Table 4.9

The results further show that an increase in temperature alone negatively affects net revenue more than a decrease in rainfall alone, highlighting the brutal and pivotal role of global warming in agriculture activities. This is evidenced by the large percentage of decreases caused by temperature (the range is between 145% and 177%) compared to the smaller decreases caused by rainfall (4.3% to 14.5%).

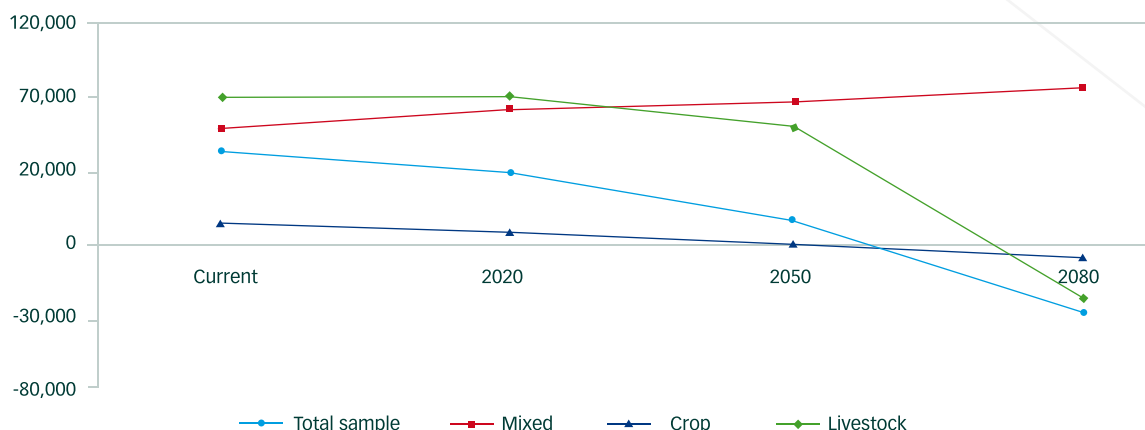
The impact of climate change on net revenue, as shown in Table 4.11, is also depicted in graphical form in Figures 4.1–4.3. The picture that emerges is that a simultaneous decrease in rainfall and increase in temperature has severe effects on net revenue, as shown by the downward sloping net revenue curves. Thus, while a simultaneous change in both rainfall and temperature will negatively affect revenue, the effects are likely to be more severe as a result of an increase in temperature than a decrease in rainfall alone. This is consistent with current African literature on climate change and farming; for example Kurukulasuriya and Mendelsohn (2008); Seo *et al.* (2009) and Nhemachena *et al.* (2010).

Figure 4.1. Change in net revenue as a result of decrease in rainfall and increase in temperature



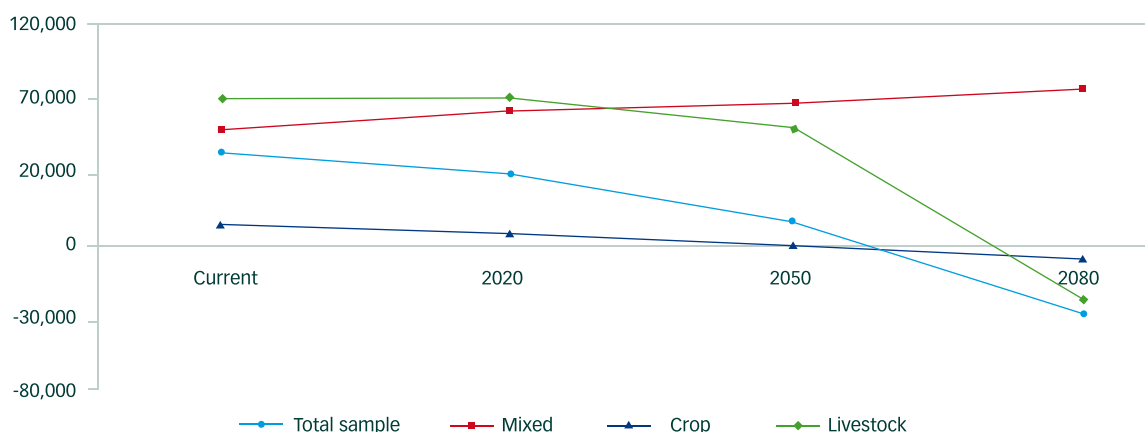
The net revenue curve for mixed farmers shows that households practising both crop and livestock (i.e. mixed) farming are less likely to be affected by climate change. This net revenue curve is increasing at a slower rate, whereas those of the crop farmers and livestock farmers decrease.

Figure 4.2. Change in net revenue as a result of increase in temperature



Furthermore, the distinction between the effects of temperature and of decreased rainfall on farming is clearly shown between the net revenue curves of Figure 4.2 and Figure 4.3. The net revenue curves in Figure 4.2 are steep and downward sloping (with the exception of the mixed farmer net revenue curve), indicating a gradual decrease in net revenue. In contrast, the net revenue curves of Figure 4.3 are relatively flat, indicating that net revenue is likely to remain constant over time.

Figure 4.3. Change in net revenue as a result of decrease in rainfall



The effect of climate change on food security is important, as households engage in agriculture mainly to supplement their income and dietary requirement. Table 4.10 shows that the major part of agricultural produce, especially crops, is retained for the households' own dietary requirements. Thus, the relationship between household food requirements and agricultural revenue needs investigating. To test this relationship, a simple correlation test was applied between household food adequacy<sup>11</sup> and agricultural revenue.

However, because the variable food adequacy is categorical by nature, the polychoric correlation is the best correlation to use, as it measures correlation between categorical variables. This implies that agricultural revenue needs to be converted to a categorical variable, which is done by constructing agricultural revenue quartiles. Table 4.12 shows the correlation between food adequacy and household farming revenue. A positive and significant sign is found between

11 Household food adequacy is a categorical variable that was obtained from the following question in the NIDS dataset: "Concerning your household food consumption, over the past month which of the following is true, it was less than adequate for household needs; or it was adequate for household needs; or it was more than adequate for household needs".

agricultural revenue and food adequacy in general, implying that the higher the agricultural revenue the higher the food adequacy. This is especially the case with agricultural revenue from crop farming.

The above analysis was extended to the Ricardian model where, in this case, the response variable was the categorical variable representing food adequacy to study the impact of food security at household level. The purpose was to capture the fact that households participate in agriculture to satisfy their own household dietary needs, and thus establish the impact climate change will have on household food adequacy. To do this, food adequacy is used as a response variable with similar regressors from Table 4.9. The outputs of these regressions are shown in Table 4.13.

Table 4.12. Correlation between food adequacy and agricultural revenue – subsistence farmers

Type of Revenue	Polychoric rho
Household income per capita (including revenue from agriculture)	0.21416039*** (0.03620008)
Agriculture revenue	0.07855172* (0.03629089)
Agriculture revenue from retained crop farming	0.08411777* (0.04155679)
Agriculture revenue from sale of crop farming	0.04673899 (0.07003469)
Agriculture revenue given as gift from crop farming	0.05359972 (0.05778999)
Agriculture revenue from retained livestock farming	-0.03415902 (0.06351433)
Agriculture revenue from sale of livestock farming	0.03810544 (0.0585823)
Agriculture revenue given as gift from livestock farming	-0.01428345

Standard errors in parentheses \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

All income/revenue variables have been changed to quartiles.

The correlation analysis is based on the total sample size of 1128.

Table 4.13. Ricardian regressions of food adequacy – subsistence farmers

	Panel A				Panel B			
	Without household and farm characteristics				With household and farm characteristics			
Food adequacy	(1) All Farmers	(2) Mixed Farmers	(3) Crop Farmers	(4) Livestock Farmers	(5) All Farmers	(6) Mixed Farmers	(7) Crop Farmers	(8) Livestock Farmers
Rain – winter	-0.0118 (0.0492)	-0.155 (0.0959)	0.00468 (0.105)	-0.0922 (0.130)	-0.0171 (0.0493)	-0.150 (0.0969)	0.00529 (0.105)	-0.0907 (0.131)
Rain – winter2	-0.000449 (0.000700)	0.00236 (0.00148)	-0.000234 (0.00150)	0.000339 (0.00186)	-0.000373 (0.000702)	0.00229 (0.00149)	-0.00299 (0.00150)	0.000395 (0.00187)
Rain – summer	-0.0636** (0.0286)	0.0848 (0.0735)	0.00733 (0.0671)	-0.134** (0.0552)	-0.0600** (0.0287)	0.0802 (0.0740)	0.00550 (0.0670)	-0.130** (0.0563)

	Panel A				Panel B			
	Without household and farm characteristics				With household and farm characteristics			
Food adequacy	(1) All Farmers	(2) Mixed Farmers	(3) Crop Farmers	(4) Livestock Farmers	(5) All Farmers	(6) Mixed Farmers	(7) Crop Farmers	(8) Livestock Farmers
Rain – summer2	0.000433*** (0.000159)	(7.639) (0.000396)	(7.600) (0.000378)	(14.67) (0.000322)	(3.483) (0.000160)	(7.741) (0.000399)	(7.571) (0.000377)	(14.74) (0.000327)
Temperature – winter	-0.000340 (1.051)	-2.03e-05 (2.332)	0.00092*** (1.900)	0.000412*** (3.032)	-0.000315 (1.056)	-1.19e-05 (2.351)	0.00088*** (1.918)	-0.169 (3.052)
Temperature – winter2	0.0101 (0.0380)	-0.100 (0.0819)	0.187*** (0.0678)	-0.113 (0.110)	0.00932 (0.0381)	-0.0992 (0.0826)	0.184*** (0.0685)	-0.110 (0.111)
Temperature – summer	-0.624 (3.464)	-16.81** (7.639)	30.14*** (7.600)	7.356 (14.67)	-0.634 (3.483)	-17.88** (7.741)	29.70*** (7.571)	6.279 (14.74)
Temperature – summer2	0.0137 (0.0861)	0.425** (0.189)	-0.737*** (0.186)	-0.196 (0.369)	0.0137 (0.0865)	0.452** (0.192)	-0.727*** (0.185)	-0.169 (0.371)
Soil 2. A4-lixisols, cambisols, luvisols	-0.503** (0.241)	-0.317 (0.460)	-1.483*** (0.524)	-1.140* (0.689)	-0.498** (0.241)	-0.313 (0.460)	-1.395*** (0.524)	-1.104 (0.694)
Soil 3. AR-arenosols	-0.584 (0.396)	-2.524*** (0.932)	0.149 (0.762)	2.258 (1.833)	-0.537 (0.398)	-2.657*** (0.945)	0.333 (0.770)	2.084 (1.838)
Soil 4. B1-ferralsols, acrisols, lixisols	-0.471 (0.549)		-0.991 (0.662)	-8.866 (773.2)	-0.436 (0.550)		-0.879 (0.665)	-8.689 (681.3)
Soil 6. C1-luvisols, planosols and solonetz	0.0282 (0.156)	-0.365 (0.285)	-0.0511 (0.359)	-0.0515 (0.311)	0.0607 (0.157)	-0.337 (0.286)	0.0874 (0.372)	-0.0153 (0.313)
Soil 7. E1-leptosols, regosols, calcisols	-0.288* (0.148)	-0.673** (0.318)	-0.782* (0.414)	-0.330 (0.248)	-0.272* (0.149)	-0.721** (0.321)	-0.671 (0.421)	-0.326 (0.249)
Livestock mitigation strategy <sup>1</sup>					-0.220 (0.359)	-0.481 (0.448)		0.270 (0.895)
Crop mitigation strategy <sup>2</sup>					0.599 (0.366)	0.498 (0.600)	0.784 (0.541)	
Main HH income from farming					-0.0759 (0.279)	-0.750 (0.496)	-0.164 (0.919)	0.565 (0.429)

	Panel A				Panel B			
	Without household and farm characteristics				With household and farm characteristics			
Food adequacy	(1) All Farmers	(2) Mixed Farmers	(3) Crop Farmers	(4) Livestock Farmers	(5) All Farmers	(6) Mixed Farmers	(7) Crop Farmers	(8) Livestock Farmers
Employed labour					0.194 (0.151)	-0.109 (0.229)	0.265 (0.256)	0.902* (0.491)
Land type, commercial-employed	0.760** (0.308)	0.360 (0.608)	-0.0735 (0.661)	1.447*** (0.538)	0.776** (0.308)	0.288 (0.612)	-0.110 (0.664)	1.473*** (0.540)
Land type, land reform project	-0.594 (0.743)	-4.669 (285.5)	-4.684 (200.0)		-0.695 (0.757)	-4.747 (285.5)	-4.881 (198.7)	
Land type, equity share scheme	0.819 (0.603)	1.418* (0.782)			0.847 (0.603)	1.325* (0.791)		
Land type, communal area	0.00223 (0.202)	-0.327 (0.372)	-0.526 (0.417)	0.593* (0.344)	0.0298 (0.204)	-0.402 (0.385)	-0.472 (0.419)	0.579* (0.345)
Land type, land near HH dwelling	0.114 (0.181)	-0.100 (0.337)	-0.596* (0.338)	0.737** (0.330)	0.129 (0.182)	-0.191 (0.348)	-0.568* (0.338)	0.713** (0.333)
Land type, other	0.215 (0.195)	-0.325 (0.380)	-0.411 (0.355)	1.120*** (0.349)	0.241 (0.196)	-0.405 (0.394)	-0.378 (0.356)	1.132*** (0.350)
Eastern Cape	-1.619*** (0.506)	-8.157 (242.7)	-2.129** (1.086)	-1.904* (1.007)	-1.647*** (0.506)	-8.134 (242.7)	-2.130** (1.086)	-1.897* (1.010)
Northern Cape	-1.254** (0.633)	-1.656 (374.7)	-7.320 (200.2)	-0.881 (1.128)	-1.230* (0.634)	-1.557 (374.7)	-7.333 (200.2)	-0.931 (1.131)
Free State	-1.612*** (0.602)	-8.476 (242.7)	-2.300* (1.260)	-1.014 (1.299)	-1.623*** (0.602)	-8.522 (242.7)	-2.332* (1.258)	-0.996 (1.305)
KwaZulu-Natal	-2.102*** (0.502)	-8.413 (242.7)	-2.876*** (1.048)	-2.721** (1.059)	-2.118*** (0.502)	-8.412 (242.7)	-2.856*** (1.045)	-2.658** (1.065)
North West	-1.401** (0.563)	-7.768 (242.7)	-1.829 (1.251)	-1.552 (1.173)	-1.409** (0.563)	-7.753 (242.7)	-1.823 (1.249)	-1.515 (1.177)
Gauteng	-1.726*** (0.649)	-13.70 (374.7)	-1.746 (1.261)		-1.763*** (0.649)	-13.71 (374.7)	-1.793 (1.259)	
Mpumalanga	0.737 (0.510)	-5.549 (242.7)	0.885 (1.158)	0.0572 (1.040)	0.709 (0.510)	-5.510 (242.7)	0.838 (1.154)	0.0918 (1.042)
Limpopo	-1.711*** (0.582)	-9.095 (242.7)	-1.556 (1.250)	-1.849 (1.360)	-1.730*** (0.583)	-9.117 (242.7)	-1.571 (1.247)	-1.759 (1.364)
cut <sup>1</sup>								



	Panel A				Panel B			
	Without household and farm characteristics				With household and farm characteristics			
Food adequacy	(1) All Farmers	(2) Mixed Farmers	(3) Crop Farmers	(4) Livestock Farmers	(5) All Farmers	(6) Mixed Farmers	(7) Crop Farmers	(8) Livestock Farmers
Constant	-13.32 (32.21)	-156.5 (253.5)	270.1*** (72.36)	83.59 (151.7)	-12.80 (32.39)	-167.5 (253.7)	266.7*** (72.00)	72.98 (152.4)
cut <sup>2</sup>								
Constant	-11.80 (32.21)	-154.8 (253.5)	271.5*** (72.37)	85.28 (151.7)	-11.29 (32.39)	-165.8 (253.7)	268.2*** (72.01)	74.70 (152.4)
Observations	1,127	408	397	305	1,127	408	397	305

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 · Soil dummy reference: AR-arenosols, acrisols and lixisols · Province dummy reference: Western Cape · Land type dummy reference: commercial- HH owned

<sup>1</sup> The livestock mitigation strategy include the use of vet services, pesticides and dips

<sup>2</sup> The crop mitigation strategy include the use of manure, fertilisers and pesticides

Table 4.13 reveals that climate variables are significant determinants of household food adequacy. Furthermore, the regression models are more significant for crop farmers than for livestock and mixed farmers. This is consistent with the early findings in Table 4.11, which showed that most of the agricultural output from crop production is retained for household consumption, and Table 4.12, where the polychoric correlation showed crop revenue to be significantly correlated with food adequacy. Hence, the crop farming regression model would be expected to be more significant than the other models representing livestock and mixed farmers.

Table 4.13 also depicts evidence of a quadratic relationship between the climate and the response variable. Summer rainfall and winter temperatures have a 'U-shaped' quadratic relationship with net revenue, which is significant for livestock farmers and crop farmers. Winter temperature is significant and has a 'hill-shaped' quadratic relationship with net revenue for crop farmers and is 'U-shaped' and significant for mixed farmers.

Table 4.14. Marginal effects and elasticity of food adequacy – subsistence farmers

		Marginal effects	Elasticity	Marginal effects	Elasticity
		Winter		Summer	
All farmers	Rainfall	-114.41 (44.73807)	-8.7130	-33.80 (14.65023)	-8.5921
	Temperature	1016.17 (310.5052)	39.6997	-713.56 (357.4547)	-39.7334
Mixed Farmers	Rainfall	31.13 (79.04899)	2.2047	-24.83 (32.95091)	-5.7115
	Temperature	486.58 (641.5055)	17.0565	395.94 (830.5744)	19.6175
Crop Farmers	Rainfall	-5.04 (19.83918)	-1.4274	-5.39 (5.960523)	-5.2610
	Temperature	64.21 (123.8368)	9.6089	120.78 (159.3299)	25.6539
Livestock Farmers	Rainfall	-494.781 (161.2729)	-19.4347	-79.714 (43.57942)	-10.5647
	Temperature	2061.024 (893.1736)	42.3337	-8.71 (1044.325)	-54.6974

Based on an increase in temperature and a decrease in rainfall

The predictions are based on the regression models 1-4 of Table 4.13

The marginal effects in Table 4.14 show that a decrease in summer rainfall decreases food adequacy for all types of farmers, whereas a decrease in winter rainfall increases food adequacy. An increase in winter temperature also increases food adequacy, whereas an increase in summer temperature decreases food adequacy for all farmers except for mixed farmers.

#### 4.4.2 Commercial Farmers

Table 4.15 shows the descriptive statistics for the four types of commercial farmers: mixed farmers, crop farmers, horticulture, and livestock farmers. Unlike subsistence farmers who participate in agriculture mainly to supplement their household income and dietary needs, the commercial farmers seek to generate revenue and manage their farms as business units.

Table 4.15. Descriptive statistics – commercial farmers<sup>12</sup>

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
<b>Net revenue</b>	20797	626,746.20	10,900,000.00	-782,000,000.00	674,000,000.00
Type of soil	20797	6.59	3	1	11
Av rain – yearly	20797	53.4	18.2	6.4	93.9
Av rain – winter	20797	25.3	14.4	7.5	114.6
Av rain – summer	20797	81.4	31.1	4.1	130.4
Av temp – yearly	20797	17.2	1.9	11.9	22.6
Av temp – winter	20797	13.8	2.3	8.0	20.0
Av temp – summer	20797	20.5	1.9	15.8	25.2
Mixed farmers					
<b>Net revenue</b>	<b>2863</b>	<b>776,377.90</b>	<b>5,162,849.00</b>	<b>-49,800,000.00</b>	<b>190,000,000.00</b>
Type of soil	2863	6.42	3	1	11
Av rain – yearly	2863	53.5	19.0	6.4	93.9
Av rain – winter	2863	27.8	16.1	7.5	114.6
Av rain – summer	2863	79.1	34.0	4.1	130.4
Av temp – yearly	2863	17.2	1.8	11.9	22.6
Av temp – winter	2863	13.8	2.1	8.0	20.0
Av temp – summer	2863	20.5	1.9	15.8	25.2
Crop farmers					
<b>Net revenue</b>	<b>1864</b>	<b>296,977.40</b>	<b>2,790,210.00</b>	<b>-18,000,000.00</b>	<b>98,800,000.00</b>
Type of soil	1864	6.57	3	1	11
Av rain – yearly	1864	58.5	17.4	6.4	93.9
Av rain – winter	1864	26.1	12.8	7.5	114.6
Av rain – summer	1864	90.9	28.8	4.1	130.4
Av temp – yearly	1864	17.0	1.8	11.9	22.6
Av temp – winter	1864	13.7	2.1	8.0	20.0
Av temp – summer	1864	20.3	1.7	15.8	25.2
Horticulture farmers					22.4

12 Throughout this paper rainfall figures are monthly averages, and not annual averages.

<b>Net revenue</b>	<b>2169</b>	<b>478,838.40</b>	<b>4,218,380.00</b>	<b>-88,200,000.00</b>	<b>49,900,000.00</b>
Type of soil	2169	6.20	3	1	11
Av rain – yearly	2169	55.2	17.0	6.4	93.9
Av rain – winter	2169	24.3	11.7	7.5	114.6
Av rain – summer	2169	86.2	28.5	4.1	130.4
Av temp – yearly	2169	17.3	2.2	11.9	22.6
Av temp – winter	2169	14.0	2.7	8.0	20.0
Av temp – summer	2169	20.6	2.1	15.8	25.2
Livestock farmers					
<b>Net revenue</b>	<b>13901</b>	<b>663,226.00</b>	<b>13,000,000.00</b>	<b>-782,000,000.00</b>	<b>674,000,000.00</b>
Type of soil	13901	6.69	3	1	11
Av rain – yearly	13901	52.3	18.2	6.4	93.9
Av rain – winter	13901	24.9	14.5	7.5	114.6
Av rain – summer	13901	79.8	30.9	4.1	130.4
Av temp – yearly	13901	17.2	1.9	11.9	22.6
Av temp – winter	13901	13.8	2.2	8.0	20.0
Av temp – summer	13901	20.6	1.9	15.8	25.2

The majority of the commercial farmers are livestock farmers (13 901), while crop farmers (1 864) are in the minority. The descriptive statistics also show that mixed farmers generate the highest agricultural net revenue (R776,378), and crop farmers generate the least (R296,977). This is similar to the subsistence farmers, where households that practise crop farming generate the least net revenue. The commercial crop farmers are mainly found in areas with relatively higher yearly rainfall (58.5mm monthly average), while livestock farmers inhabit the lower rainfall areas (52.3mm monthly average).

Table 4.16. Ricardian regressions of net revenue model – commercial farmers

Panel A					
Without farm characteristics					
Dependent variable	(1)	(2)	(3)	(4)	(5)
Net farming revenue	All Farmers	Mixed Farmers	Crop Farmers	Horticulture Farmers	Livestock Farmers
Rain – winter	-14,080 (25,368)	-51,662 (33,645)	22,217 (22,259)	-34,037 (38,807)	-6,656 (36,882)
Rain – winter <sup>2</sup>	86.60 (269.5)	605.8* (340.1)	-268.3 (219.2)	151.3 (392.6)	-27.52 (397.0)
Rain – summer	-4,355 (10,646)	-17,268 (13,159)	-17,963* (10,033)	-4,877 (15,067)	-438.1 (15,851)
Rain – summer <sup>2</sup>	42.08 (78.56)	157.0 (97.11)	140.0** (65.90)	-8.639 (103.3)	19.84 (120.2)
Temperature – winter	180,755 (444,328)	-359,562 (590,012)	-419,669 (475,114)	563,140 (530,717)	222,138 (655,101)

Panel A					
Without farm characteristics					
Dependent variable	(1)	(2)	(3)	(4)	(5)
Net farming revenue	All Farmers	Mixed Farmers	Crop Farmers	Horticulture Farmers	Livestock Farmers
Temperature – winter <sup>2</sup>	-1,716 (16,166)	11,396 (21,199)	11,947 (17,377)	-15,025 (18,653)	-942.0 (24,107)
Temperature – summer	1,832,408* (1,071,299)	1,717,439 (1,450,469)	1,330,138 (1,240,150)	1,441,000 (1,089,000)	2,228,000 (1,596,000)
Temperature – summer <sup>2</sup>	-46,319* (26,667)	-42,046 (35,901)	-29,290 (30,751)	-36,397 (27,311)	-57,173 (39,844)
Soil 2. A4-lixisols, cambisols, luvisols	276,314 (376,030)	-185,956 (483,626)	197,835 (324,124)	967,705* (583,661)	312,767 (538,228)
Soil 3. AR-arenosols	166,285 (488,706)	-30,037 (617,147)	-109,185 (444,137)	715,661 (591,410)	228,038 (756,314)
Soil 4. B1-ferralsols, acrisols, lixisols &	183,204 (623,709)	-191,505 (958,005)	-87,204 (1,081,587)	922,873 (834,814)	152,041 (849,145)
Soil 6. C1-luvisols, planosols and solonetz	981,606** (449,132)	-230,925 (563,631)	628,876 (458,121)	1,453,000** (709,947)	1,167,000* (636,684)
Soil 7. E1-leptosols, regosols, calcisols	265,117 (321,180)	-6,801 (413,976)	141,431 (238,290)	1,026,000** (481,398)	291,184 (469,230)
Water purchased					
Mitigation strategy <sup>1</sup>					
Insurance					
Farm mortgaged					
Constant	-19,400,000** (9,054,216)	- 12,800,000 (12,700,000)	- 11,200,000 (10,200,000)	-18,190,000** (8,995,000)	-23,900,000* (13,440,000)
Observations	20,797	2,863	1,864	2,169	13,901
R-squared	0.001	0.003	0.007	0.010	0.001

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 · Soil dummy reference: AR-arenosols, acrisols and lixisols · Province dummy reference: Western Cape · Land type dummy reference: commercial- HH owned

<sup>1</sup> The mitigation strategy include the use of vet services, pesticides and manure

Panel B					
With farm characteristics					
Food adequacy	(1) All Farmers	(2) Mixed Farmers	(3) Crop Farmers	(4) Horticulture Farmers	(5) Livestock Farmers
Rain – winter	-14,080 (25,368)	-51,662 (33,645)	22,217 (22,259)	-34,037 (38,807)	-6,656 (36,882)
Rain – winter2	86.60 (269.5)	605.8* (340.1)	-268.3 (219.2)	151.3 (392.6)	-27.52 (397.0)
Rain – summer	-4,355 (10,646)	-17,268 (13,159)	-17,963* (10,033)	-4,877 (15,067)	-438.1 (15,851)
Rain – summer2	42.08 (78.56)	157.0 (97.11)	140.0** (65.90)	-8.639 (103.3)	19.84 (120.2)
Temperature – winter	180,755 (444,328)	-359,562 (590,012)	-419,669 (475,114)	563,140 (530,717)	222,138 (655,101)
Temperature – winter2	-1,716 (16,166)	11,396 (21,199)	11,947 (17,377)	-15,025 (18,653)	-942.0 (24,107)
Temperature – summer	1,832,408* (1,071,299)	1,717,439 (1,450,469)	1,330,138 (1,240,150)	1,441,000 (1,089,000)	2,228,000 (1,596,000)
Temperature – summer2	-46,319* (26,667)	-42,046 (35,901)	-29,290 (30,751)	-36,397 (27,311)	-57,173 (39,844)
Soil 2. A4-lixisols, cambisols, luvisols	276,314 (376,030)	-185,956 (483,626)	197,835 (324,124)	967,705* (583,661)	312,767 (538,228)
Soil 3. AR-arenosols	166,285 (488,706)	-30,037 (617,147)	-109,185 (444,137)	715,661 (591,410)	228,038 (756,314)
Soil 4. B1-ferralsols, acrisols, lixisols &	183,204 (623,709)	-191,505 (958,005)	-87,204 (1,081,587)	922,873 (834,814)	152,041 (849,145)
Soil 6. C1-luvisols, planosols and solonetz	981,606** (449,132)	-230,925 (563,631)	628,876 (458,121)	1,453,000** (709,947)	1,167,000* (636,684)
Soil 7. E1-leptosols, regosols, calcisols	265,117 (321,180)	-6,801 (413,976)	141,431 (238,290)	1,026,000** (481,398)	291,184 (469,230)
Water purchased					
Mitigation strategy1					
Insurance					
Farm mortgaged					
Constant	-19,400,000** (9,054,216)	- 12,800,000 (12,700,000)	- 11,200,000 (10,200,000)	-18,190,000** (8,995,000)	-23,900,000* (13,440,000)
Observations	20,797	2,863	1,864	2,169	13,901
R-squared	0.001	0.003	0.007	0.010	0.001

Table 4.16 shows the Ricardian regression model for the commercial farmers. The models support the quadratic relationship between climate variables and net revenue. Similar to the subsistence analysis and consistent with current literature, the effects of the climate variables on net revenue vary by type of farmer. The climate variables also appear to be more significant among the crop farmers. Furthermore, rainfall appears to have a 'U-shaped' quadratic relationship with net revenue for all farmers except the crop farmers, although it is only significant among the crop and mixed farmers. On the other hand, temperature has a 'hill-shaped' relationship with net revenue but only becomes significant when all farmers are considered.

Similar to the subsistence farmer analysis, Panel B of Table 4.16 introduces farm characteristics, specifically a dummy variable of whether the commercial farmer purchases water and an additional dummy variable of whether the farm applies any mitigation strategies (here the use of vet services, pesticides and manure). The regression results indicate that net revenue significantly increases if a commercial farmer purchases water. Adopting a mitigation strategy, such as using manure, pesticides or vet services, also has the effect of increasing net revenue. Having access to insurance (represented by the insurance dummy in the regression model) has a positive and significant effect on net revenue. This supports the current literature on climate change and adaptation, which has established that access to insurance and extensions are paramount mitigation strategies to climate change (Morduch, 1995; Hassan and Nhemachena 2008; Di Falco & Chavas, 2009; Deressa *et al.*, 2008).

To allow for ease of interpretation, the marginal effects and elasticity of the climate variables were generated, as shown in Table 4.17. A marginal increase in summer rainfall has the effect of increasing net revenue for all farmers except horticultural farmers, while an increase in winter rainfall has the opposite effects for all the farmers. A marginal increase in summer temperature reduces net revenue for livestock farmers, which is similar to subsistence farmers and consistent with literature stating that high temperatures are harmful to livestock (Seo and Mendelsohn, 2006).

Table 4.17. Marginal effects and elasticity – commercial farmers

		Marginal effects	Elasticity	Marginal effects	Elasticity
		Winter		Summer	
Total sample	Rainfall	-9694.52 (12938.14)	-0.3917	2493.64 (3863.517)	0.3238
	Temperature	133438.20 (74170.92)	2.9349	-70787.66 (98603.88)	-2.3204
Mixed farmers	Rainfall	-17972.93 (16376.91)	-0.6437	7587.12 (4691.673)	0.7735
	Temperature	-44477.81 (106376.2)	-0.7920	-5308.37 (136285.7)	-0.1401
Crop farmers	Rainfall	8196.06 (12120.62)	0.7212	7488.00 (3510.595)	2.2916
	Temperature	-92250.35 (69928.21)	-4.2567	139407.70 (86609.65)	9.5416
Horticulture farmers	Rainfall	-26692.93 (21563.88)	-1.3531	-6366.06 (5414.202)	-1.1460
	Temperature	142061.50 (110336)	4.1572	-60495.02 (154137.8)	-2.6066
Livestock farmers	Rainfall	-8023.959 (18842.09)	-0.3008	2729.607 (5767.324)	0.3285
	Temperature	196229.200 (106998.7)	4.0689	-124057.300 (142596.1)	-3.8480

These are calculated at the mean using the OLS coefficient of the models 1 to 5 in Table 4.16  
The standard errors are in parenthesis

Table 4.18 shows the projected impact of climate change using the 2020, 2050 and 2080 climate predictions. The results show similar findings to those of subsistence farmers: while all farmers will be affected by climate change, the effects will be felt more by crop farmers and least by mixed farmers. Similar to subsistence farmers, an increase in temperature alone negatively affects net revenue more than a decrease in rainfall. For example, an increase in temperature will cause a 119.2% decrease in net revenue for all farmers by 2080, but a decrease in rainfall will result in an 8.3% increase in net revenue by 2080. Revenue appears to be increasing in the case of a decrease in rainfall, but is increasing at a lower rate than normal, which is also an undesirable condition. Overall, climate change seems to affect most severely agricultural net revenues of smaller farms with net revenues of less than R500,000 per year. When those farms are excluded from the sample, the losses are 10–20% less severe for all farmers.

Table 4.18. Climate change impact by type of farmer – commercial farmers

	2020		2050		2080	
	$\Delta$ in revenue	% $\Delta$	$\Delta$ in revenue	% $\Delta$	$\Delta$ in revenue	% $\Delta$
Change in temperature and rain						
All farmers	1570,000.76	0.3	-114503,000.90	-18.3	-694903,000.60	-110.9
Mixed farmers	-71396,000.50	-9.2	-148688,000.50	-19.1	-549917,000.80	-70.8
Crop farmers	-17134,000.98	-5.8	-114128,000.90	-38.4	-434065,000.50	-146.1
Horticulture farmers	37449,000.25	7.8	-17162,000.15	-3.6	-405165,000.80	-84.6
Livestock farmers	-6072,000.98	-0.9	-126040,000.80	-19.0	-842914,000.00	-127.3
Change in temperature						
All farmers	-39621,000.85	-6.3	-150582,000.50	-24.0	-746772,000.70	-119.2
Mixed farmers	-110253,000.90	-14.2	-158120,000.30	-20.4	-575645,000.80	-74.1
Crop farmers	-20985,000.23	-7.1	-103697,000.50	-34.9	-422667,000.80	-142.3
Horticulture farmers	-9203,000.88	-1.9	-99167,000.03	-20.7	-508777,000.10	-106.2
Livestock farmers	-41170,000.96	-6.2	-157369.50	-23.8	-883062,000.10	-133.3
Change in rain						
All farmers	41192,000.61	6.6	36078,000.57	5.8	51869,000.10	8.3
Mixed farmers	38857,000.37	5.0	9431,000.88	1.2	25728,000.04	3.3
Crop farmers	7158,000.93	2.4	-7122,000.82	-2.4	-8089,000.10	-2.7
Horticulture farmers	46653,000.14	9.7	82004,000.88	17.1	103611,000.20	126.3
Livestock farmers	35097,000.97	5.3	31328,000.70	4.7	40148,000.03	6.1

Based on an increase in temperature and a decrease in rainfall

The predictions are based on the regression models 1-3 of Table 4.16

Figure 4.4 to Figure 4.6 provide a pictorial analysis of the effects of climate change on net revenue as shown in Table 4.18. All the curves clearly slope downwards, indicating that climate change has a negative impact on net revenue. Similar to the findings for subsistence farmers, mixed commercial farmers are less likely to be affected by climate change. As Figure 4.4 shows, the net revenue curve for mixed farmers is flatter and appears on the upper part of the graph, above the other net revenue curves.

Figure 4.4. Change in net revenue (in rands) as a result of decrease in rainfall and increased temperature

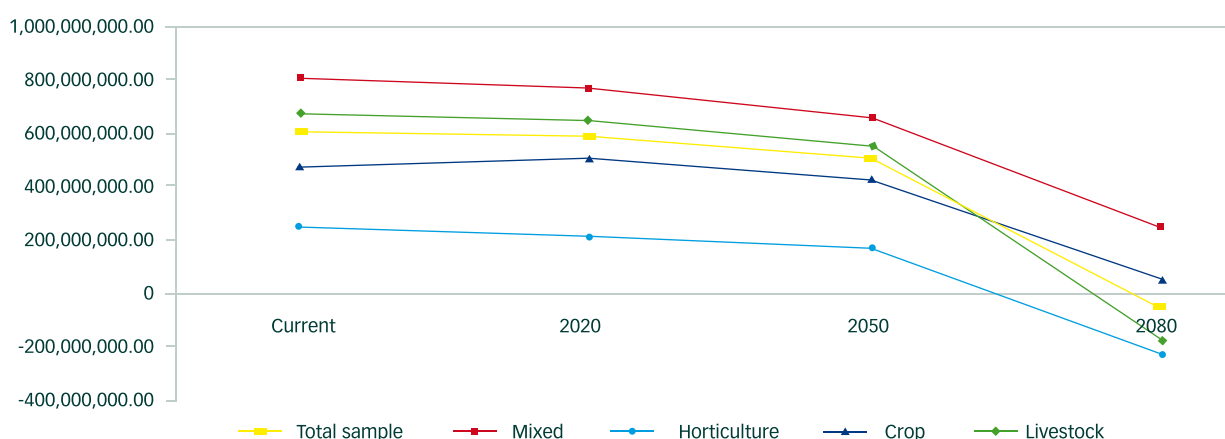


Figure 4.5. Change in net revenue (in rands) as a result of increased temperature

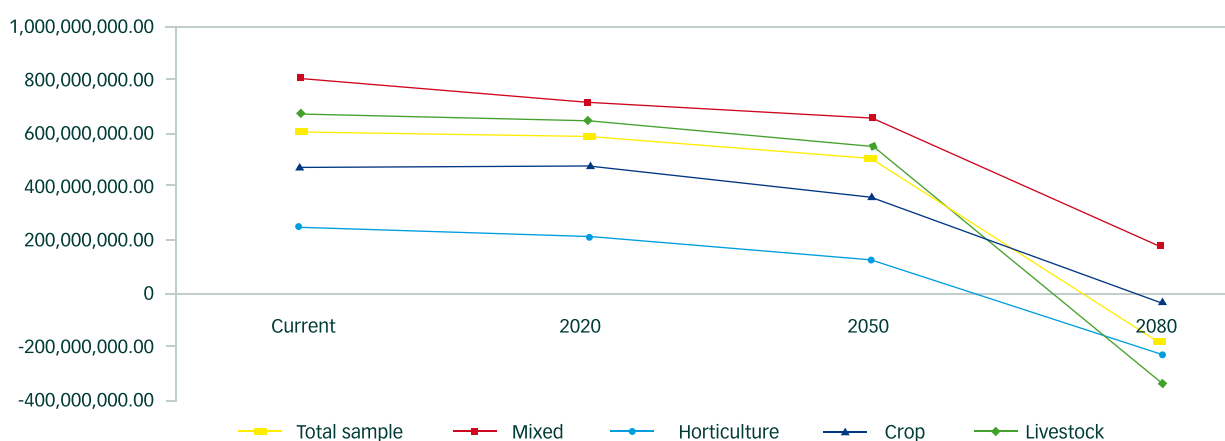
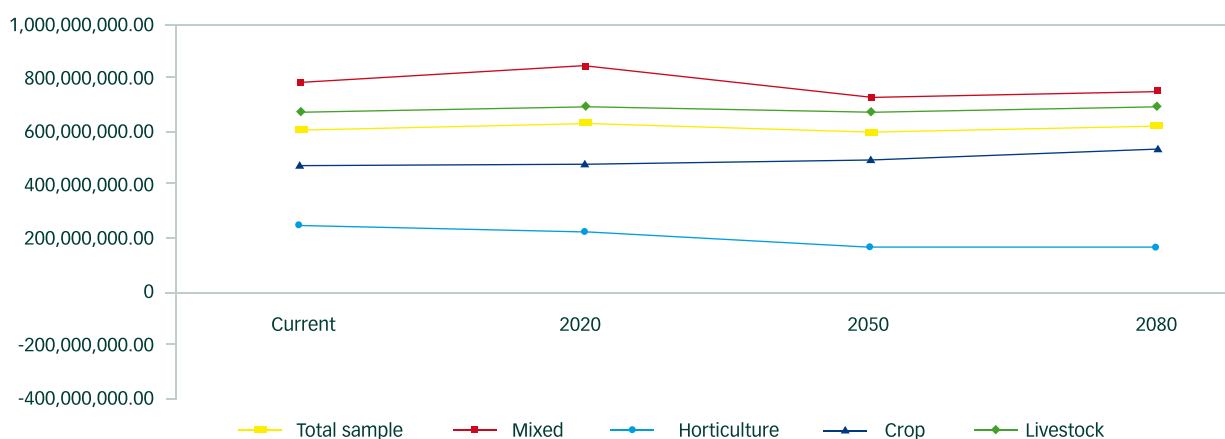


Figure 4.6. Change in net revenue(in rands) as a result of decreased rainfall



Similar to subsistence farmers, the results show that an increase in temperature is likely to negatively affect net revenue more than a decrease in rainfall (Figures 4.5 and 4.6): the net revenue curves for temperature increases are steep and downward sloping (Figure 4.5), whereas those for decrease in rainfall are relatively flat and placed on the upper part of the graph (Figure 4.6).

#### 4.4.3 Total Loss in Net Revenue by Province

Climate change will affect continents, and regions within a country, differently. Therefore, the impact of climate change on different provinces of South Africa was assessed. This section includes the results for commercial farmers but not



for subsistence farmers as their sampling across provinces is biased, with few observations for a number of provinces such as the Northern Cape, Western Cape and Gauteng.

Table 4.19 illustrates the revenue loss for the different categories of commercial farmers by province. As expected, the effects of climate change vary by province: the most severe overall revenue losses for 2080 are predicted in the North West (of R88,455,490) and in Limpopo (of R106,544,600). In terms of percentage change, the Northern Cape loses the most net revenue (439% decrease), followed by North West (231.1% decrease) and Limpopo (158.6% decrease). It is obvious that further increases in temperature and decreases in rainfall are likely to make these already arid areas less productive.

- Among **crop farmers**, the following provinces could be the hardest hit by 2080: North West – R126,662,600 (1,677% decline), Limpopo – R106,251,000 (226% decline), Free State – R106,022,000 (178% decline) and Gauteng – R85,024,610 (1,639% decline).
- Among **livestock farmers**, Limpopo will experience the greatest decline in revenue, to R114,352,300 (270% decline). However, in terms of percentage change, other provinces also seem to be hard hit, in particular the Free State (462% decline), North West (418% decline) and Northern Cape (1,396.7% decline).
- Among **horticulture farmers**, the Northern Cape, Mpumalanga and Western Cape appear to be the worst off provinces, with a total loss of R284,605,100 (208% decline), R144,229,000 (120% decline) and R177,815,100 (119% decline) respectively.
- Among the **mixed farmers**, the worst-affected provinces are Limpopo and North West, with a loss of R118,734,700 (82%) and R114,693 (361.3%) respectively.

The provinces already facing harsh climate conditions will be the most severely affected, which concurs with the argument that Africa is likely to feel the impact of climate change more than other global regions (Kruger and Shongwe, 2004; Benhin, 2008).

Table 4.19. Total loss in revenue of commercial farmers by province

	2020		2050		2080	
	Δ in revenue	% Δ	Δ in revenue	% Δ	Δ in revenue	% Δ
All farmers						
Eastern Cape	3,141,408	6.0	10,150,570	19.3	-28,411,600	-54.1
Free State	1,119,872	2.1	-13,549,220	-24.8	-71,723,060	-131.3
Gauteng	1,817,924	0.8	-12,523,080	-5.3	-77,673,670	-32.9
KwaZulu-Natal	9,944,743	8.3	4,302,936	3.6	-36,534,210	-30.4
Limpopo	1,029,631	1.5	-29,026,390	-43.2	-106,544,600	-158.6
Mpumalanga	5,713,480	6.9	1,690,323	2.0	-42,460,720	-51.0
North West	-6,103,211	-15.9	-16,381,910	-42.8	-88,455,490	-231.1
Northern Cape	-10,264,900	-62.5	-18,205,140	-110.8	-72,198,230	-439.6
Western Cape	3,057,832	4.2	-16,399,600	-22.5	-81,756,590	-112.3
Mixed farmers						
Eastern Cape	-3,666,069	-3.9	15,541,940	16.6	-8,691,356	-9.3
Free State	-212,306	-0.2	-8,271,312	-8.4	-69,911,390	-70.7
Gauteng	-6,273,643	-3.2	-7,100,470	-3.6	-90,438,240	-45.6
KwaZulu-Natal	5,447,123	2.6	-248,571	-0.1	-51,586,280	-24.6

	2020		2050		2080	
	$\Delta$ in revenue	% $\Delta$	$\Delta$ in revenue	% $\Delta$	$\Delta$ in revenue	% $\Delta$
Limpopo	-3,887,866	-2.7	-28,809,720	-20.0	-118,734,700	-82.4
Mpumalanga	5,773,134	3.2	22,480,110	12.6	-163,627	-0.1
North West	-9,879,199	-31.1	-32,481,020	-102.3	-114,693,200	-361.3
Northern Cape	-605,691	-0.5	-7,059,142	-6.0	-42,979,080	-36.5
Western Cape	4,884,206	5.2	11,673,430	12.4	-13,996,380	-14.9
Horticulture farmers						
Eastern Cape	-7,230,091	-5.0	12,256,330	8.4	-4,973,261	-3.4
Free State	-865,847	-0.6	3,193,784	2.3	-25,142,550	-18.1
Gauteng	1,995,842	0.4	-7,300,849	-1.5	-68,839,210	-13.9
KwaZulu-Natal	17,414,650	21.1	11,512,480	14.0	-8,782,142	-10.7
Limpopo	-4,540,622	-3.8	2,224,046	1.9	-30,879,930	-26.0
Mpumalanga	-20,181,680	-16.8	-39,718,530	-33.1	-144,229,000	-120.1
North West	-1,114,616	-0.6	-13,477,090	-7.6	-90,332,620	-51.0
Northern Cape	-10,177,480	-7.5	-144,683,200	-106.1	-284,605,100	-208.6
Western Cape	2,257,265	2.3	-29,023,630	-29.3	-117,815,100	-119.0
Crop farmers						
Eastern Cape	-13,388,570	-14.5	12,575,500	13.6	-18,225,780	-19.7
Free State	1,158,827	2.0	-25,330,100	-42.7	-106,022,000	-178.5
Gauteng	-5,412,822	-104.4	-1,384,259	-26.7	-85,024,610	-1639.3
KwaZulu-Natal	8,803,300	10.6	4,969,197	6.0	-30,953,480	-37.2
Limpopo	-8,987,322	-19.2	-18,089,660	-38.6	-106,251,000	-226.6
Mpumalanga	6,791,558	27.5	5,622,757	22.7	-39,155,980	-158.4
North West	-3,376,198	-44.7	-34,357,980	-455.0	-126,662,600	-1677.3
Northern Cape	17,354,090	188.1	3,369,061	36.5	-12,137,260	-131.6
Western Cape	5,298,141	9.8	12,844,580	23.8	3,617,346	6.7
Livestock farmers						
Eastern Cape	-1,089,660	-4.5	8,381,534	34.9	-31,890,710	-132.7
Free State	-237,209	-1.5	-18,266,100	-117.5	-71,983,640	-462.9
Gauteng	2,297,208	1.1	-15,416,270	-7.2	-77,432,630	-36.0
KwaZulu-Natal	10,322,670	3.8	3,833,253	1.4	-40,935,780	-15.3
Limpopo	4,928,809	11.7	-31,108,950	-73.6	-114,352,300	-270.6
Mpumalanga	7,089,438	3.2	-4,044,091	-1.9	-39,590,300	-18.1
North West	-5,399,523	-33.8	-4,616,182	-28.9	-66,763,390	-418.4
Northern Cape	-17,007,730	-518.7	-3,531,524	-107.7	-45,800,990	-1396.7
Western Cape	1,883,231	5.0	-16,827,660	-44.7	-72,912,520	-193.9

Figure 4.4 illustrates the total loss in net revenue over time for commercial farmers, as a result of a concurrent increase in temperature and a decrease in rainfall prediction for 2020, 2050 and 2080. In all the provinces, the net revenue curves slope downward, indicating that climate change will have an adverse effect in all the provinces, resulting in decreasing net revenue over time.

Figure 4.7. Predicted change in net revenue as a result of change in rainfall and temperature at a provincial level

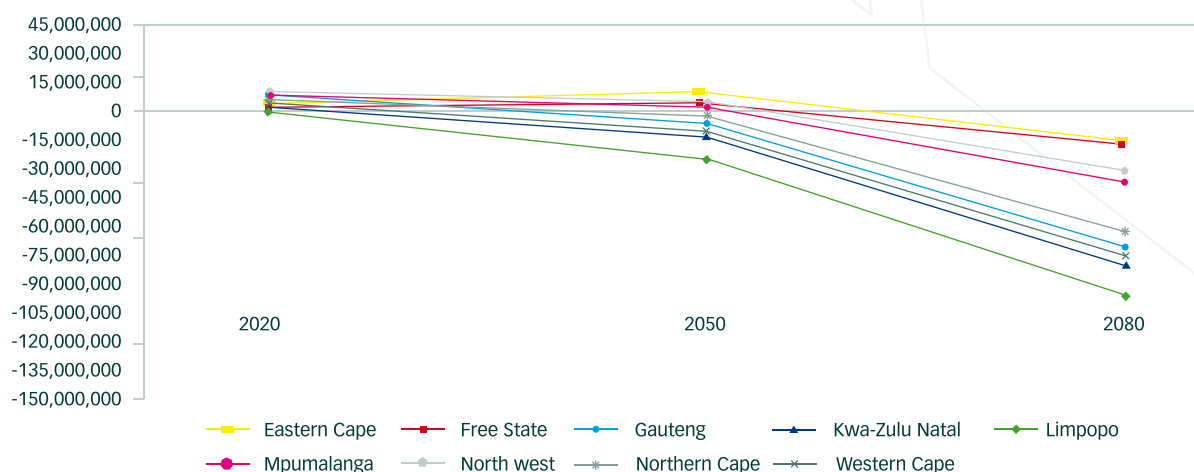


Figure 4.7 shows that the North West and Limpopo provinces will be worse off than other provinces in South Africa, as they have relatively steeper downward-sloping net revenue curves, positioned below other net revenue curves.

The findings on the impacts of climate change on agriculture, especially crop losses, coincided with findings for 11 of the most vulnerable municipalities identified, including those in Limpopo and North West provinces. Although the provincial analyses for subsistence farmers were not included in this study, results indicated similar patterns to those for commercial farmers.

Predictions for commercial agriculture are less severe in KwaZulu-Natal and the Eastern Cape than in other provinces. For subsistence farmers, the predicted losses in 2080 for KwaZulu-Natal reflect a 124% decline, whereas for the Eastern Cape an increase of 7.5% in net revenue is predicted. In contrast, the municipal study indicated that several of the most vulnerable municipalities are located in these two provinces. Therefore, vulnerability to climate change from an agricultural perspective does not necessarily overlap with rural municipal vulnerability.

## 4.5 Discussion

### 4.5.1 Validity of the Study Results

This study's results suggest that the predicted simultaneous decrease in rainfall and increase in temperature will have an adverse effect on both subsistence farmers (151% in loss net revenue by the year 2080) and commercial farmers (111% in lost revenue by 2080). By 2080, commercial farmers could lose a total of R6.9 billion rand, as a result of climate change. Furthermore, and as expected, climate change is likely to affect crop farmers the most, with both subsistence and commercial farmers expected to lose approximately 144% of their net revenue by 2080. Both categories of livestock farmers are predicted to lose 127% by 2080 and horticultural farmers 86% of net revenue. Commercial mixed farmers are expected to lose 71%, whereas mixed subsistence farmers are expected to gain 30% in revenue.

However, the results of the Ricardian analysis should be interpreted with caution. One of the model's major limitations is that it excludes other possible adaptation outside agriculture incorporated in land values and therefore may overestimate damages from climate change (Mendelsohn *et al.*, 1994). Since agricultural land in most rural areas in third-world countries has very limited alternatives (Benhin, 2008) this caveat is less of a concern in this study.

A second limitation of the model is the assumption of constant prices. The main argument here is that the Ricardian price schedule will overestimate the positive effects of climate change, since it underestimates damages and overestimates benefits (Darwin, 1999; Adams, 1999). However, price changes are not likely to be a problem for globally traded goods such as agricultural products, since local gains and losses in production are expected to offset each other with a small change in global output (Benhin, 2008).

The third limitation of the Ricardian approach is that the model does not measure the effect of different levels of carbon dioxide across space, which may be relatively important in farm productivity. However, given that carbon dioxide does

not systematically vary across South Africa (Kurukulasuriya and Mendelsohn, 2006), this criticism may be less relevant in the South African context.

Probably the most valid criticism of the Ricardian model is that climate variation observed across space may not resemble climate change over time. Nevertheless, in a second-best scenario, cross-sectional analysis provides the best approach of assessing such impacts given the lack of long-term data (Benhin, 2008).

A further limitation is that the Ricardian model does not examine the possibility of changing technology over the predicted periods. In addition, external policies, such as trade policies, taxes and private property rights, may also have significant implications on the impacts of climate change on agriculture in future but are not incorporated in the Ricardian model (Kurukulasuriya and Mendelsohn, 2006).

A potential source of bias in our study was the use of net revenue per farming unit instead of net revenue per hectare. Similar literature on climate change in Africa by Seo *et al.*, (2006) and Kabubo *et al.*, (2007) also used net revenue instead of net revenue per hectare, although, the authors did not indicate the implication of using this proxy in their model and hence the estimators. However, not including this information is unlikely to have affected results, as controlling for the effect of land size on net revenue captures the efficiency of the farm, unless farm size systematically differs by province (geographically across South Africa). Furthermore, the results in the study concur with findings from other studies (Kurukulasuriya and Rosenthal, 2003; Nelson *et al.*, 2010; Nhemachena *et al.*, 2010) that used net revenue per hectare as the dependant variable in their analysis.

#### 4.5.2 Impacts on National Food Security and Household Livelihoods

This study's results support current literature (Kurukulasuriya and Rosenthal, 2003; Nelson *et al.*, 2010; Nhemachena *et al.*, 2010) on food security and climate change, which shows that warmer and drier climates negatively affect net farm revenues, thereby translating into severe food security problems. People who are already vulnerable and food insecure are likely to be even worse off as a result of change in the current climate. A strong and positive correlation was found between food adequacy and net farming revenue among subsistence farmers. Subsistence farmers usually retain 58% of the total crop production output for household consumption and 26.7% of total livestock products for household dietary needs. Therefore, climate change will not only affect net farming revenue but also food adequacy for farmers who participate in agriculture mainly to supplement their household income and dietary requirements.

The threat to food security – from the demise of commercial agriculture because of climate change in South Africa – is very real. By 2050, commercial agricultural net revenue is expected to lose 18.3%, which may seem moderate, but, as the predictions for 2080 show, the impacts become more drastic. Across all farmer types, predicted losses in net revenue will be 110% on average, making agriculture unprofitable.

South Africa is a net exporter of food. Therefore, climate change could affect food security not only in South Africa but also in the Southern African region. For example, 50% of the maize (the main staple) in the Southern African Development Community (SADC) region is produced in South Africa (Kurukulasuriya and Rosenthal, 2003). Therefore, adverse effects of climate variability and extreme weather conditions in South Africa could destabilise the whole region. The SADC governments, policy-makers and development practitioners need to collaborate to design efficient mitigation measures and innovative fiscal instruments that effectively deal with the impacts of climate change on the agricultural sector.

#### 4.5.3 Factors Affecting Resilience to Climate Change

The impact of climate change will vary not only by continents but also by regions within a country (Kurukulasuriya & Rosenthal 2003; Gbetibouo and Hassan, 2005; Nhemachena and Hassan, 2007; Seo *et al.*, 2008). The study shows that the Free State, North West and Limpopo are the provinces in South Africa potentially the most negatively affected by climate change. These are arid areas and particularly vulnerable to future changes in climate. Any fiscal and financial mechanisms aimed at alleviating the impact from climate change will have to take these geographical differences in vulnerability into account.

#### 4.5.4 The Role of Adaptation in Agriculture

The adaptation literature frequently mentions crop diversification and changing planting and harvesting dates as a potential strategy to climate change. Adaptation measures include diversifying crops, planting different crop varieties, replacing farm activities with non-farm activities, changing planting and harvesting dates, increasing the use of irrigation

and of water and soil conservation techniques (Nhemachena and Hassan 2007, Osbahr *et al.*, 2010). Successful adaptive actions are those that promote system resilience and legitimate institutional change, and sustain collective action (Osbahr *et al.*, 2010).

Some of these measures have positive impacts for communities, whereas others have negative spill-overs. Farming adaptation strategies can be classified as (Below *et al.*, 2010): farm management and technology; farm financial management; diversification on and beyond the farm; government interventions in infrastructure, health and risk reductions; and knowledge management, networks and governance.

External interventions aimed at facilitating adaptation within these communities should further complement the farmers' individual response to climate change (Below *et al.*, 2010; Osbahr *et al.*, 2010). These should include the development of new drought-resistant varieties, improved weather forecasts, the provision of financial services, mixed farming strategies and improvement of rural transportation.

Although climate conditions have a significant effect on net farm revenue, various farming characteristics and mitigation strategies undertaken at the farm level may play a critical role in adapting to climate change. For livestock farmers, the use of strategies, such as accessing veterinary services and dips, strengthen resilience. The results for crop farmers were less clear, as fertilisers and pesticide use is not significant for subsistence farmers. Fertilisers and pesticide use is only significant for all farmer types (but not in the specific farmer type) at the commercial level. For commercial farmers, purchasing water has a positive and significant impact on agriculture. If purchasing additional water is possible (perhaps through prospective inter-basin transfers), the farmers may be able to adapt to decreasing rainfall by switching to irrigated agriculture and accessing water for livestock. Given South Africa's scarce water resources, such opportunities would clearly be limited. These findings underline the importance of farm management and technology as adaptation strategies.

As far as farm financial management is concerned, the results indicate that larger, or more efficient commercial farms (with net revenues greater than R500,000 per year), are less severely impacted by climate change than smaller farms. When farmers with net revenues of lower than R500,000 are omitted, predictions for 2080 are down by 10–20%. In the longer run, smaller and less efficient farms faced with the harsh consequences of climate change may well exit the agricultural market. Larger and increasingly efficient farms with the financial infrastructure to adapt to changing circumstances may then come to dominate the agricultural landscape.

One of the study's most robust findings is the difference in the extent to which the various types of farming will be affected: crop farming will be most severely affected, and mixed farming will be least vulnerable. Mixed farming (13.7%) is also the most prevalent form of farming in our sample, after livestock farming (66%), and on average more lucrative than livestock farming, horticulture or crop farming. Over time, mixed farming strategies are likely to become more prevalent, as farmers begin to diversify in response to changes in climate.

The analysis of subsistence farmers yielded further interesting results on governance related to property rights and land reform. Investigating the effects of changes in temperature and rainfall on net revenues, crop farmers are better off when the household owns the farm than if the land is part of a land reform project. In the case of livestock farming, more revenue is earned when the land is communal than when the land is privately owned, implying that communal access to large tracts of grazing lands for subsistence farmers increases marginal net benefits.

Although at this stage very little external support is available for farmers, the role of financial services could be investigated using the commercial dataset. Access to insurance yielded positive and significant results for all farmer types. This supports the current literature on climate change and adaptation, which has established that access to insurance is a paramount mitigation strategy to climate change (Morduch, 1995; Hassan *et al.*, 2008; Di Falco and Chavas, 2009; Deressa *et al.*, 2008).

Although the subsistence farmers' data did not allow the effects of insurance and credit on net revenues to be studied, providing access to insurance and credit to small-scale farmers will be a key factor in improving small-scale farmers' adaptive capacity. Compared to commercial farmers, small farmers have limited access to financial instruments, such as credit and insurance, to hedge against climatic risk, leaving the poor and the marginalised exposed and more vulnerable. Access to insurance and credit has been found to influence the adoption of productivity-increasing technologies and contribute to lowering climate risk faced by farmers (Murdoch, 1995; Di Falco and Chavas, 2009; Deressa *et al.*, 2008; Hassan *et al.*, 2008). Unless farmers have the means for self-insurance or risk diffusion, risk aversion will result in reduced farming investment and, therefore, in overall participation in agricultural activities. In South Africa, the main barriers to

adaptation cited by farmers are: the lack of access to credit, the lack of wealth, government farm support, access to fertile land, information on climate and insufficient access to inputs (Nhemachena and Hassan, 2007; Bryan *et al.*, 2009).

Case studies in southern Africa by Osbahr *et al.* (2010) argue that, although the ability to self-organise and absorb knowledge is critical to the innovation process and livelihood resilience, changes in farming methods most often result from collective actions and building of social capital. This also requires the involvement of multiple actors, from community members, government extension officers and NGOs, to create mechanisms for microfinance, devise opportunities for technical and business skills improvement, and promote networks for engagement. As Osbahr *et al.* (2010) point out: “Opportunities for micro financing and business training, together with infrastructural support, will facilitate livelihood specialisation and agricultural commercialisation but can also finance risk-spreading options that include diversification and access to land in a range of ecosystem and catchment contexts.” Finally, investments to increase agricultural productivity (including agricultural research, improvements in irrigation efficiency and expansion of irrigated areas and rural road construction) can offset much of the effects of climate change mentioned here (Nelson *et al.*, 2010).

Any fiscal and financial mechanisms aimed at alleviating the impact from climate change will have to take into account geographical differences in vulnerability. The current literature acknowledges that the impact of climate change varies by region. This study supports the literature that acknowledges the impact of climate change varies by region, finding the Free State, North West and Limpopo are the most vulnerable provinces in South Africa.

#### 4.6 Vulnerabilities of Municipalities to Climate Change<sup>13</sup>

Climate change will play a pivotal role in shaping development agendas and is an important topic in policy and planning documents. Indeed, World Bank senior economist Dorte Verner described climate change as “the defining development challenge of our generation” (Verner, 2011). As climate change impacts are typically localised, particular emphasis is placed on local institutions and governance to be the drivers of adaptation and coping mechanisms. Furthermore, socially vulnerable groups are most reliant on local institutions and government for coping and adaptation measures (Agrawal, 2008). This further emphasises the role of local government as facilitators of climate change-related actions. However, since resources are limited, knowing where to prioritise action is important, so that appropriate mechanisms to improve resilience to climate change can target the most vulnerable areas.

Understanding patterns in vulnerability to climate change is crucial at all scales in order to guide where resources should be allocated to help society adapt. At a global scale, assessments of vulnerability to climate change find that tropical, developing countries are generally most vulnerable, in particular those situated in sub-Saharan Africa and that have recently experienced conflict (Brooks *et al.*, 2005). South Africa is a middle-income country and, as such, has a relatively high capacity to adapt to climate change and is not as vulnerable as some of its poorer, conflict-ridden African neighbours (Vincent, 2004). This understanding could lead to some complacency, if local-scale variation in vulnerability is not taken into account.

National-level assessments are commonly criticised for failing to capture sub-national variation in vulnerability or capacity to adapt (Adger, 2006). Since climate change will be felt – and will have to be dealt with – at local level, understanding vulnerability at the local scale will be essential in order to guide meaningful adaptation strategies. Analysis of vulnerability at a sub-national scale can yield an entirely different picture. For example, in Norway (one of the countries least vulnerable to climate change and that could even benefit from some of its effects), sub-national assessment has shown areas where the population is highly vulnerable to climate-induced impacts (O’Brien *et al.*, 2003). Indeed, within South Africa, vulnerability to climate change probably ranges from situations equivalent to developed countries, to situations equivalent to some of the worst-off developing countries. Another aspect that has received less treatment in the literature is that vulnerability of different sectors of society varies. In South Africa, as a result of the legacy of apartheid, a high degree of variability is likely in both these dimensions, and local government will have to deal with this complexity.

Local government has an important role to play in meeting South Africa’s developmental goals. However, human capacity and financial constraints already severely limit the extent to which it can provide the necessary services. In many local

13 Authors: Jane Turpie, Dane Marx and Martine Visser



and metropolitan municipalities, the lack of service delivery is a major issue and has led to numerous protests in recent years. In rural areas, local municipalities face challenges that result from many interrelated factors, including rising unemployment and poverty, the spread of HIV/AIDs, looming water shortages and environmental degradation.

Climate change is likely to exacerbate these challenges and will increasingly stretch the resources available to local governments and their ability to fulfil their mandates. The anticipated changes in weather patterns, hydrological cycles, oceanic circulation systems and sea level are expected to lead to changes in biodiversity, the supply of renewable natural resources, agricultural productivity, and increases in natural disasters such as heat waves, floods, drought and storms. All of these impacts would be felt at a local level.

#### 4.6.1 Assessing Vulnerability

Depending on the analytical context, vulnerability has been defined in a number of different ways (e.g. Bohle *et al.*, 1994; Adger, 2000; O' Brien *et al.*, 2004; Hahn *et al.*, 2009). The most widely accepted definition in a development context is from Chambers (1989): "Vulnerability refers to exposure to contingencies and stress and means for coping with them". Vulnerability thus has two sides: an external side of risks, shocks and stress to which an individual or household is subject, and an internal side, which is the means for coping without damaging loss (Casale *et al.*, 2010). In its simplest sense, vulnerability is a measure of susceptibility to damage or harm (Eakin and Luers, 2006).

Vulnerability assessment can occur in a variety of contexts. Over the past couple of decades vulnerability assessments have been made of various socio-ecological systems and of stressors, including natural resource scarcity, climate change, globalisation and HIV/AIDS. However, most recent attention has been in the field of climate change (Eakin and Luers, 2006; Casale *et al.*, 2010). In an early case study based in southern Africa, Leichenko and O'Brien (2002) argued that vulnerability patterns should be considered dynamic because of on-going economic and institutional changes, and that dynamic vulnerability provides a more accurate indication because it includes the effects of globalisation.

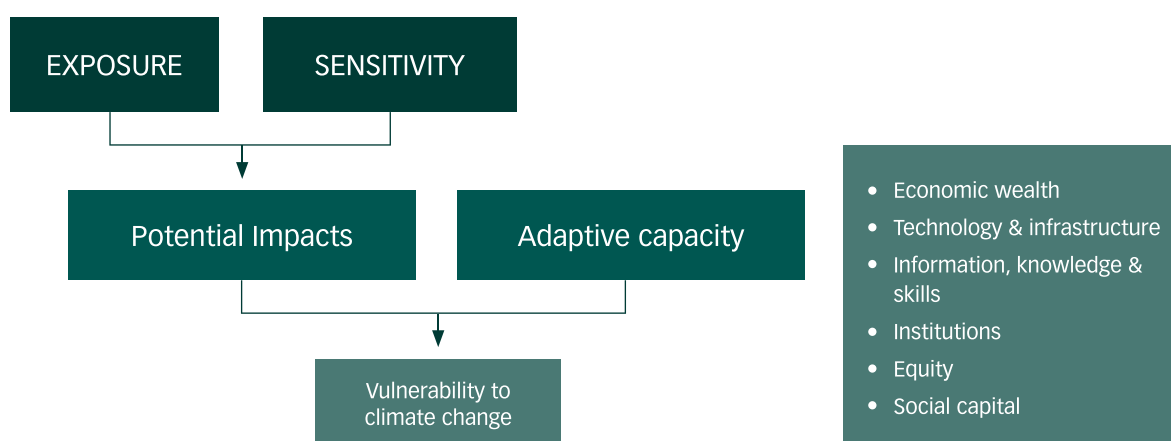
The initial approaches used in climate change research were risk-hazard approaches, which are impact oriented. These tend to look at the biophysical risk factors (e.g. change in temperature, precipitation or the frequency of extreme events) and the consequences that might be expected for a specific area or population (Eakin and Luers, 2006). For example, Jones and Boer (2003) measured risk by calculating the likelihood of exceeding a certain acceptable threshold, above which the population could be classified as vulnerable. Since then, political-economy and political-ecology approaches have evolved from the risk-hazard approaches. These approaches incorporate socio-political, cultural, and economic factors to explain differences in exposure, impacts, and capacity to cope with stressors or hazards (Eakin and Luers, 2006). Thus, vulnerability is recognised as being affected by access to resources and various social dimensions and tends to be more sensitive to issues of power than the traditional risk-hazard approaches. Political ecologists look at both biophysical and social dynamics (Eakin and Luers, 2006), while ecological resilience is an additional factor that has been considered in more recent approaches.

In climate change vulnerability studies, vulnerability is typically characterised as a function of exposure and sensitivity to stress on the one hand, and capacity to deal with the effects of the stress on the other (Eakin and Luers 2006). The Intergovernmental Panel on Climate Change defines vulnerability in the context of climate change as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity." (IPCC, 2007a).

Accordingly, vulnerability encompasses both the potential impacts likely to occur and the adaptive capacity of a system to deal with those potential impacts. In effect, vulnerability can be defined as a function of exposure, sensitivity and its adaptive capacity, where sensitivity is "the degree to which a system is affected, either adversely or beneficially", exposure is "the nature and degree to which a system is affected" and adaptive capacity is "an ability to adjust to stress, to realise opportunities or to cope with consequence" (IPCC, 2007a; McCarthy *et al.*, 2005).

The outputs of these indices can then be mapped using GIS, to show the spatial distribution of sensitivity, exposure or capacity measures, or outcome/impact vulnerability (O'Brien *et al.*, 2004). Mapping vulnerability follows on from earlier mapping of exposure to risk, which has been used in disaster management and has been enabled by the immense recent progress in GIS. Many of these studies are now considering vulnerability in the light of multiple stressors, for example the combination of climate change and globalisation (import competition) on rural agriculture (O'Brien *et al.*, 2004).

Figure 4.8. Determinants of vulnerability to climate change



Source: IPCC 2001

The literature on the development and use of vulnerability metrics look at the parameters used to compile a vulnerability assessment, and the relationships between them. The central philosophical debate is whether vulnerability is the end point or a starting point in these assessments. In the former, vulnerability is the residual of climate change impacts minus adaptation, whereas in the latter, vulnerability is a contextual variable that determines adaptive capacity (O'Brien *et al.*, 2004, Ford *et al.*, 2010). Vulnerability should be seen as a state that may be continually changing (Ford *et al.*, 2010).

The United Nations Development Programme Adaptation Policy Framework (APF) is a pragmatic approach, which allows for flexibility in indicators, methodology, and frameworks. Its premise is that adaptive capacity is essential for reducing vulnerability (Eakin and Luers, 2006). The APF outlines four general approaches: a climate-hazards approach, a vulnerability-based approach, a policy-analysis approach, and an adaptive-capacity approach (Eakin and Luers, 2006). The vulnerability approach is based on earlier approaches for assessing food security, sustainable livelihoods, and poverty, and is thus centred on people and their activities, resource systems and institutions (Downing and Patwardhan, 2004).

One of the challenges has been the development of robust and credible measures of vulnerability (Adger, 2006; Eriksen and Kelly, 2007). Although vulnerability assessments are constrained by the availability of datasets, many metrics are available for comparing vulnerability on a national scale (e.g. Brooks *et al.*, 2005; Eakin and Luers, 2006).

Exposure is typically measured by climatic variables, although studies vary in their inclusion of either current or future climatic conditions, the degree of change, or some combination of these. For example, Yusuf and Francisco (2009) assessed exposure using data on the frequency of tropical cyclones, floods, landslides, droughts over the past 20 years and the area below 5m above sea level. Sensitivity is generally measured using variables describing population density, dependence on natural resources, current environmental condition and extent of low-lying coastal areas.

Adaptive capacity is measured by a range of socio-economic variables indicating levels of income per capita, life expectancy, education levels and literacy, investment in health, governance, civil and political rights, among others. The eight determinants of adaptive capacity of a country highlighted by the IPCC 2001 are as follows (Yohe and Tol, 2002):

1. The range of available technological options for adaptation
2. The availability of resources and their distribution across the population
3. The structure of critical institutions, the derivative allocation of decision-making authority, and the decision criteria that would be employed
4. The stock of human capital, including education and personal security
5. The stock of social capital, including the definition of property rights
6. The system's access to risk-spreading processes



7. The ability of decision-makers to manage information, the processes by which these decision-makers determine which information is credible, and the credibility of the decision-makers themselves
8. The public's perceived attribution of the source of stress and the significance of exposure.

Comparative international studies differ in their choice of indicators, index construction and also in their identification of the most vulnerable countries or areas (Eriksen and Kelly, 2007). Many studies lack proper conceptualisation of how specific factors influence vulnerability, transparency in the methods used and verification, all of which affect their credibility (Eriksen and Kelly, 2007). Supporting research may involve both analogues and case studies (Ford *et al.*, 2010).

Case studies can be used to test hypotheses and provide insights and, in sufficient numbers, to develop more generalised understanding through meta-analysis. Analogous research can be spatial or temporal and involves using what is currently known to make inferences about the future (Ford *et al.*, 2010). For example, Yohe and Tol (2002) found that the probability of dying in a natural disaster was negatively correlated with per capita income and positively correlated with population density. Brooks *et al.* (2005) also identified socio-economic variables that were correlated with mortality from climate-related disasters over a decade. O'Brien *et al.* (2004) verified their results using interviews with government officials and experts, and analyses of socio-economic and climatic statistics.

The weighting of the components of vulnerability indices include weightings constructed using expert judgement, arbitrarily assigned equal weightings or weightings assigned on the basis of principal components analysis (Brooks *et al.*, 2005). For example, Vincent (2004) assessed the vulnerability of African countries to climate change using a very simple index comprising the weighted average of five composite sub-indices: economic well-being and stability (20%), demographic structure (20%), institutional stability and strength of public infrastructure (40%), global interconnectivity (10%) and dependence on natural resources (10%). Nelson *et al.* (2010) overlaid simple scales of exposure and adaptive capacity to come up with another simple scale of vulnerability. In such cases, the formulation is equivalent to a weighted average of impacts and adaptive capacity (as opposed to a multiplicative index, which would lead to a more skewed distribution of vulnerability). This follows the perception that vulnerability is the residual of impact and adaptive capacity.

Following the suite of international assessments, most of the emphasis on vulnerability assessment has been at a local to regional scale, usually sub-national (e.g. Ramachandran and Eastman, 1997; Cutter *et al.*, 2003; Yusuf and Francisco, 2009). Scale is an important issue when assessing vulnerability because systems and processes operate at multiple scales and cross-scale interactions influence outcomes (Fekete *et al.*, 2010). National-level assessments are useful for guiding the allocation of international funds to the most vulnerable parts of the world, but the comparability of these measures across very different countries can be criticised (Eakin and Luers, 2006).

At the sub-national scale, vulnerability assessments allow governments to assess which parts of the country need the most assistance. Data availability at this scale is often relatively good, and these kinds of assessments can make use of national datasets, such as census data and spatial GIS data. Vulnerability assessments can be carried out at a more localised scale, such as within a municipality or metro. At this scale, even more detailed information and complexity can be captured (Fekete *et al.*, 2010). One of the issues associated with mapping vulnerability and associated indices is that they often imply abrupt boundaries, and mask the interactions occurring at different spatial scales (O'Brien *et al.*, 2004).

The choice of suitable indicators to use at a sub-national scale varies between countries and according to the focus of the study. For example, a study mapping vulnerability to increased frequency of bushfires in Australia (Preston *et al.*, 2009) will use a different set of indicators from a study mapping vulnerability of rural communities to climate variability and change (Nelson *et al.*, 2010). In southern Africa, both Hahn *et al.* (2009) and Turpie (2010) have developed indices of vulnerability that are based on the Sustainable Livelihoods Approach and an assessment of five types of household assets: natural, social, financial, physical, and human capital, based on the Sustainable Livelihoods Approach.

Although much progress has been made, several challenges remain in assessing vulnerability (Eakin and Luers, 2006), including addressing multiple, interacting stressors; capturing socio-economic and biophysical uncertainty; accounting for cross-scalar influences and outcomes; and emphasising equity and social justice.

#### 4.6.2 Vulnerability Index for South African Municipalities

##### **Formulation of the index**

This study followed the conceptual structure of vulnerability outlined by the IPCC. Available spatial data was collated on suitable indicators from which the three broad measures could be derived (exposure, sensitivity and adaptive capacity).

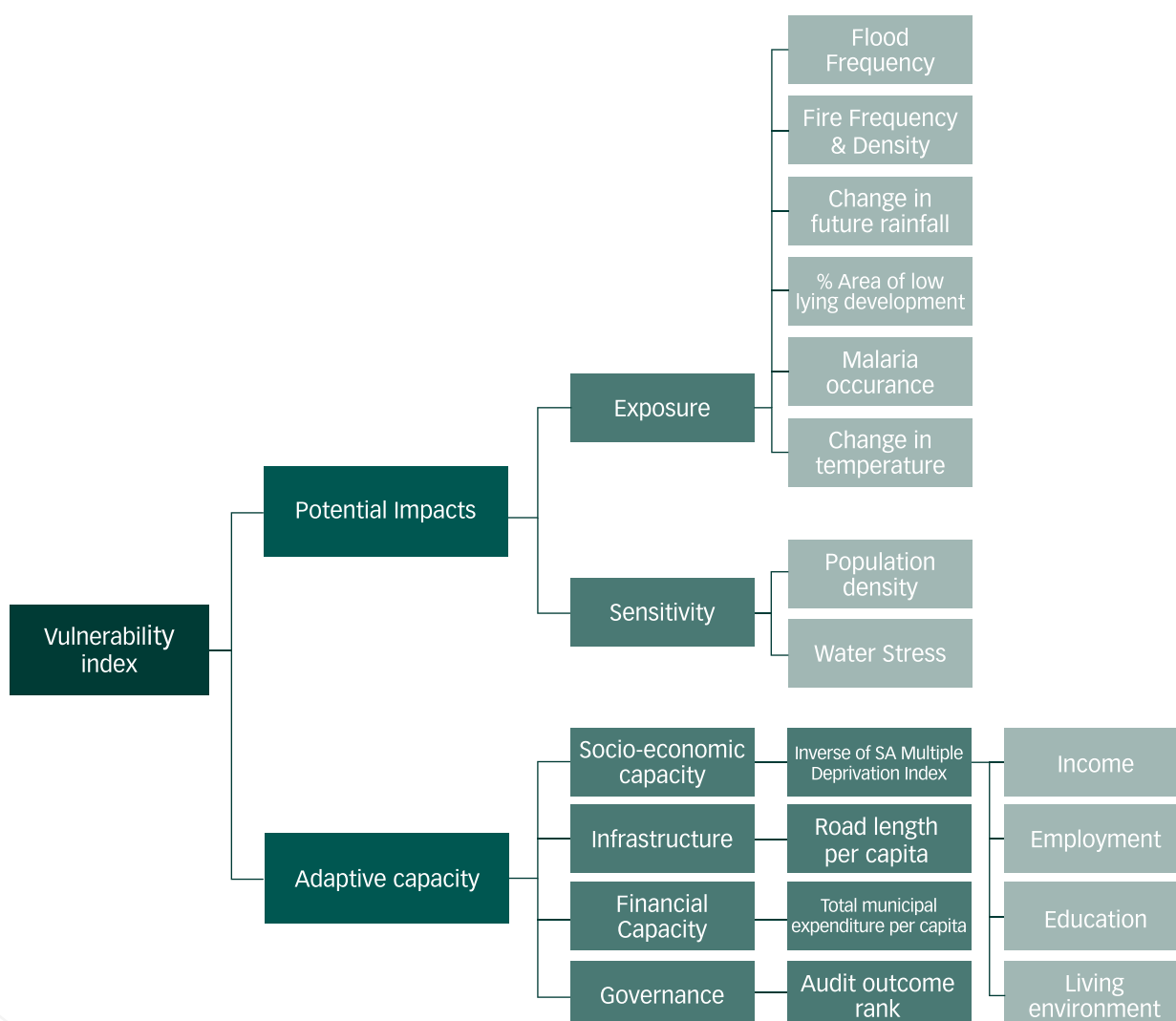
A total of eleven different spatial data layers were used to compile the overall vulnerability index at municipal level (See Figure 4.9 and Table 4.20). The component layers and the computation of the index values are described in more detail below. A map of South Africa's 234 local and metropolitan municipalities<sup>14</sup> formed the spatial basis for the vulnerability index and its constituent layers. The analysis was performed using ArcMap 9.3 (ESRI) and the Hawth's Analysis Tools plug-in (Beyer, 2004).

All the above layers were summarised by municipality and then reduced to a score of 1–5 based on quintiles. Equal weightings were used throughout the index, apart from the sensitivity component, which was weighted 60:40 in favour of population density. The overall vulnerability score for each municipality was assumed to be the residual of impact and adaptive capacity, and was calculated as follows:

$$V = ((E + S) / 2 + (5 - A)) / 2,$$

where  $V$  = vulnerability,  $E$  = exposure,  $S$  = sensitivity and  $A$  = adaptive capacity.

Figure 4.9. Composition of the overall vulnerability layer and its various components



14 Source: <http://www.demarcation.org.za>

Table 4.20. Parameters used in the index, and the units and source of the data

Component	Parameter	Unit/measure	Source
Exposure	Change in rainfall.	% change (either + or -) from past to 2050	CCAFS
	Change in temperature	% change (either + or -) from past to 2050	CCAFS
	Fire risk	Number of events per area per year	PREVIEW
	Sea Level Rise	% area below 5m	CGIR
	Flood risk	Number of floods per 100 years	PREVIEW
	Malaria risk	Change in exposure period (present-2100)	Transer <i>et al.</i> , 2003.
Sensitivity	Population density	n/km <sup>2</sup>	2001 Census
	Water Stress	RWSI Index value	AWSS
Adaptive capacity	Financial	Total Expenditure per capita	MFMA
	Infrastructure	Km roads/km <sup>2</sup>	Map of the World
	Socio-economic capacity	SA Index of Multiple Deprivations (0-100)	SAIMD
	Governance	Audit score over past four years (1-5)	Auditor general

### Exposure

When assessing climate change at a local scale, one complication is the lack of accurate downscaled future projections of climate-change impacts. Such phenomena include shifts in the patterns of drought, fire, sea level rise etc. Furthermore, climate change will result in increased variability of weather patterns across the globe, and current extreme weather events will typically worsen rather than abate (IPCC, 2001; Salinger *et al.*, 2005). In the absence of future predictions on events such as flood and fire frequency, for this study, historical exposure to climate change risks was considered the best available proxy and has been the preferred method in past studies (Yusuf and Francisco, 2009). However, three of the exposure layers were based on changes between current and future climate predictions: the future shifts in rainfall patterns and average temperature exposure layers, which were accounted for by comparing past data and future global climate model (GCM) predictions, and changes in current and future malaria exposure, based on the predictions of Transer *et al.* (2003).

The exposure index's six components were flood frequency, fire frequency and density, percentage change in future rainfall, change in temperature, the proportion of low-lying coastal urban development, and malaria exposure.

The flood frequency, fire frequency and density data was obtained from the PREVIEW Global Risk Data Platform,<sup>15</sup> a collaborative product of multiple agencies that collates global data on natural hazards and exposure risk. PREVIEW is hosted in partnership by the United Nations Environmental Program and the Global Resource Information Database Geneva (UNEP/GRID Geneva).

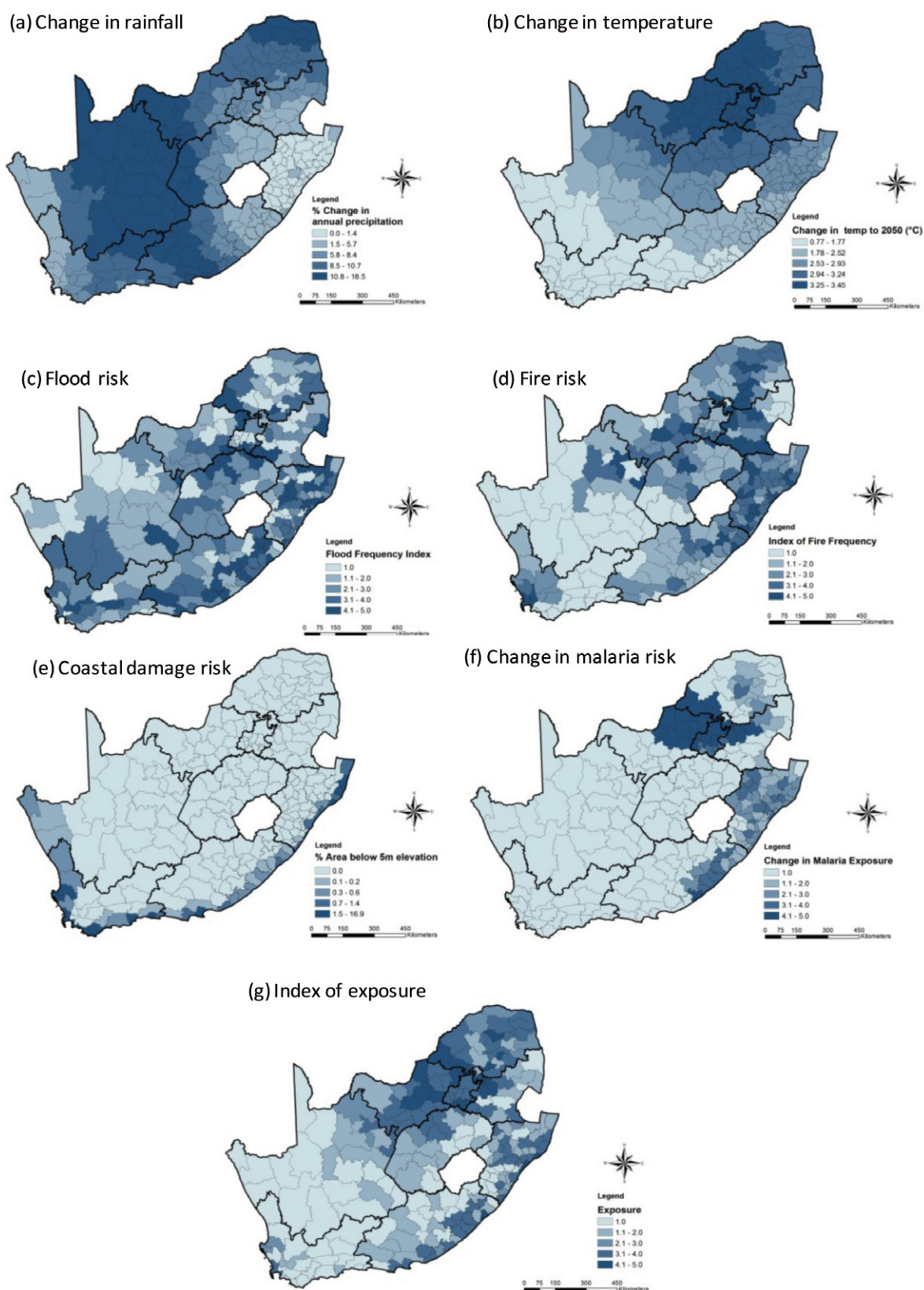
Predicted changes in rainfall and temperature were both calculated using historical and predicted future precipitation data obtained from the WorldClim<sup>16</sup> (past-present data) and the CCAFS<sup>17</sup> (future, spatially downscaled predictions) global climate databases – a set of globally mapped climate layers of approximately 1km<sup>2</sup> resolution (Hijmans *et al.*, 2005). Predicted future precipitation was based on the HADCM3 global climate model under the A2A climate scenario for the year 2020 (IPCC, 2007b). The degree of change in precipitation highlights the departure from the normal rainfall to which a municipality is accustomed, be it lesser or greater. As Figure 4.10 shows, the change in rainfall is most pronounced in a thick band running from the central north, through the central interior and extending to the central southern coast. KwaZulu-Natal is predicted to experience a much smaller shift relative to the rest of the country. Nine of the ten municipalities with the greatest shift in rainfall are located within the Northern Province and include Mier, //Khara Hais, !Kheis and Joe Morolong. The change in temperature displays a rather different trend, with the north-eastern region of the country experiencing the greatest change, decreasing outwards and lowest in the south-west.

15 <http://preview.grid.unep.ch>

16 <http://www.worldclim.org>

17 <http://www.ccafs-climate.org/>

Figure 4.10. Patterns of potential exposure



(a) projected % change in total rainfall (b) projected change in temperature °C, (c) relative frequency of flood events (d) fire frequency and density (average number of events per 0.1 decimal degrees per year\*100); (e) % area below 5m; and (f) expected change in exposure to Malaria *Plasmodium falciparum* and (g) overall Index of Exposure.



As Figure 4.10 illustrates, flood risk shows little spatial pattern across the country, relating directly to the topographic lay of major river systems and catchments rather than any overlying forcing effect. Fires are most frequent in the north-west region, extending down along the east coast slightly west into the central northern areas. The western half of the country showed noticeably lower fire risk, with the exception of several prominent Western Cape municipalities.

Elevation data from a global digital elevation model was used to determine the extent of low-lying coastline in coastal municipalities. The Consultative Group on International Agricultural Research-Consortium for Spatial Information (CGIAR-CSI<sup>18</sup>) provide a high quality, void-filled version of the Shuttle Radar Topography Mission (SRTM) global digital elevation model. Elevation data was overlaid with the National Land Cover map (SANBI, 2009), in order to determine the amount of low-lying urban development in each municipality. Figure 4.10 reveals that the three municipalities with the most low-lying urban land are The Big 5 False Bay, Mtubatuba and uMhlathuze.

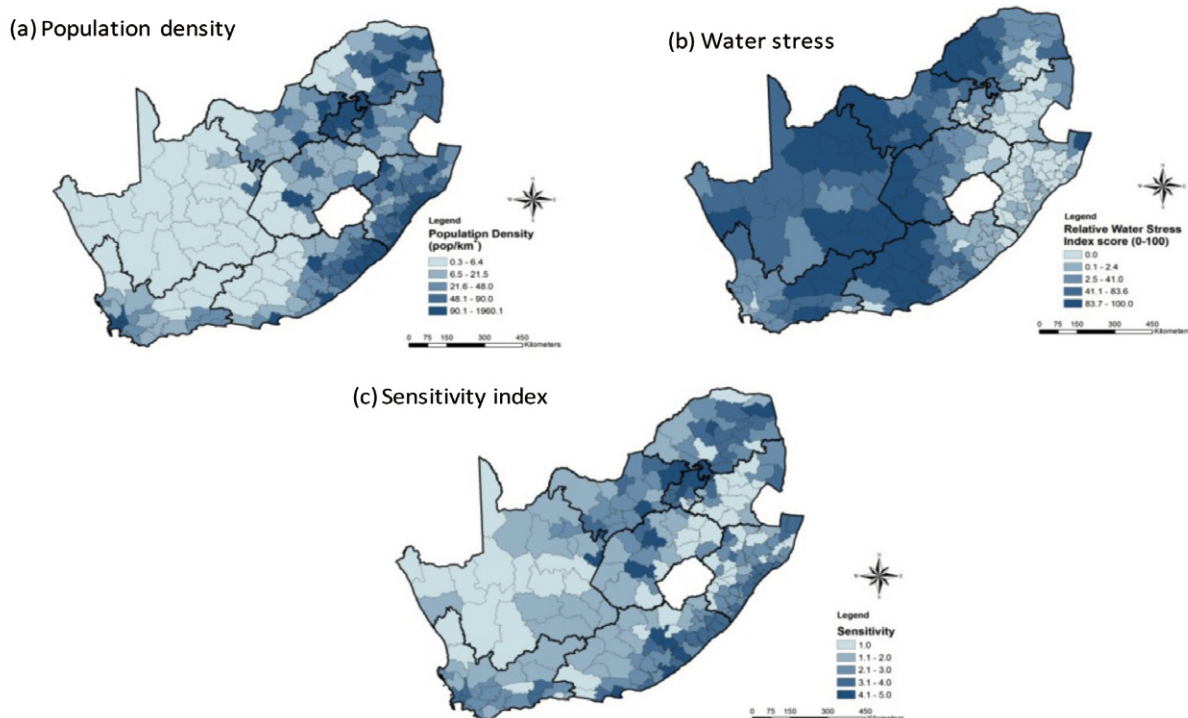
To determine the predicted shift in potential malaria exposure, maps generated by Tranter *et al.* (2003) showing current and predicted future periods of malaria exposure were overlaid, and the percentage increase each exposure category per municipality was calculated. As Figure 4.10 shows, municipalities in the North West and Gauteng provinces are most likely to be affected, while municipalities in both the Eastern Cape and KwaZulu-Natal see substantial expansions in the length of environmental suitability for the malaria *Plasmodium parasite*.

Overall exposure highlighted the frequent exposure of the north-eastern and coastal regions and the relatively low exposure of the north-west. Exposure in the north-east is largely because of changes in temperature, rainfall and increased malaria exposure. The east coast's exposure can be attributed largely to relatively frequent fire and flooding events, low-lying coastal areas and the potential for increased malaria exposure.

### Sensitivity

Sensitivity to future climate change was composed of two different base layers: population density and water stress. Population density was considered to be highly relevant for determining the impacts of most of exposure index's elements and was thus awarded a higher weighting than water stress. Average population density was calculated for each municipality using the most recent census data (2001) available at the sub-place scale, although the 2001 Census did not distinguish rural from urban households. As Figure 4.11 shows, population density is highest in the eastern half of the country and the south-western Cape and reaches high concentrations in the large metropolitan municipalities.

**Figure 4.11. Factors affecting sensitivity**



(a) Population density per South African municipality and (b) Average Relative Water Stress (RWSI) per South African municipality

Water stress was considered the second important factor of sensitivity. Any household experiencing a high degree of water stress is likely to be more severely affected by the effects of climate change, for example a reduction of rainfall in an already water-stressed region. The 2005 African Water Stress Study (AWSS) conducted by the Water Systems Analysis Group (WSAG) at the University of New Hampshire) provided detailed outputs from a Water Balance and Transport Model (Vörösmarty *et al.*, 2005), mapping the spatial distribution of renewable water supply across the African continent. One of the AWSS outputs, the Relative Water Stress Index (RWSI) layer was used to provide an index showing the ratio of water use (domestic, agricultural and industrial) to the long-term mean annual discharge, highlighting areas where water demand outstrips supply. An average RWSI value was determined per municipality. Figure 4.11 shows that the municipalities in the arid central, western and northern regions of the country are among the most water-stressed municipalities in the country.

Infrastructure plays an important role in determining a municipality's adaptive capacity. Electricity and water supply to households is taken into account in the South African Index of Multiple Deprivations (SAIMD) index. The level of public infrastructure was assessed using a measure of road density per municipality. Since population density and water stress display inverse patterns, the overall index of sensitivity is sensitive to the weighting of the two indices. As population was more heavily weighted, the pattern reflects population density more strongly than water stress (Figure 4.11). Overall, the most sensitive municipalities are located along the east coast (particularly the Eastern Cape), as well as several central/interior municipalities around within and around Gauteng Province.

### **Adaptive capacity**

The adaptive capacity index was made up of four equally weighted components: socio-economic capacity, public infrastructure, municipal expenditure per capita and governance. Socio-economic capacity was represented by the inverse of an existing index, the SAIMD, which is a measure of the degree of deprivation across South Africa, summarised at the municipal level (Wright and Noble, 2009). This index is based on four domains of deprivations: income and material deprivation, employment deprivation, education deprivation and living environment deprivation. These four domains were assessed using a total of 11 indicators, as described in Table 4.21.

**Table 4.21. The 11 indicators used to compile the South African index of multiple deprivations.**

<p>Income and material deprivation:</p> <ul style="list-style-type: none"> <li>• Number of people living in a household with a household income below 40% of the mean equivalent household income (approximately R1,003 per month in February 2007); or</li> <li>• Number of people living in a household without a refrigerator; or</li> <li>• Number of people living in a household with neither a television nor a radio.</li> </ul>	<p>Living environment deprivation:</p> <ul style="list-style-type: none"> <li>• Number of people living in a household without piped water inside their dwelling or yard; or</li> <li>• Number of people living in a household without a pit latrine with ventilation or flush toilet; or</li> <li>• Number of people living in a household without use of electricity for lighting; or</li> <li>• Number of people living in a shack; or</li> <li>• Number of people living in a crowded household.</li> </ul>
<p>Employment deprivation:</p> <ul style="list-style-type: none"> <li>• Number of people who are unemployed (using official definition); plus</li> <li>• Number of people who are not working because of illness or disability.</li> </ul>	<p>Education deprivation:</p> <ul style="list-style-type: none"> <li>• Number of adults (18–65 years) with no secondary schooling.</li> </ul>

The most recent SAIMD is based on results from the 2007 South African Community Survey. The SAIMD effectively evaluates four of five types of capital that offer resilience to shocks: financial capital (income and material, and employment), human capital (education), physical and natural capital (living environment) but omits any measure of social capital, which is more difficult to attain at this scale. As the SAIMD provides a good indication of vulnerability, the inverse of this index was assumed to provide a good indication of society's resilience or capacity to adapt to climate change. This index suggests that socio-economic capacity is highest in most of the western and south-western municipalities, and in the more developed north-western municipalities in and around Gauteng (Figure 4.11). Socio-

economic capacity is most lacking along the Transkei and Wild Coast, and in the large central-northern municipalities of North West province.

GIS data on roads was obtained from the Digital Chart of the World Project<sup>19</sup> (Figure 4.12). Infrastructure was high in all metropolitan municipalities, in several municipalities in northern Limpopo province, and in the central region of South Africa, straddling the Northern Cape, North West and Free State Provinces.

The local government's average annual expenditure per capita was used as an indicator of financial capacity for dealing with climate change at a local level. The average annual expenditure (including capital expenditure) was calculated for the past four financial years for each municipality (standardised to 2011 values). These included the 2007/08, 2008/09, 2009/10 audited expenditures and the estimated (pre-audit) 2010/2011 expenditure. Expenditure per capita was highest in the metropolitan and other highly urban municipalities, as well as along the southern Cape coast (Figure 4.12).

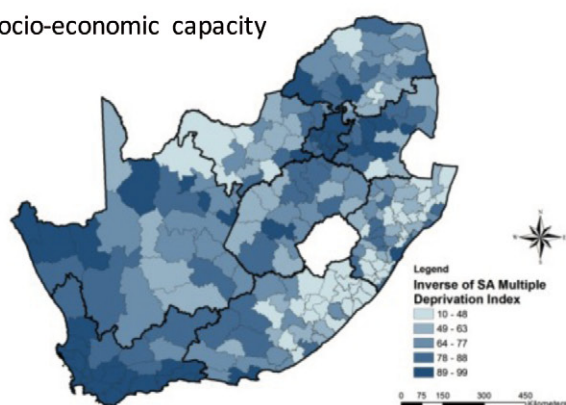
Governance is a very important component of a government entity's ability to deal with climate change. In this study, the state of municipal financial audits over a four year period was used to assess local government's financial governance capacity. In each year, the audit outcome was given a score from 1 (worst) to 5 (best) (Table 4.22), and the score was averaged over four years. Financial governance was taken to be a proxy for overall governance. Governance was particularly weak in areas of the Free State and Eastern Cape, while municipalities in the Western Cape, Gauteng and KwaZulu-Natal were relatively strong (Figure 4.12).

Table 4.22. Audit outcomes and the score assigned to

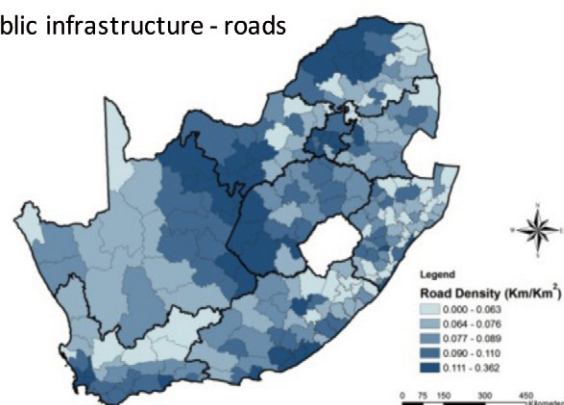
Audit outcome	Score
Financially unqualified without findings	5
Financially unqualified with findings	4
Audit not finalised at legislated date	3
Qualified	3
Disclaimer	2
Adverse	1

Figure 4.12. Measures affecting adaptive capacity of South African municipalities:

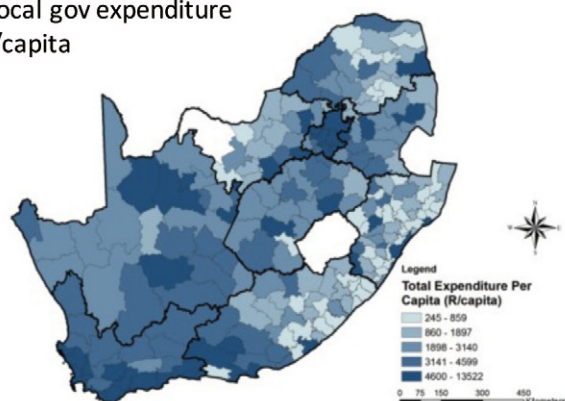
(a) Socio-economic capacity



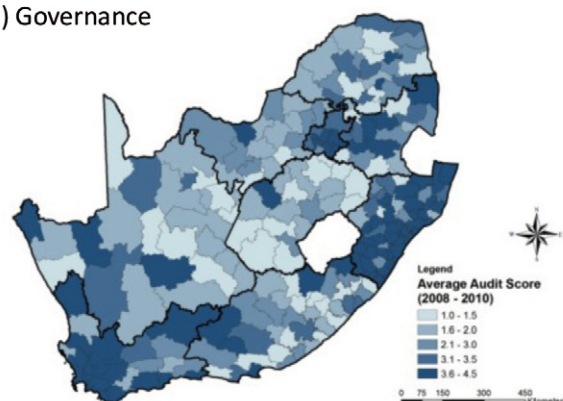
(b) Public infrastructure - roads



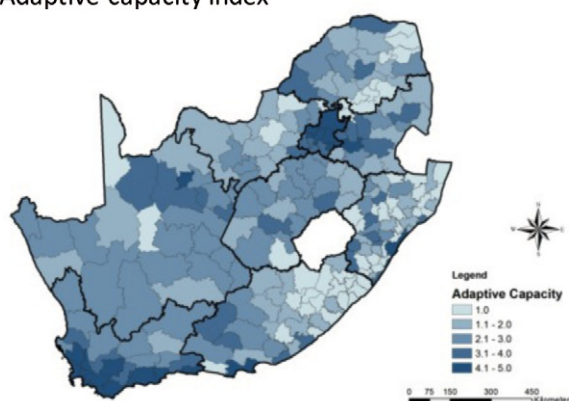
(c) Local gov expenditure  
– R/capita



(d) Governance



(e) Adaptive capacity index



(a) Socio-economic capital (inverse of SAIMD) (b) Road length per  $\ln(pop)$ , (c) Average annual municipal expenditure per capita and (d) Financial governance index

Overall adaptive capacity was highest for the more developed metropolitan municipalities and for most of the south-western municipalities. Adaptive capacity was particularly low in the eastern half of the Eastern Cape, in northern KwaZulu-Natal, and in parts of Limpopo and North West Province (4.12).

#### 4.6.3 Relative Vulnerability of South African Municipalities

As Figure 4.13 shows, the overall vulnerability was the highest in the eastern half of the country, particularly in areas corresponding to former homeland areas, while most municipalities in the western half of the country and several in Gauteng and Mpumalanga are comparatively resilient. Twenty municipalities were classified as highly vulnerable (Table 4.23).

Figure 4.13. Index value of vulnerability to climate change for South African municipalities

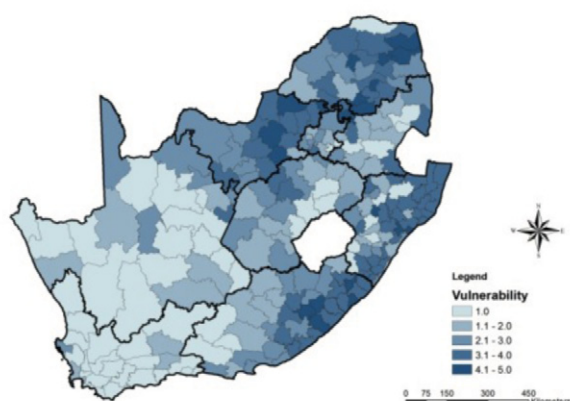


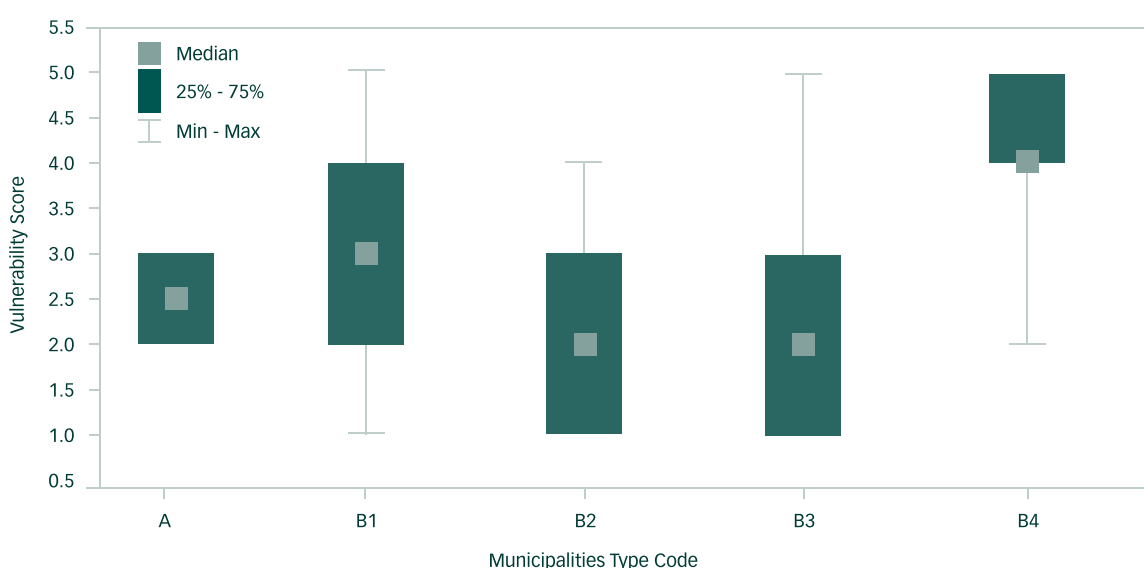


Table 4.23. The twenty most vulnerable municipalities

Municipality Name	Municipality Code	Municipality Type	Municipality Name	Municipality Code	Municipality Type
Mnquma	EC122	B4	Thulamela	LIM343	B4
Intsika Yethu	EC135	B4	Aganang	LIM352	B4
Engcobo	EC137	B4	Ephraim Mogale	LIM471	B4
Port St Johns	EC154	B4	Elias Motsoaledi	LIM472	B4
Ntabankulu	EC444	B4	Fetakgomo	LIM474	B4
Indaka	KZN233	B4	Thembisile	MP315	B4
Mandeni	KZN291	B4	Moretele	NW371	B4
Maphumulo	KZN294	B4	Moses Kotane	NW375	B4
Greater Giyani	LIM331	B4	Ditsobotla	NW384	B3
Greater Letaba	LIM332	B4	City of Matlosana	NW403	B1

As a group, rural municipalities (type B4) were significantly more vulnerable than other types of non-metro municipalities (Kruskal-Wallis test,  $H=87.955$ ,  $P<0.001$ ). The differences between the average vulnerability scores of other types of municipalities were not significant.

Figure 4.14. Box and whisker plot of the vulnerability scores of different types of municipalities



A = metropolitan, B1 = secondary cities, B2 = large towns, B3 – small towns and B4 = rural

### Robustness of the vulnerability index

Index-based vulnerability assessments are sensitive to a range of assumptions, often as a result of data shortcomings. In particular, the relative scales of exposure and sensitivity, and of impacts and adaptive capacity are unknown. Thus, the index has to be interpreted carefully in terms of the relative sensitivity of different municipalities. Nevertheless, the rank order of municipalities based on their vulnerability would be expected to be reasonably robust. Equal weighting of parameters was used in all cases except for the sensitivity index, which weighted population density more heavily than water stress because of its relevance to all types of exposure.

In this case, the weighting had a potentially significant bearing on the sensitivity index because the spatial pattern of the two subcomponents was opposing. However, analysis of the overall index to the weighting of the sensitivity index

revealed no significant difference in outcomes between equal and reverse weighting and the chosen weighting of the sensitivity component (Spearman rank coeff: 0.907, 0.894;  $P < 0.01$ ).

Within the index, the computation and scoring of the component parameters also has a potential impact on the outcome, especially where data or densities are not normally distributed. For example, population density scored in absolute terms or using evenly spread groupings would yield a very different range of scores compared to being scored based on logarithmically transformed data or using quantiles. This study scored each of the parameters and component indices using quantiles. Data summarised using quantiles display a wider 'dispersion' than if they were categorised by the Jenks method (the calculation used by the 'natural breaks' categorisation technique in ArcGIS), or using even breaks, and the use of quantiles has found extensive support (MacEachren, 1994; Brewer and Pickle, 2002). Nelson *et al.* (2010) use this kind of dispersion in their vulnerability analysis.

### **Potential impacts of climate change on South African municipalities**

Rainfall patterns are projected to have the most severe impacts in South Africa's more arid regions, which already experience low and highly variable rainfall. This will inevitably affect agricultural outputs in these areas (see Section 4.2), and may result in already marginal farming communities becoming further impoverished. Even regions whose total precipitation changes little may experience shifts in the timing and distribution of rainfall, resulting potentially in extended periods of droughts coupled with sudden downpours and increased flooding. Furthermore, less frequent and more intense rainfall may result in worsening water supply issues, which may require costly interventions.

Increased frequency and intensity of fires will affect some of the most densely populated municipalities in South Africa, particularly in the north-east and eastern coastal regions. Changes in fire intensity, frequency and timing are also likely to have a strong impact on rural communities, as timing (and intensity) of seasonal burns is crucial to provide good grazing for livestock, as well as to maintain grassland and savanna ecosystems (Tainton, 1999).

No strong regional patterning is visible, as flood risk is not correlated with rainfall patterns but dictated by the geographic distribution of rivers and floodplains across the country. Flooding can result in significant physical damage to infrastructure, such as bridges, utilities and road networks, agricultural land, and urban and rural settlements. Such primary impacts are often worsened by secondary effects, such a loss of water supply and contamination of water bodies, the associated proliferation of disease and later shortages of food from lost productivity.

Similar physical damage may occur from rising sea levels, and heightened wave run-up. Particularly in developed areas, coastal property commands a high value and is often characterised by dense residential development. The average global rise in sea level may be as high as 770mm by 2100 (IPCC, 2007b), which would have massive and widespread impacts on coastal development and infrastructure in South Africa, particularly in the south-western and the most eastern coastal municipalities.

Although effectively controlled in South Africa through the use of a range of controls and preventative techniques, such as insecticides and education programmes, malaria increased again in the late 1990s, peaked in 2000 and remains a threat. Climate change is predicted to increase massively both the range and duration of exposure in South Africa (Transter *et al.*, 2003). Under the most widely accepted climate change scenario, by the end of the century Transter *et al.* (2003) calculated a 237% increase in person-months of exposure and a 188% increase in population exposure. Such a widespread increase in the disease will inevitably lead to higher costs not only of preventative measures, but also in health care, tourism, lost workforce productivity and ultimately on the local and national economy (Turpie *et al.*, 2002).

South Africa's municipalities vary in their sensitivity to the effects of climate change and, accordingly, an event of the same magnitude in two different locations may have very different impacts. The overarching factor determining sensitivity to any climate-related changes or events is the number of people affected, which is represented by population density in this analysis. In the case of an extreme event, the greater the population, the greater the resources required to deal with associated impacts and relief efforts. Thus, more densely populated regions will inevitably endure greater costs associated with negative impacts of climate change. The most densely populated metropolitan municipalities are thus most sensitive to any of the climate-related events mapped within the exposure layers.

However, when considering shifts in rainfall patterns, water-stressed regions are likely to suffer the most from substantial deviations in the current rainfall patterns. In order to account for this, a measurement of water supply balance was used as the sensitivity factor when considering changes in rainfall. As mentioned above, South Africa's most arid, water-stressed regions will experience the greatest change in rainfall patterns, resulting in potentially high impacts

on municipalities in the central western region of South Africa. The overall potential impact map reflects the above sensitivities and exposure events, particularly emphasising the arid, water-stressed municipalities in the central regions, and four of the more developed municipalities: Cape Town, Bitou, Ethekwinini and Emfuleni.

#### 4.6.4 Adaptive Capacity of South African Municipalities

Adaptation to climate change is only just starting to emerge in policy and practice in South Africa (Ziervogel and Taylor, 2008). Adaptation seeks to minimise the adverse impacts of climate change on individuals or society at large (Laukkonen *et al.*, 2009) and may be anticipatory or reactive, privately or publicly driven, and autonomous or planned (Adger *et al.*, 2003). In South Africa, publicly driven adaptation measures will need to include water supply and conservation measures, measures to deal with reduced land and resource productivity, monitoring and early warning systems to deal with extreme events, measures to ameliorate flood or storm damage and improved provision of health care facilities (e.g. Mukheibir and Sparks 2003). While understood in broad terms, some of the details of adaptation strategies will need to be established through research.

Just as different regions in South Africa experience different exposure to weather events, and different sensitivities in the form of population density and water stress, so too do municipalities differ in their capacity to adapt to these climate change-related events. Mapping adaptive capacity allows for an understanding of which regions are best prepared to deal with future climate change impacts and (in the context of potential impact levels) which are most vulnerable.

Socio-economic wellbeing is considered to be an important measure of adaptive capacity. Regions with high socio-economic capacity are better able to deal with the impacts of climate change-related disasters, as households with access to various forms of capital (financial, physical, natural, social and human) are more buffered from shocks in difficult times, and better able to adapt (Adger, 2003). This places less stress on municipal and state resources. This study suggests that a number of east coast municipalities, as well as Kagisano/Molopo, Joe Morolong and Blouberg in the north, have extremely low socio-economic capacity, and that local communities and households lack the capacity to deal with large-scale climate-related disruptions. Conversely, households will likely be better able to cope with climate change-related impacts where socio-economic capacity is high, most notably along the west coast, metropolitan and neighbouring municipalities, (Adger, 2003).

Infrastructure is a common component when assessing adaptive capacity (Brooks *et al.*, 2005; Vincent, 2004). In addition, a meta-analysis by Twomlow *et al.* (2008) listed increased investment in infrastructure as one of the nine most commonly cited climate change adaptation methods. In this study, the proxy used for infrastructure – major road network length per capita – highlights basic infrastructural capacity. Road networks are a form of primary infrastructure and support transport industries, logistics and the relocation of goods. In addition, household electrification and water supply were accounted for in the socio-economic index. It is interesting to note that road length per capita is highest in the more sparsely populated municipalities that are traversed by important national roadways, not in the most developed urban regions. This is because only major roadways were assessed and, although this may suggest a potential weakness, the indicator also reflects the difficulties associated with managing high population densities in areas of sprawling urban development.

Financial capacity comprises another crucial adaptability measure for local government, as adaptation measures are often costly. One such example is the construction of desalination plants to cope with rising demand for and falling supply of water. The total expenditure layer highlights the relatively high financial capacity of the more developed urban municipalities, while illustrating the low per capita expenditure of the north-east and east coast municipalities. For example, the lack of preparedness of local municipalities for disaster risk management is related to a lack of financial resources. Although 75% of metropolitan municipalities reported their DRM centres were in good functioning order, 40% of local municipalities reported poor functioning (Botha *et al.*, 2010). Furthermore, 60% of municipalities reported that they had never received any grants from government to establish a DRM unit. Across the board, municipalities reported a lack of resources, including equipment such as vehicles and emergency response equipment. In fact, one-third of local municipalities reported having no budget at all for this function (Botha *et al.*, 2010).

By incurring a range of direct and indirect costs to municipalities as discussed above, climate change also threatens to undermine the capacity of local municipalities to delivery services, which will further affect their ability to adapt to climate change. There is thus an urgent need to bring about action to alleviate this situation.

How well the municipality is governed is one of the most important factors determining the ability of a municipality to adapt to the impacts of climate change. Financial good governance was taken to be a proxy for overall governance and highlighted the poor governance capacity of many rural municipalities, particularly in the Eastern Cape.

Combining the above factors clearly illustrates the low adaptive capacity of primarily the east coast municipalities, as well as Kagisano/Molopo, Joe Morolong and Blouberg in the north. This suggests that national-level plans may need to assist these municipalities to adapt to and cope with climate change. Conversely, the more densely populated, urban municipalities will be better able to adapt to climate change impacts, given their currently available resources and capital. Indeed, metropolitan municipalities, such as eThekweni (Roberts, 2008), Cape Town and Johannesburg have made most progress made in adapting to climate change.

In rural areas, progress on adaptation has been more varied. An important factor that has contributed to the progress made so far has been capacity building of key local government personnel who could build local interest and make interventions more meaningful (Ziervogel and Taylor, 2008). Ziervogel and Taylor (2008) found that climate change information was not really integrated into local municipal activities, but there was an awareness that this needed to be done.

#### 4.6.5 Overall Vulnerability of South African Municipalities

The overall vulnerability index reveals the importance of considering both potential impacts and adaptive capacity. In many instances where potential impacts are high, a municipality's adaptive capacity has ameliorated vulnerability to a certain extent. The high vulnerability of some of the more developed, urban municipalities is largely because of the interaction between high sensitivity associated with dense populations and the various exposure layers. This is despite these municipalities also exhibiting high adaptive capacity, showing that the strength of potential impacts is great enough to overshadow adaptive capacity.

Overall, rural municipalities are significantly more vulnerable than other types of municipalities, and rural municipalities in former homeland areas are especially vulnerable. In general, studies have found that vulnerability appears to be strongly tied to wealth (Smith *et al.*, 2001), which is certainly reflected in the results of this study. In many cases, the most vulnerable areas are also those containing most of the country's rural poor. Furthermore, among rural communities, inequality extremes may further increase vulnerability, as they create limits for adaptive strategies. Since South Africa emphasises developing these communities, efforts must be redoubled in order to achieve their goals in the face of climate change.

#### 4.6.6 Improving the Resilience of Rural Municipalities

Adaptation measures will ameliorate some of the potential costs of climate change, but on balance the adaptation measures and residual impacts may still incur significant costs. Government will need to find ways to incentivise or finance adaptation measures and to help local municipalities to deal with the residual impacts of climate change. In addition, resources will be needed to fund research into efficient ways to address climate change impacts and adaptation, and to build the required institutional capacity.

### 4.7 Fiscal and Financial Measures for Improving Resilience to Climate Change in Rural Areas<sup>20</sup>

Vulnerability to climate change is determined by the interaction of exposure and sensitivity in the context of adaptability. Sensitivity is inherent and can be assumed to be beyond the reach of short-term policy. However, the degree of exposure can be addressed by mitigation actions which aim to reduce the causes and effects of climate change, and adaptability can be addressed through a range of engineering and behavioural solutions. Mitigation is the main focus of developed countries, but adaptation is the priority of developing countries that will bear the brunt of climate change. South Africa needs to address both issues to a significant degree.

However, this study has focused on adaptation as a means of reducing vulnerability to climate change. While some adaptation will occur naturally, substantial financing will be needed to achieve the level of adaptation required to reduce significantly societies' vulnerability to climate change. This is recognised globally, and competition for funds will mean that attention will have to be focused on the most vulnerable elements of society, which in South Africa include rural communities.

Existing local government capacity cannot adequately support the challenges that rural communities face in adapting to climate change. Local government capacity to deal with development challenges in general, and climate change

<sup>20</sup> Authors: Jane Turpie and Martine Visser

in particular, is hampered by a range of factors including lack of human capacity, corruption and limited resources. Rural municipalities, in particular, have fewer opportunities to raise revenues and are at a disadvantage when seeking to attract skilled personnel. Resilience needs to be built through empowerment, innovation, good governance and financial support.

A number of possible mechanisms could help vulnerable rural communities build resilience to local climate change. National, provincial and local governments will need to intervene, using fiscal and financial measures to fund and incentivise activities that improve the resilience of local communities. These include research into efficient ways to address climate change impacts, capacity building and implementing adaptation measures.

#### 4.7.1 Impacts of Climate Change on Local Government Finances

Climate change is likely to have a significant impact on local government finances and their capacity to deliver services. In South Africa, municipalities finance their operating budgets through property rates income, service tariffs (e.g. water, electricity), fines and the 'equitable share', which is the allocation from national government. The latter depends largely on the number of low-income persons in the area, with rural municipalities usually receiving more, but typically only contributes to a small portion of the operating budget. The capital budget is financed from the Municipal Infrastructure Grant (MIG) funding mechanism, as well as public/private partnerships, donations, internal and external loans. Climate change is likely to add to the financial burden of municipalities in several ways, such as:

- Loss of municipal tax income from business, agriculture and industry sectors, as a result of increased costs of inputs, notably water
- Loss of municipal tax income from the tourism sector, as a result of impacts on tourism attractions and/or tourist-carrying capacity
- Loss of rates income, as a result of decreased property values, e.g. due to expansion of setback areas along coast
- Infrastructural damage costs, rescue and medical costs caused by natural disasters;
- Increased costs of water supply because of water scarcity
- Increased costs of sewage treatment because of increased temperatures
- Increased requirements for health and welfare services, as a result of the shortages of natural resources, reduced productivity and increased disease.

Investing in adaptation measures will ameliorate or offset some of the potential costs of climate change, but on balance the adaptation measures and residual impacts may still incur significant costs. Thus, in addition to investing in adaptation measures, vulnerable municipalities are likely to require additional financial support just to maintain the status quo in service delivery.

#### 4.7.2 Fiscal and Financial Mechanisms

Desired outcomes, such as implementing climate change adaptation measures, can be achieved through either (a) financing mechanisms, such as grants, buyout schemes, public-private partnerships and payments for ecosystem services, or where feasible (b) incentive measures, which is generally a more efficient solution when designed appropriately. Incentive measures include financial incentives (subsidies, direct payments or tax relief), development incentives (tradable or transferable property rights) and motivational incentives (e.g. education, local awards, community recognition, stakeholder involvement, technical support, materials, and juridical protection against land invasions).

Grants will be an important mechanism for overcoming cost barriers associated with implementing new climate change-related measures. This is particularly true for low-income areas, which may not have the capital to invest in new technologies or measures (Koeppel and Ürge-Vorsatz, 2007). For example, new national grants may provide incentives to reward or encourage climate change-friendly actions, ensure the maintenance and repair of important infrastructure, provide environmental services, fund relevant research and build capacity for dealing with climate change in local government. However, both grants and subsidies may be open to exploitation by free-riders who qualify for, but may not necessarily require, the assistance provided by these mechanisms (Koeppel and Ürge-Vorsatz, 2007).

Previous research has suggested that limiting subsidies to either a short time-frame or to specific target groups enhances their effectiveness (Jeeninga and Uytterlinde, 2000). In the 2012/2013 Submission for the Division of Revenue Technical Report (FFC, 2011), it is suggested that any national grants established for the above purposes should take into account relevant factors such as the geographical location, municipality size, population and vulnerability to climate change. South Africa should also seize the opportunity of the Global Green Fund, which is meant to assist poor countries adapt to climate change. In this fund, opening a rural window would be important to assist rural areas to adapt and develop resilience to climate change.

Table 4.24 describes the different funding mechanisms for disaster risk management recommended by the Department of Local Government in its National Framework (DPLG, 2005). This existing policy may provide an opportunity to implement funding mechanisms for climate change-related actions.

Table 4.24. Suggested funding arrangements for disaster risk management by municipalities

Activity	Funding Sources	Funding Mechanism
Start-up activities	National government	Conditional grant for local government – district and metropolitan municipalities where necessary
On-going DRM operations	New assignment to local government	Increase the institutional component of the equitable share of local government
Disaster risk reduction	District municipalities	Own budget – can be augmented by application for funding to the NDMC for special national priority risk-reduction projects.
	Low-capacity, resource-poor municipalities*	Additional funding provided by the NDMC
Response, recovery, rehabilitation and reconstruction	Local government	Access to central contingency fund once threshold is exceeded. Conditional grant, i.e. MIG.
Education, training and capacity-building programmes	Local government	Own budgets and reimbursement through SETAs. Public awareness programmes and research activities can be funded by private sector, research foundations, NGOs and donor funding.

\*Low-capacity, resource-poor municipalities identified through creating a composite index that takes into account the operating income of municipalities and their capacity, as determined by the National Treasury

Source: based on Visser and van Niekerk, 2009

In various parts of the world, another type of grant/subsidy – buyout schemes – has been implemented to reduce the level of exploitation of natural resources such as fisheries and grazing, in order to achieve sustainable use levels and/or increase ecosystem resilience in the face of climate change (e.g. Walden *et al.*, 2003). Examples of these schemes include purchasing fishing rights or livestock and paying farmers not to plough in wetland areas.

The role of private financing should not be neglected. Local government initiatives and national policy should be geared to facilitate investment in private funding mechanisms, such as corporate retained earnings and venture capital. Corporate interest in adaptation and mitigation is largely market driven, and policy should be directed to ensure that incentives and abilities to earn profits are set appropriately. For example, a successful joint venture agreement between the Chilean Government and the US firm ITT led to the establishment of a national agency for new technology. Since its inception, the organisation has been praised for incubating new ventures through entrepreneurship and new technologies (Aubert, 2004). This example highlights the potential of such projects, and partnerships where the government and private sector can work together to effect climate change-related measures should be investigated.

To improve resilience to climate change, various incentive measures can also be used to encourage changes in behaviour, including natural resource management. Fiscal measures include charges, taxes and subsidies, which are all tools that act as incentives, disincentives or even perverse incentives. Charges and taxes are generally favoured over subsidies. However, charges and taxes may be useful measures for reducing consumption and pollution and achieving a low-carbon economy, but rural societies needing to adapt to climate change will probably require tax-breaks and subsidies to help them invest in new technologies. For example, subsidies for introducing new crop varieties/seed material and climate change-resistant livestock breeds, and climate change-related technologies. Although these will incur costs to



national treasury, the investment is likely to avert major costs in the medium to long term. To some extent, these costs could be recouped through taxing or removing existing subsidies on adaptation-unfriendly actions.

Trading systems, such as tradable use rights (e.g. for water, pollution, grazing or natural resource harvesting) and payments for ecosystem services are more efficient than taxes and subsidies (Wunder, 2005). For these systems to work effectively, an institutional setting will need to be in place, such as Catchment Management Agencies to manage water and land use.

In summary, a wide range of fiscal and financial mechanisms can be used to enhance resilience to climate change in vulnerable rural areas. Furthermore, in many cases, these mechanisms can be implemented through existing local avenues, in the form of capital grants and existing policies and guidelines, although some amendments may be required to facilitate access to these funds for climate change-related projects.

#### 4.7.3 Measures to facilitate adaptation

Table 4.25 lists some adaptation measures that will be required to deal with climate change impacts in rural areas, together with fiscal and financial measures that would be needed to achieve them (in addition to improved regulation).

Table 4.25. Climate change adaptation measures for adverse impacts in rural areas and the types of fiscal and financial measures required to bring these about

Type of impact	Adaptation actions required	Fiscal and financial measures
Reduced water supply (quantity and quality)	Supply and sanitation infrastructure Supply management Demand management	Grants, public-private partnerships, subsidies to motivate technological innovation Tradable water use rights and pollution permits Payments for ecosystem services Water pricing
Reduced land and renewable resource capacity	Changes in farming practices Improved natural resource conservation measures Increased alternative livelihood opportunities	Spatial planning of rural agricultural development/land reform Subsidised drought-resistant seeds Funding of extension services Improved financial services (credit and insurance) Support of joint ventures to farm on spatially separated areas Increased support to land reform projects Support of agricultural cooperatives Funding of buyout schemes and abattoirs to reduce stocking rates during drought More investment in education in rural areas Reduced perverse incentives for employment on farms
Sea-level rise, increased storms and floods	Disaster risk management	Municipal infrastructure grants for infrastructural protection measures Grants for investment in 'ecological infrastructure' (e.g. acquisition of land for buffer areas)
Health impacts	Increased preventative action and medical facilities	Major investments to eradicate climate-sensitive disease vectors (already underway) Investment in infrastructure and Food subsidies, maize subsidies, social grants
All	Research and monitoring of climate, ecosystem, and socio-economic parameters	National academic research funding support to climate change projects (e.g. research on viability of new cultivars) Funding of national monitoring programmes
All	Capacity building	Salary top-ups or tax breaks to attract professionals to government and health care positions in rural areas Significant investment in school education Funding from private sector, research foundations, NGOs and donor funding.

### **Securing water supply and quality**

Top of the list are water supply issues, which will need to be dealt with at all government levels. Increasing urbanisation will further exacerbate water supply and sanitation problems in urban areas. Decreased viability of farming, as a result of climate change, may lead to increased population pressures in some villages and small towns, especially as farmers are becoming increasingly mechanised and opting for limited migrant labour in response to a combination of harsh international competition and the *Extension of Security and Tenure Act (ESTA)*.

A substantial part of the national budget has already been allocated to fund the development of new water supply infrastructure. However, the increasing marginal cost of water supply infrastructure means that the development of alternative water supply and treatment technologies will be essential, through supporting technological innovation and public-private partnerships. These developments also need to be stimulated by harsher legislation, particularly in heavily populated mining areas.

Water resource management and water demand management will also be crucial to ensuring adequate water supplies in the future. The former will require government to speed up the devolution of water management to the catchment level (through the establishment of Catchment Management Agencies, which will be key in setting up incentive schemes such as payments for ecosystem services, tradable water and pollution permits, and demand management through water pricing).

### **Improving land capacity and agricultural viability**

Impacts on agriculture may destabilise rural communities and place an enormous burden on rural municipalities, as escalating poverty affects food security, health and crime. Farming households will need to be supported in their efforts to adapt to a changing climate. Government interventions to achieve land reform will need to be planned carefully from a spatial and product perspective. The increasing risks of farming will need to be addressed through access to insurance.

One of the study's most robust findings is the potential resilience of mixed farming, as a strategy for coping with climate change for both commercial and subsistence farmers. While large farming operations may be able to diversify gradually into mixed farming, the ability of small-scale farmers to experiment with such diversification would be limited. Moreover, for specific sectors such as horticulture, investments in new cultivars are costly and involve longer-term investments. In both these instances, extension services – to do research and provide expert advice on drought resistant crops and cultivars – are crucial as a support mechanism for commercial and subsistence farmers. A worthwhile initiative would also be to support agricultural cooperatives, by creating infrastructure for accessing inputs, packaging and marketing for small-scale commercial farmers.

The agricultural analysis indicates that small and less efficient farms are likely to exit the agricultural market, as pressures of climate change mount. Our predictions show that both commercial subsistence crop and livestock farming could become unviable by 2080. Therefore, if government is committed to redress past land ownership inequalities, much of subsistence agriculture will have to be subsidised, while support will be needed for farmers to diversify into mixed farming practices that allow them to spread climate-change risks.

In the face of government's commitment to land reform, the study indicates that small-scale and subsistence farmers who are part of land reform projects are worse off than those who have access to their own land for cultivation. For such projects to survive the harsh environments of competitive international markets compounded by predicted changes in climate, government will have to make a concerted effort to provide support to land reform projects if they are to be sustainable and economically viable.

Natural resources, including grazing veld, soils and harvested resources will need to be better protected in order to preserve their resilience and capacity to produce during times of drought. A plethora of literature exists on schemes and incentives for achieving better natural resource management. These include compensation and buyout schemes, to reduce pressures on natural resources, and institutional reforms. Buyout schemes are already being investigated for livestock in Namaqualand in order to reduce vulnerability to climate change. Throughout southern Africa, community-based natural resource management has been achieved through financial support.

Another initiative aimed at supporting small-scale livestock farming would be state-operated abattoirs with storage facilities for destocking during drought periods, thereby ensuring price stability. In the current environment, during periods of drought, small-scale farmers are forced to sell stock at very low prices to owners of feed points with access



to private abattoir bookings. This produces the perverse incentive of holding onto stock at times when economically and ecologically they should be destocking for grazing purposes.

The study further indicated that the impacts of climate change will vary substantially from one geographical area to the next. The possibility of incentivising joint ventures that farm on spatially separated areas to spread risk should be investigated.

Improved access to financial services is one of the most important mechanisms for lowering risk for both subsistence and commercial agriculture. The research indicated that accessing insurance is largely beneficial for commercial farmers. Access to credit is also likely to determine the ability of farming operations to cope with harsher climates. Weather-based insurance for small-scale farmers is becoming a popular mechanism in Africa and should be considered in South Africa.

To boost livelihood strategies, investment in education may be an important opportunity to re-skill a new generation of rural inhabitants to find employment in other sectors, as well as to improve efficiency and productivity in the agricultural sector. Given the study's predictions, unemployment is likely to become a major problem in rural areas, as farms consolidate and marginal farms exit the market because of harsher climates. Therefore, government should prioritise alternative employment creation in rural areas. At the same time, revisiting the ESTA may be prudent to retain jobs in rural areas. Options may include subsidising farmers to house retired farm workers and providing off-farm retirement homes for farm workers.

### ***Disaster risk management***

Natural disasters are currently dealt with at the municipal level, using national funds that are set aside for this purpose. Nevertheless, in the event of droughts, floods and coastal storms, municipalities (and their populations) incur costs and will have to develop measures to reduce the impacts. Some cases will be contentious, such as delineating setback lines to protect coastal areas from damage because of rising sea levels, and government support may be needed to compensate landowners for the loss in property value. At present, municipalities are being taken to task over this, which means that they will have legal costs to cover.

### ***Improving health care and food security***

Municipalities are responsible for providing health services, which are already seriously overburdened because of a lack of finance and capacity. Climate-change impacts will require major investments to deal with diseases such as malaria (as well as water quality). Investment in health facilities is possible from existing infrastructure grants, but municipalities will need financial assistance to attract good medical (and other) professionals to rural areas.

Pressure on commercial agriculture is also likely to have severe impacts on food security in the region, as crop and livestock farming becomes unviable. Accessing subsidies, credit and also insurance will become a crucial facet of supporting the agricultural sector, which supplies much of Southern Africa with food. Moreover, food adequacy among families who supplement their diet through subsistence agriculture (especially crop farming) will decline significantly. The effects of declining food adequacy on malnutrition, stunting and child mortality will have to be carefully monitored. A number of interventions may be required to address overall food security at the household level, from increasing social grants, improving infrastructure for distributing food and subsidising basic foods such as maize, to importing food.

### ***Research and monitoring***

Research and monitoring is fundamental and will help to direct actions for the most efficient use of available resources. South African and international institutions such as the National Research Foundation, the Water Research Commission and several agricultural research centres already fund this kind of research, but demand for these funds is in excess of their supply. A concerted effort should be made to tap into international funding sources for short-term research, and government funding should be allocated to the roll-out of long-term monitoring programmes that track appropriate climatological, ecological and socio-economic factors.

### ***Capacity building***

Lack of human capacity, both in government institutions and in society as a whole, is one of the biggest hindrances to coping with climate change in rural areas. Human capacity needs to be addressed in the short term by attracting skilled personnel to rural areas through incentive measures. This is likely to be more effective than trying to capacitate

existing personnel (e.g. through training courses) who are already overextended in institutions that have a high level of vacancies.

To address capacity needs in the longer term, the most important investment that the government can make to help rural South Africans deal with climate change will be in an apparently unrelated area: school education. Education will provide opportunities for finding alternatives to current rural livelihoods and will, ultimately, help to alleviate the capacity needs in local government and services such as health and education. This is not about refining the curriculum to include climate change (which is being addressed in any case), but about addressing the shortage of skilled teachers, schools and equipment. Education will also provide the most important avenue for rural communities to find alternative livelihoods that make them less dependent on climate-sensitive activities.

## 4.8 Recommendations

With respect to addressing impacts of climate change in rural areas, the Commission recommends that:

- The Department of Environmental Affairs (DEA) and the National Disaster Management Centre (NDMC) should develop a municipal vulnerability index and disaster-risk modelling tools to assist municipalities assess their vulnerability to climate change and non-climate change disasters and determine associated contingent liabilities.
- The DEA and NDMC should:
  - Develop a standardised **Vulnerability Index** that government can adopt as the basis for:
    - i. identifying and monitoring municipal jurisdictions and municipalities that are most vulnerable to disasters;
    - ii. coordinating and providing targeted national and provincial support to vulnerable municipalities;
    - iii. enabling improved planning and risk management by all municipalities.
  - The vulnerability index, at a minimum, should take into account the *exposure*, *sensitivity* and *adaptive capacity* of an area to disasters. Suggested indicators for these criteria are provided in the Technical Report that accompanies this Submission.
  - Standardise and use disaster-risk modelling techniques to project the potential damage of disasters on human life, livelihoods, infrastructure and property. For example, the estimated number of people who will become homeless, the number of buildings that will have to be rebuilt and the cost of reconstruction operations;
  - Develop and implement a government-wide national climate change programme, which includes monitoring climatic and oceanic parameters, ecosystem health (rivers, wetlands, estuaries, marine and terrestrial systems) and socio-economic variables.
- The Department of Cooperative Governance (DCoG) should adjust the objectives, terms and conditions, and procedures of the MIG (municipal infrastructure grant) to:
  - Permit municipalities to use grant funds for climate adaptation and mitigation investments that involve creating, rehabilitating or modifying municipal infrastructure and,
  - Ensure that these investments prioritise and directly address the vulnerabilities faced by poor households.
- The DCoG should restructure the Special Municipal Infrastructure Grant component of the MIG in order to:
  - Allow municipalities to acquire or rehabilitate ecological infrastructure (such as coastal dunes or mangroves that provide natural protection from excessive storm surge and other weather events), provided that the return on investment is greater than a comparable engineering solution;

- Provide a funding window for rural municipalities to receive resources from the Green Fund and similar global resources (e.g. the World Bank Clean Technology Fund and the newly established Green Climate Fund) in accordance with their terms and conditions.
- The Department of Agriculture, Forestry and Fisheries (DAFF) should expand support services for small-scale farmers to encourage them to adopt climate-resilient farming strategies aimed at adapting and mitigating the projected local effects of climate change through:
  - Advice on diversification, mixed-cropping, drought-resistant crops and efficient irrigation systems;
  - Improved access to financial services and instruments (such as micro-credit and weather-based insurance) that can help lower their risk exposures

#### Annexure 4A. Vulnerability Scores for Municipalities

Municipality name	Municipality code	Municipality type	Vulnerability score	Municipality name	Municipality code	Municipality type	Vulnerability score
Kheis	NC084	B3	3	Dikgatlong	NC092	B3	2
Khara Hais	NC083	B2	1	Dipaleseng	MP306	B3	3
Abaqulusi	KZN263	B3	1	Ditsobotla	NW384	B3	5
Aganang	LIM352	B4	5	Dr JS Moroka	MP316	B4	4
Albert Luthuli	MP301	B4	2	Drakenstein	WC023	B1	1
Amahlathi	EC124	B3	3	eDumbe	KZN261	B3	4
Ba-Phalaborwa	LIM334	B3	3	Ekurhuleni	EKU	A	2
Baviaans	EC107	B3	1	Elias Motsoaledi	LIM472	B4	5
Beaufort West	WC053	B3	1	Elundini	EC141	B4	3
Bela-Bela	LIM366	B3	4	Emadlangeni	KZN253	B3	2
Bergvliet	WC013	B3	1	Emakhazeni	MP314	B2	2
Bitou	WC047	B3	1	Emalahleni	EC136	B4	4
Blouberg	LIM351	B4	4	Emalahleni	MP312	B1	4
Blue Crane Route	EC102	B3	2	Emfuleni	GT421	B1	4
Breede Valley	WC025	B2	1	Emnambithi/Ladysmith	KZN232	B2	2
Buffalo City	BUF	B1	4	Emthanjeni	NC073	B3	2
Bushbuckridge	MP325	B4	3	Endumeni	KZN241	B3	1
Camdeboo	EC101	B3	1	Engcobo	EC137	B4	5
Cape Agulhas	WC033	B3	1	Ephraim Mogale	LIM471	B4	5
Cederberg	WC012	B3	1	Ethekwini	ETH	A	2
City of Cape Town	CPT	A	2	Ezingoleni	KZN215	B4	4
City of Johannesburg	JHB	A	3	Fetakgomo	LIM474	B4	5
City of Matlosana	NW403	B1	5	Gamagara	NC453	B3	1
City of Tshwane	TSH	A	3	Gariep	EC144	B3	2
Dannhauser	KZN254	B4	3	Ga-Segonyana	NC452	B3	3
Dihlabeng	FS192	B2	1	George	WC044	B1	1
				Govan Mbeki	MP307	B1	1

Municipality name	Municipality code	Municipality type	Vulnerability score	Municipality name	Municipality code	Municipality type	Vulnerability score
Great Kei	EC123	B3	4	Laingsburg	WC051	B3	1
Greater Giyani	LIM331	B4	5	Langeberg	WC026	B3	1
Greater Kokstad	KZN433	B2	1	Lekwa	MP305	B3	2
Greater Letaba	LIM332	B4	5	Lekwa-Teemane	NW396	B3	3
Greater Taung	NW394	B4	4	Lepele-Nkumpi	LIM355	B4	4
Greater Tubatse	LIM475	B4	4	Lephalale	LIM362	B3	3
Greater Tzaneen	LIM333	B4	4	Lesedi	GT423	B3	1
Hantam	NC065	B3	1	Letsemeng	FS161	B3	3
Hessequa	WC042	B3	1	Local Municipality of Madibeng	NW372	B1	4
Hibiscus Coast	KZN216	B2	3	Lukanji	EC134	B2	4
Hlabisa	KZN274	B4	4	Mafikeng	NW383	B2	4
Ikwezi	EC103	B3	1	Mafube	FS205	B3	2
Imbabazane	KZN236	B4	4	Magareng	NC093	B3	3
Impendle	KZN224	B4	2	Makana	EC104	B2	3
Indaka	KZN233	B4	5	Makhado	LIM344	B4	4
Ingwe	KZN431	B4	3	Makhudu-thamaga	LIM473	B4	4
Inkwanca	EC133	B3	2	Maletswai	EC143	B3	3
Intsika Yethu	EC135	B4	5	Maluti a Phofung	FS194	B3	3
Inxuba Yethemba	EC131	B3	2	Mamusa	NW393	B3	3
Joe Morolong	NC451	B4	3	Mandeni	KZN291	B4	5
Jozini	KZN272	B4	4	Mangaung	MAN	B1	2
Kagisano/Molopo	NW397	B4	3	Mantsopa	FS196	B3	1
Kai !Garib	NC082	B3	2	Maphumulo	KZN294	B4	5
Kamiesberg	NC064	B3	2	Maquassi Hills	NW404	B3	4
Kannaland	WC041	B3	1	Maruleng	LIM335	B4	3
Kareeberg	NC074	B3	1	Masilonyana	FS181	B3	3
Karoo Hoogland	NC066	B3	1	Matatiele	EC441	B4	2
Kgatelopele	NC086	B3	1	Matjhabeng	FS184	B1	4
Kgetlengrivier	NW374	B3	4	Matzikama	WC011	B3	1
Khai-Ma	NC067	B3	1	Mbhashe	EC121	B4	4
King Sabata Dalindyebo	EC157	B2	4	Mbizana	EC443	B4	4
Knysna	WC048	B2	1	Mbombela	MP322	B1	1
Kopanong	FS162	B3	2	Merafong City	GT484	B2	3
Kouga	EC108	B3	2	Metsimaholo	FS204	B2	3
Kou-Kamma	EC109	B3	3	Mfolozi	KZN281	B4	4
Kwa Sani	KZN432	B3	1	Mhlontlo	EC156	B4	4
KwaDukuza	KZN292	B2	3	Midvaal	GT422	B2	2
				Mier	NC081	B3	3

Municipality name	Municipality code	Municipality type	Vulnerability score	Municipality name	Municipality code	Municipality type	Vulnerability score
Mkhambathini	KZN226	B3	4	Nyandeni	EC155	B4	4
Mkhondo	MP303	B3	4	Okhahlamba	KZN235	B4	3
Mnquma	EC122	B4	5	Oudtshoorn	WC045	B2	2
Modimolle	LIM365	B3	4	Overstrand	WC032	B2	1
Mogalakwena	LIM367	B2	3	Phokwane	NC094	B3	4
Mogale City	GT481	B1	2	Phumelela	FS195	B3	2
Mohokare	FS163	B3	3	Pixley Ka Seme	MP304	B3	2
Molemole	LIM353	B4	4	Polokwane	LIM354	B1	3
Mookgopong	LIM364	B3	2	Port St Johns	EC154	B4	5
Moqhaka	FS201	B2	3	Prince Albert	WC052	B3	2
Moretele	NW371	B4	5	Ramotshere Moiloa	NW385	B3	4
Moses Kotane	NW375	B4	5	Randfontein	GT482	B2	2
Mossel Bay	WC043	B2	1	Ratlou	NW381	B4	3
Mpofana	KZN223	B3	2	Renosterberg	NC075	B3	1
Msinga	KZN244	B4	4	Richmond	KZN227	B4	3
Msukaligwa	MP302	B2	1	Richtersveld	NC061	B3	1
Mthonjaneni	KZN285	B3	2	Rustenburg	NW373	B1	4
Mtubatuba	KZN275	B3	4	Sakhisizwe	EC138	B3	3
Musina	LIM341	B3	1	Saldanha Bay	WC014	B2	3
Mutale	LIM342	B4	4	Senqu	EC142	B4	3
Nala	FS185	B3	4	Setsoto	FS191	B3	1
Naledi	NW392	B3	3	Siyancuma	NC078	B3	1
Naledi	FS164	B3	2	Siyathemba	NC077	B3	1
Nama Khoi	NC062	B3	1	Sol Plaatjie	NC091	B1	4
Ndlambe	EC105	B3	3	Stellenbosch	WC024	B1	1
Ndwedwe	KZN293	B4	4	Steve Tshwete	MP313	B1	2
Nelson Mandela Bay	NMA	A	3	Sundays River Valley	EC106	B3	3
Newcastle	KZN252	B1	4	Swartland	WC015	B3	1
Ngqushwa	EC126	B4	4	Swellendam	WC034	B3	1
Ngquza Hill	EC153	B4	4	Thaba Chweu	MP321	B3	2
Ngwathe	FS203	B3	2	Thabazimbi	LIM361	B3	2
Nkandla	KZN286	B4	4	The Big 5 False Bay	KZN273	B3	4
Nketoana	FS193	B3	1	The Msunduzi	KZN225	B1	2
Nkomazi	MP324	B4	4	Theewaterskloof	WC031	B3	1
Nkonkobe	EC127	B3	4	Thembelihle	NC076	B3	1
Nongoma	KZN265	B4	4	Thembisile	MP315	B4	5
Nqutu	KZN242	B4	4	Thulamela	LIM343	B4	5
Ntabankulu	EC444	B4	5	Tlokwe City Council	NW402	B1	2
Ntambanana	KZN283	B4	4				
Nxuba	EC128	B3	3				

Municipality name	Municipality code	Municipality type	Vulnerability score	Municipality name	Municipality code	Municipality type	Vulnerability score
Tokologo	FS182	B3	2	uMshwathi	KZN221	B4	2
Tsantsabane	NC085	B3	1	Umsobomvu	NC072	B3	1
Tsolwana	EC132	B3	2	Umtshezi	KZN234	B3	1
Tswaing	NW382	B3	4	UMuziwabantu	KZN214	B3	4
Tswelopele	FS183	B3	3	Umvoti	KZN245	B3	4
Ubuhlebezwe	KZN434	B4	4	Umzimkhulu	KZN435	B4	4
Ubuntu	NC071	B3	2	Umzimvubu	EC442	B4	4
Ulundi	KZN266	B4	4	Umzumbe	KZN213	B4	4
Umdoni	KZN212	B2	1	UPhongolo	KZN262	B4	4
Umhlabuyalingana	KZN271	B4	4	Ventersdorp	NW401	B3	4
uMhlathuze	KZN282	B1	4	Victor Khanye	MP311	B3	2
Umjindi	MP323	B3	1	Vulamehlo	KZN211	B4	4
uMlalazi	KZN284	B4	4	Westonaria	GT483	B2	3
uMngeni	KZN222	B2	1	Witzenberg	WC022	B3	1

## References

- Adams, RM. 1999. On the search for the correct economic assessment method. *Climatic Change*, 41(3-4): 363-70.
- Adger, WN. 2000. Social and ecological resilience: are they related? *Progress in Human Geography*, 24: 347.
- Adger, WN. 2003. Social capital, collective action, and adaptation to climate change. *Economic geography*, 79:4: 387-404.
- Adger, WN. 2006. Vulnerability. *Global Environmental Change*, 16, 268-281.
- Adger, WN, Huq, S, Brown, K, Conway, D and Hulme, M. 2003. Adaptation to climate change in the developing world developing world. *Progress in Development Studies*, 3: 179-185.
- Agrawal, A. 2008. *The role of local institutions in adaptation to climate change*. Paper prepared for the Social Dimensions of Climate Change, Social Development Department. Washington DC: The World Bank.
- Aubert, J-E. 2004. *Promoting Innovation in Developing Countries: A Conceptual Framework*. Washington DC: World Bank Institute.
- Below, T, Artner, A, Siebert, R and Sieber, S. 2010. Micro-level Practices to Adapt of Climate Change for African Small-scale Farmers, *IFPRI Discussion Paper* 00953.
- Benhin, JKA. 2008. South African crop farming and climate change: An economic assessment of impacts. *Global Environmental Change*, 18: 666-678.
- Benhin, J, Mutoko, M, Ritho, C and Mbatia, O. 2010. Analysis of economic efficiency in smallholder maize production in Northwestern Kenya. *East African Agricultural and Forestry Journal*, 74, No 1&2.
- Beyer, HL. 2004. *Hawth's Analysis Tools for ArcGIS*. Available at [www.spatialecology.com/htools](http://www.spatialecology.com/htools).
- Bohle, GH, Downing, TE and Watts, JW. 1994. Climate change and social vulnerability: Toward a sociology and geography of food insecurity. *Global Environmental Change*, 4(1): 37-48
- Botha, D, van Niekerk, D, WenOnk, G, Tshona, T Maartens, Y, Forbes, K, Annandale, E, Coetzee, C and Raju, E. 2010. *Disaster Risk Management Status Assessment at Municipalities in South Africa*. SALGA, Pretoria.
- Brewer, C and Pickle, L. 2002. Evaluation of methods for classifying epidemiological data on choropleth maps in series. *Annals of the Association of American Geographers*, 92:4: 662-681.
- Brooks, N, Adger, NW and Kelly, PM. 2005. The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global Environmental Change*, 15: 151-163.



- Bryan, E, Deressa, T, Gbetibouo, GA and Ringler, C. 2009. Adaptation to climate change in Ethiopia and South Africa: options and constraints. *Environmental Science and Policy* 12: 413-236.
- Casale, M, Drimie, S, Quinlan, T and Ziervogel, G. 2010. Understanding vulnerability in southern Africa: comparative findings using a multiple-stressor approach in South Africa and Malawi. *Regional Environmental Change*, 10(2): 157-168.
- Chambers, R. 1989. Editorial introduction: vulnerability, coping and policy. *IDS Bulletin*, 20(2): 1-7.
- Cutter, S, Boruff, BJ and Shirley, WL. 2003. Social vulnerability to environmental hazards. *Social Science Quarterly*, 84: 242-261.
- DAFF (Department of Agriculture, Forestry and Fisheries). 2012. *Strategic Plan: 2012/13–2016/17*. Pretoria: DAFF.
- Darwin, R. 1999. The impacts of global warming on agriculture: a Ricardian analysis – comment. *American Economic Review*, 89: 1049-1052.
- Deressa, T, Hassan, R and Ringler, C. 2008. Measuring Ethiopian Farmers' Vulnerability to Climate Change Across Regional States, *IFPRI Discussion Paper No. 806*, <http://www.ifpri.org/pubs/dp/>. Washington, DC: IFPRI.
- Di Falco, S, and Chavas, J. 2009. On crop biodiversity, risk exposure, and food security in the Highlands of Ethiopia. *American Journal of Agricultural Economics* 91(3): 599-611.
- Downing, TE and Patwardhan, A. 2004. Assessing vulnerability for climate adaptation. In Lim, B and Spanger-Siegfried, E. (ed.). *Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures*, chapter 3. Cambridge University Press: Cambridge.
- DPLG (Department of Provincial and Local Government). 2005. National Disaster Management Framework for South Africa issued in terms of the *Disaster Management Act 57 of 2002*. Pretoria: Government Printer.
- DWAF (Department of Water, Agriculture and Forestry). 2002. Proposed First Edition National Water Resources Strategy, Pretoria.
- Eakin, H and Luers, AL. 2006. Assessing the vulnerability of social-environmental systems. *Annual Review of Environment and Resources*. 31: 365-394.
- El-Shaer, HM, Rosenzweig, C, Iglesias, A, Eid, MH and Hillel, D. 1997. Impact of climate change on possible scenarios for Egyptian agriculture in the future. *Mitigation and Adaptation Strategies for Global Change*, 1: 233-250.
- Eriksen, SH and Kelly, PM. 2007. Developing credible vulnerability indicators for climate adaptation policy assessment. *Mitigation and Adaptation Strategies for Global Change*, 12, 495-524.
- FAO (Food and Agriculture Organisation). 2008. *Climate Change and Food Security: A Framework Document*. Rome: FAO-UN.
- Fekete, A, Damm, M and Birkmann, J. 2010. Scales as a challenge for vulnerability assessment. *Natural Hazards*, 55:3: 729-747.
- FFC (Financial and Fiscal Commission). 2011. *Submission for the 2012/13 Division of Revenue Technical Report*. Midrand: Financial and Fiscal Commission.
- Ford, JD, Keskitalo, ECH, Smith, T, Pearce, T, Berrang-Ford, L, Duerden, F and Smit, B. 2010. Case study and analogue methodologies in climate change vulnerability research. *Wiley Interdisciplinary Reviews: Climate Change* 1: 374-392.
- Gbetibouo, GA and Hassan RM. 2005. Measuring the economic impact of climate change on major South African field crops: a Ricardian approach. *ELSEVIER, Global and Planetary Change* 47 (2005) 143-152.
- Hahn, MB, Riederer, AM and Foster, SO. 2009. A pragmatic approach to assessing risks from climate variability and change – a case study in Mozambique. *Global Environmental Change*, 19(1): 74-88.
- Hassan R and Nhemachena, C. 2008. Determinants of African farmers' strategies for adapting to climate change: Multinomial choice analysis. *African Journal of Agricultural Research*, Vol 2 No 1 March
- Hijmans, RJ, Cameron, SE, Parra, JL Jones PG and Jarvis, A. 2005. Very high resolution interpolated climate surfaces for global land areas. *International Journal of Climatology*, 25: 1965-1978.
- IPCC. 2001. *Climate Change 2001: Impacts, Adaptation, and Vulnerability*. Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK.
- IPCC. 2007a. Parry, ML, Canziani, OF, Palutikof, JP, van der Linden, PJ and Hanson, CE. (eds.) *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press.

- IPPC. 2007b. Schneider, SH, Semenov S, Patwardhan, A, Burton, I, Magadza, CHD, Oppenheimer, M, Pittcock, AB, Rahman, A, Smith, JB, Suarez, A and Yamin F. 2007: *Assessing key vulnerabilities and the risk from climate change*. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Parry, ML, Canziani, OF, Palutikof, JP, van der Linden, PJ and Hanson, CE, (Eds.) Cambridge University Press, Cambridge, UK, 779-810.
- Jeeninga, H and Uytendin, MA. 2000. The sky is the limit! Or why can more efficient appliances not decrease the electricity consumption of Dutch households. In Bertoldi, P, Ricci, A and Almeida, A. (eds.) *Energy Efficiency in Household Appliances and Lighting*. Heidelberg: Springer.
- Jones, RN and Boer, R. 2003. Assessing current climate risks. In Lim, I. Carter, S. al Huq, (eds.). *Adaptation Policy Framework Technical Paper 4B*. New York: UNDP. Available: <http://www.undp.org/GEF/documents/publications/apf-technical-paper04.pdf>.
- Kabubo-Mariara, J and Karanja, FK. 2007. The economic impact of climate change on Kenyan crop agriculture: a Ricardian approach, *Policy Research Working Paper 4334*. New York: World Bank.
- Kates, RW. 2000. Cautionary tales: Adaptation and the global poor. *Climatic Change*, 45: 5-17.
- Kaufmann, R. 1998. Commentary: the impact of climate change on US agriculture: a response to Mendelsohn *et al.*, 1994. *Ecological Economics*, 26: 113-119.
- Koeppel, S and Ürge-Vorsatz, D. 2007. *Assessment of Policy instruments for reducing greenhouse gas emissions from Buildings*. Unpublished report for the UNEP – Sustainable Buildings and Construction Initiative. Central European University, Budapest.
- Kruger, AC and Shongwe, S. 2004. Temperature trends in South Africa: 1960-2003. *International Journal of Climatology*, 24 (15), 1929-1945.
- Kumar, K and Parikh, J. 2001. Socio-economic impacts of climate change on Indian agriculture. *International Review for Environmental Strategies*, 2(2).
- Kurukulasuriya, P and Ajwad M. 2006. Application of the Ricardian technique to estimate the impact of climate change on smallholder farming in Sri Lanka. *Climatic Change*, doi: 10.1007/s10584-005-9021-2.
- Kurukulasuriya, P and Mendelsohn, R. 2006. A Ricardian Analysis of the impact of Climate Change on African Cropland, *African Journal of Agricultural and Resource Economics*, vol. 2(1), March.
- Kurukulasuriya, P, and Mendelsohn, R. 2008. Crop switching as a strategy for adapting to climate change. *African Journal of Agricultural and Resource Economics*, Volume 2, No. 1 (March), Pretoria.
- Kurukulasuriya, P and Rosenthal, S. 2003. Climate Change and Agriculture: A Review of Impacts and Adaptations. *Climate Change Series 91*. Environment Department Papers. Washington, DC: World Bank.
- Laukkonen, J, Blanco, PK, Lenhar, J, Keiner, M, Cavric, B and Kinuthia-Njenga, C. 2009. Combining climate change adaptation and mitigation measures at the local level. *Habitat International*, 33: 287-292.
- Leichenko, R and O'Brien, K. 2002. The dynamics of rural vulnerability to global change: the case of Southern Africa. *Mitigation and Adaptation Strategies for Global Change*, 7: 1-18.
- MacEachren, AM. 1994. *Some Truth with Maps: A Primer on Symbolisation and Design*. Washington DC: Association of American Geographers.
- Maddison, D, Manley, M and Kurukulasuriya, P. 2007. The impact of climate change on African agriculture, a Ricardian approach. *Policy Research Working Paper 4306*, The World Bank Development Research Group.
- Madzwamuse, M. 2010. *Climate Change Vulnerability and Adaptation Preparedness in South Africa*. Document prepared for Heinrich Böll Stiftung Southern Africa.
- McCarthy, JJ, Long Martello, M, Corell, R, Eckley Selin, N, Fox, S, Hovelsrud-Broda, G, Mathiesen, SD, Polsky, C, Selin H and Tyler, NJC. 2005. Climate change in the context of multiple stressors and resilience. In Symon, C, Arris, L and Heal, B (Eds.) *Arctic Climate Impact Assessment (ACIA)*. Cambridge: Cambridge University Press, 945-988.
- McGuigan, C, Reynolds, R and Wiedmer, D. 2002. Poverty and climate change: Assessing impacts in developing countries and the initiatives of the international community. London School of Economics Consultancy Project for the Overseas Development Institute.
- Mendelsohn, R and Dinar, A. 1999. *Climate Change, Agriculture, and Developing Countries: Does Adaptation Matter?*, World Bank Research Observer, Oxford University Press, vol. 14(2), pages 277-93, August, <http://ideas.repec.org/a/oup/wbrobs/v14y1999i2p277-93.html>.



- Mendelsohn, R and Dinar, A. 2003. Climate, Water, and Agriculture. *Land Economics* 79(3): 328-41.
- Mendelsohn, R and Williams, L. 2004. Comparing forecasts of the global impacts of climate change. *Mitigation and Adaptation Strategies for Global Change* 9(4): 315-33.
- Mendelsohn, R, Nordhaus, W, and Shaw, D. 1994. Measuring the impact of global warming on agriculture. *American Economic Review* 84: 753-771.
- Mendelsohn, R, Dinar, A and Dalfelt, A. 2000. *Climate impacts on African agriculture*. World Bank.
- Mendelsohn, R, Sanghi, A and Dinar, A. 2001. The effect of development on the climate sensitivity of agriculture. *Environment and Development Economics* 6(1): 85-101.
- Mukheibir, P and Sparks, D. 2003. Water resource management and climate change in South Africa: Visions, driving factors and sustainable development indicators. Energy and Development Research Centre, University of Cape Town.
- Morduch, J. 1995. Income Smoothing and Consumption Smoothing, *Journal of Economic Perspectives*, 9(3): 103-114.
- Nelson, C, Rosegrant, M, Koo, J, Robertson, R, Sulser, T, Zhu, T, Ringler, C, Msangi, S, Palazzo, A, Batka, M, Magalhaes, M, Valmonte-Santos, R, Ewing, M and Lee, D. 2010. The costs of agricultural adaptation to climate change. *World Bank Discussion Paper*, no 4.
- Nhemachena, C and Hassan, R. 2007. Micro-level analysis of farmers' adaptation to climate change in southern Africa, *IFPRI Discussion Paper* 00714.
- Nhemachena, C, Hassan, R and Chikwizira, J. 2010. *Economic Impacts of Climate Change on Agriculture and Implications for Food Security in Southern Africa*. Centre for Environmental Economics and Policy in Africa (CEEPA).
- O'Brien, K, Sygna, L and Haugen, JE. 2003. Vulnerable or resilient? A multi-scale assessment of climate impacts and vulnerability in Norway. *Climatic Change*: 193-225.
- O'Brien, K, Leichenko, R, Kelkar, U, Venema, H, Aandahl, G, Tompkins, H, Javed, A, Bhadwal, S, Bard, S, Ygaard, L and West, J. 2004. Mapping vulnerability to multiple stressors: climate change and globalization in India. *Global Environmental Change*, 14: 303-313.
- Osborne, H, Twyman, C, Adger, W and Thomas, D. 2010. Evaluating successful livelihood adaptation to climate variability and change in southern Africa. *Ecology Society*. 15 (2): 27.
- Preston, BL, Brooke, C, Measham, TG, Smith, TF and Gorddard, R. 2009. Igniting change in local government – lessons learned from a bushfire vulnerability assessment. *Mitigation and Adaptation Strategies for Global Change*, 14, 251-283.
- Ramachandran, M and Eastman, R. 1997. Applications of GIS to vulnerability mapping: a West African food security case study. In: *Applications of Geographic Information Systems (GIS) Technology in Environmental Risk Assessment and Management*. UNEP and the Clark Labs for Cartographic Technology and Geographic Analysis.
- Reilly, J and Schimmelpfennig, D. 1999. Agricultural impact assessment, vulnerability, and the scope for adaptation. *Climatic Change* 43: 745-788.
- Roberts, D. 2008. Thinking globally, acting locally -- institutionalizing climate change at the local government level in Durban, South Africa. *Environment and Urbanization*, 20: 521-537.
- Rosenzweig, C and Iglesias, A (eds). 1994. *Implications of climate change for international agriculture: Crop modelling study*. (EPA 230-B-94-003) US Environmental Protection Agency, Washington DC.
- Rosenzweig, C and Parry, M. 1994. Potential Impact of Climate Change on World Food Supply. *Nature* 367(6459): 133-38.
- Salinger, J, Sivakumar, MVK and Motha, PR. 2005. Increasing climate variability and change—reducing the vulnerability of agriculture and forestry. Springer, AA Dordrecht, The Netherlands.
- SANBI (South African National Biodiversity Institute). 2009. *National Land Cover Map*. Pretoria: SANBI.
- Seo, S and Mendelsohn, R. 2006. Climate change impacts on animal husbandry in Africa: a Ricardian analysis. *CEEPA Discussion Paper No. 9*, Centre for Environmental Economics and Policy in Africa, University of Pretoria.
- Seo, N, Mendelsohn, R and Kurukulasuriya, P. 2006. Climate Change Impacts on Animal Husbandry in Africa: A Ricardian Analysis. *CEEPA Discussion Paper No. 9*. Pretoria: CEEPA.
- Seo, S, Mendelsohn, R, Dinar, A, Hassan, R and Kurukulasuriya, P. 2008. *A Ricardian analysis of the distribution of climate change impacts on agriculture across agro-ecological zones in Africa*. Policy Research Working Paper Series 4599, The World Bank.

- Seo, S, Mendelsohn, R, Dinar, A, Hassan, R and Kurukulasuriya, P. 2009. A Ricardian analysis of the distribution of climate change impacts on agriculture across agro-ecological zones in Africa. *Environ Resource Econ*, 43:313-332.
- Smith, A, Schellnhuber, HJ and Mirza, MMQ. 2001. *Reasons for concern: a synthesis*, pp 913-970. In McCarthy, JJ, White, KS, Canziani, O, Leary, N and Dokken DJ (eds.), *Climate Change 2001: Impacts, Adaptation and Vulnerability*. Cambridge: Cambridge University Press.
- Stats SA. 2007. *Census of Commercial Agriculture 2007*(Preliminary). Pretoria: StatsSA
- Tainton, NM. 1999. Veld and pasture management in South Africa—the ecology of the main grazing lands of South Africa. University of Natal Press, Scottsville, South Africa.
- Tranter, FC, Sharp, B and le Sueur, D. 2003. Potential effect of climate change on malaria transmission in Africa. *The Lancet*, Vol. 362.
- Turpie, JK. 2010. Wetland Valuation. Vol III. The Wetland Livelihood Value Index: A tool for the assessment of the livelihood value of wetlands. Wetland Health and Integrity Programme, *Water Research Commission Report TT442/09*, Pretoria, 54pp.
- Turpie, J, Winkler, H, Spalding-Fecher, R and Midgley, G. 2002. *Economic Impacts of Climate Change in South Africa: A Preliminary Analysis of Unmitigated Damage Costs*. Unpublished report to USAID by Southern Waters Ecological Research and Consulting and Energy and Development Research Centre, University of Cape Town, Rondebosch.
- Twomlow, S, Mugabe, FT, Mwale, M, Delve, R, Nanja, D, Carberry, P and Howden, M. 2008. Building adaptive capacity to cope with increasing vulnerability due to climatic change in Africa—A new approach. *Physics and Chemistry of the Earth*. Vol 33, no 8-13, pp 780-787.
- UCT (University of Cape Town). 2008. *Phase study: the economic impacts of climate change in South Africa*. The UCT Partnership for a Sustainable Environment. <http://www.phase.uct.ac.za>.
- Verner, D. 2011. Social Implications of Climate Change in Latin America and the Caribbean. *Economic Premise*, 61.
- Vincent, K. 2004. *Creating an index of social vulnerability to climate change for Africa*. Tyndall Centre for Climate Change Research, Working Paper 56. Available online at: <http://www.tyndall.ac.uk/>.
- Visser, R and Van Niekerk D. 2009. *A funding model for disaster risk reduction in municipalities in South Africa*. National Disaster Management Centre.
- Vörösmarty, CJ, Douglas, EM, Green, PA and Revenga, C. 2005. Geospatial indicators of emerging water stress: an application in Africa, *Ambio*, 34(3): 230.
- Walden, JB, Kirkley, JE and Kitts, AW. 2003. A limited economic assessment of the Northeast Groundfish Fishery Buyout Program. *Land Economics* 79: 426-439.
- Wright, G and Noble, M. 2009. *The South African Index of Multiple Deprivation 2007 at Municipality Level*. Department of Social Development, Pretoria, Republic of South Africa.
- Wunder, S. 2005. Payments for environmental services: Some nuts and bolts. *Occasional Paper no. 42.*, Center for International Forestry Research (CIFOR); 32pp.
- Yohe, G and Tol, R. 2002. Indicators for social and economic coping capacity moving toward a working definition of adaptive capacity. *Global Environmental Change* 12: 25-40.
- Yusuf, AA and Francisco, H. 2009. Climate change vulnerability mapping for Southeast Asia. EEPSEA, IDRC Regional Office for Southeast and East Asia, Singapore, SG.
- Ziervogel, G and Taylor, A. 2008. Feeling stressed: integrating climate adaptation with other priorities in South Africa. *Environment Science and Policy for Sustainable Development* 50(2): 32-41.

# Chapter 5

## ALTERNATIVE FINANCING MECHANISMS FOR DISASTER RISK MANAGEMENT IN SOUTH AFRICA

Nomonde Madubula<sup>1</sup> and Prof. De Wald van Niekerk<sup>2</sup>

### 5.1 Introduction

This report provides insight into current and ongoing research on alternative funding arrangements for disaster risk management in South Africa,

Natural disasters have a huge impact on social and economic welfare (Vakis, 2006). This impact is especially severe in low/middle-income countries, where governments often have insufficient funds after major disasters to repair critical infrastructure and provide assistance to the private sector (Linnerooth-Bayer and Mechler, 2007, p 57; Kotler *et al.*, 2006, p 236). The poor are particularly exposed to natural disasters and have limited access to risk management instruments. This leaves poor households less able to cope with the impact of disasters than more affluent citizens (Vakis, 2006, p 4). Such a state of affairs has two major consequences for the poor: (i) the severe effect of the shocks accentuates their poverty; and (ii) they become more risk averse and unwilling (or unable) to engage in risky, but higher return activities (Vakis, 2006, p 6). Therefore, to prevent sharp increases in poverty in a country following a disaster, mechanisms should be in place to mitigate the possible financial and societal impacts (Skoufias, 2003, p 1087).

According to the *Disaster Management Act No. 57 of 2002* (DMA), disasters are progressive or sudden, widespread or localised, natural or human-caused tragedies or hazards that threaten life, health, property or environment (South Africa, 2002). In developing countries disasters are common, in part because of climate change and inadequate risk management and associated funding. The literature suggests that disasters often put severe strain on public financing resources and overwhelm the public sector's ability to respond effectively especially for developing countries (Hofman and Brukof, 2006; Cardenas, 2009). In South Africa, each sphere of government plays a significant and unique role in managing and funding disasters and their risks. The role of local government specifically in disaster risk management is emphasised in both the DMA (2002) and the 1999 White Paper on Disaster Management.

Through stakeholder consultations, the FFC informed the National Disaster Management Centre (NDMC), which is the principal functional unit for disaster risk management in the national sphere, of the study from its inception. The department has since responded to the study, expressing general support of the study, its findings and recommendations. Further details of their response can be found on Annexure 5A.

#### 5.1.1 Problem Statement

The current funding model for disaster risk reduction within government and the private sector does not provide optimally for the dynamic risk profile of South Africa and its diverse public financial management system. A number of challenges have emerged since 2005, when the Financial and Fiscal Commission (the Commission) revised the funding mechanisms for disaster management in South Africa. Firstly, the different spheres of government do not fully apply or adhere to current legislative, policy and institutional and funding mechanisms. Secondly, relief measures often take time to reach the victims or places affected by disasters because of the lengthy bureaucratic processes for disbursing disaster funds. Thirdly, experience has shown that funding for disasters does not always adequately address the effects of a particular hazardous event or the cost incurred by provinces or municipalities. The other challenge is that most municipalities do not understand the necessity of budgeting for disaster risk reduction (Visser & Van Niekerk, 2009). Similarly, provinces do not make provision for risk-reduction funding in their planning and budgeting processes. Finally, the lack of such measures have created some perverse incentives: when a disaster occurs, communities are discouraged from taking minimal mitigating or preventative measures by their expectation of some form of compensation from government.

<sup>1</sup> Financial and Fiscal Commission (Fiscal Policy Unit), Midrand, South Africa

<sup>2</sup> University of the North West: African Centre for Disaster Studies

These challenges have resulted in many vulnerable members of the society suffering immensely from disaster events. This has also begged a number of questions, *inter alia*:

- What are the problems associated with current disaster risk-reduction funding mechanism? Is the funding mechanism adequate and effective?
- What are the feasible alternative funding mechanisms for disasters in South Africa? Is there a space for risk sharing and public-private partnerships?
- Are the institutional, policy and legislative frameworks for funding disasters adequate and effective in South Africa?

### 5.1.2 Objectives of the study

The objectives were to:

- Review and evaluate the legislative, policy and institutional frameworks for managing disaster risk reduction in South Africa.
- Give an overview of natural hazards and disaster risks that occur in South Africa.
- Give an overview of future scenarios and threats posed by climate change and variation in South Africa, and the sectors and locations likely to be affected.
- Review and assess the current funding arrangements and funding model for disaster risk management in South Africa.
- Evaluate the relevance of alternative disaster risk management financing mechanisms, for example in the form of the insurance options and public-private partnerships.
- Make policy proposals on best practices for financing disaster losses and disaster risk management, and alternative financing mechanisms, given the threats of climate change and variation.

### 5.1.3 Relationship to Research Strategy and Past Commission Work

In 2009, the Commission adopted a five-year research strategy to assist in attaining its vision of “enhancing the developmental impact of public resources through the financial and fiscal system in South Africa”. The four thematic areas, identified as fundamental principles and goals within the research strategy, are:

- I. Policy outcomes
- II. Accountable institutions
- III. Equitable growth and distribution of resources
- IV. Flexible response

This paper is well located within the Commission’s research strategy, especially “equitable growth and distribution of resources” (by making sure that resources are distributed equitably in disaster funding) and “accountable institutions” (policy-makers design disaster management policies that improve the planning and coordination of disasters and have clear accountable structures). These issues bode well for the Commission’s role of maintaining an effective, equitable and sustainable system of intergovernmental fiscal relations in South Africa.

The frequency (and severity) of natural disasters is increasing (Ghesquiere and Mahul, 2007, p 2). As a result, the fiscal and economic exposure of developing countries grows every year for reasons that range from the growing concentration of populations and assets in high-risk areas to increases in climate variability. Both Olokesusi (2005, p 17) and Ghesquiere and Mahul (2007, p 2) indicated that disasters have serious implications for long-term development if risk management is not actively applied. This poses an increasing threat to poverty reduction and sustainable development. South Africa, like any developing country, has suffered significantly from natural and man-made hazards.

General international viewpoints regarding disaster risk management provide a theoretical basis for the study. The international trend is to emphasise funding disaster risk reduction before an event occurs (*ex ante*) rather than the traditional approach of funding losses associated with a disaster after it has happened (*ex post*). This report will use these two focuses (*ex ante* and *ex post*).

Each of these focuses is unique and requires distinctive funding mechanisms, yet these two domains are inextricably linked. The aim of this report is to highlight the salient aspects that need to be considered when drafting a new national funding model and policy on disaster risk management funding. Aspects include funding for disasters and risks, disaster response and recovery strategies, financial tools that can be used, the role of government, access to alternative funding, and how other countries have financed disasters.

## 5.2 Disaster Risk Reduction vs. Disaster Response and Recovery

To understand the various components of disaster risk management within the South African context, and subsequently the funding needs, it is imperative to define the respective components. The National Disaster Management Framework (NDMF) and the DMA allude to the need for ‘pre-’ and ‘post-disaster’ funding. The first refers to what is commonly known as disaster reduction and the latter to disaster response and recovery.

Disaster risk reduction (also called ‘disaster reduction’) can be defined as the “practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events” (UNISDR, 2009). According to Freeman, Keen and Mani (2003, p 14–16), a variety of measures can possibly be used to reduce the physical destruction caused by natural disasters. These measures include: land-use planning, to reduce construction on seismic fault lines, in coastal regions subject to storm damage, and along river shorelines subject to frequent floods; building standards aimed at ensuring some level of robustness against earthquakes or cyclones; mitigating environmental degradations, such as soil erosion, that can worsen the impact of disasters; and engineering interventions, such as the creation of dams for flood control, dikes to reroute flood waters, fire breaks and seawalls to break storm surges.

The growing importance of disaster risk reduction is emphasised by a global review carried out by the United Nations Inter-agency Secretariat of the International Strategy for Disaster Reduction (UNISDR, 2004, p 345). Highlighting the mounting costs of disasters, the huge losses that have to be covered by insurance companies, the fiscal pressure on governments undertaking post-disaster recovery and reconstruction measures, the UNISDR has called for sustainable financing arrangements to address disaster risks.

The growing need for investment in disaster mitigation and preparedness at national and local levels means that financing disaster risk reduction has become a critically important issue. Recent developments have encouraged disaster risk reduction to become embedded in development projects; particularly as risk assessments are taken into account (as is the case of the Integrated Development Plans (IDPs) at municipal level in South Africa). These developments have been supported by the Organisation for Economic Cooperation and Development (OECD), the World Bank and the International Monetary Fund (IMF), as well as other development banks (UNISDR, 2004, p 345–350).

Furthermore, governments also require resources to deal with small and medium-size disasters. Therefore, they depend on domestic resources for financing disaster risk management schemes, which have been slow to develop because of institutional ignorance and weakness in addressing disaster risks. National budgets that usually make provision for disasters still focus mainly on relief and emergency response activities.

Prevention and mitigation have not yet become an integral part of public financing, nor have institutional channels been developed. Many countries have now set up special funds for the financing of disaster risk reduction, the so-called calamity funds, reconstruction, mitigation and vulnerability reduction funds, as well as social funds and public works programmes (UNISDR, 2004, p 350–356).

Structural measures may be necessary in sectors such as agriculture, water and construction. These structural developments will have significant fiscal consequences, as a result of explicit public policy commitments and the implicit responsibilities of the state in the context of such disasters. Government, therefore, has an important role to play in disaster risk reduction, not only to safeguard its own property, but also to take measures, such as coastal defences and early warning systems for detecting timeously any developing weather risks, and implement



appropriate regulatory controls, for example, on land use. Infrastructure planning also needs to be sensitive to the risks of extreme weather events.

However, the extent of risk-reduction measures in developed and developing countries is markedly different. In the USA, expenditure on preparedness and mitigation measures has increased significantly. In contrast, the financial resources, technical knowledge and political will to mitigate physical vulnerability are often absent in many developing countries. In developing countries, there is little incentive to mitigate damages with *ex-ante* measures because in many cases such damages are paid for by the national government (in the case of sub-national governments, such as municipalities) or foreign donors (in the case of the national government itself). This is sometimes referred to as the 'Samaritan's dilemma' (Freeman *et al.*, 2003, p 17).

The 'Samaritan's dilemma' is when governments or sub-national governments in developing countries believe that they can rely on disaster relief from the national government or foreign donors without taking any *ex-ante* measures to deal with disaster risks themselves. Mahul and Gurenko (2006, p 2) found that the availability of free or inexpensive post-disaster funding discourages developing countries from any proactive *ex-ante* risk management, such as looking into market-driven risk transfer solutions, including reinsurance. They maintain that *ex-post* financing is not the right approach. Instead, a formal country risk-financing framework would provide tangible incentives for proactive country risk management and promote market risk financing. This approach should include developing risk-funding solutions that would provide developing countries with strong economic incentives to engage in active risk management, and thereby reduce their growing vulnerability and levels of exposure significantly (Mahul and Gurenko, 2006, p 3). Nevertheless, historically most governments have not taken much interest in the *ex-ante* management of disasters because of a perception of low vulnerability levels and the fact that most severe hazards manifest themselves very infrequently (Kaplow, 1991; Kunreuther, 1996, p 7).

### 5.2.1 Disaster Response and Recovery

The UN defines disaster response as "the provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected" (UNISDR, 2009). Recovery is "the restoration and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors" (UNISDR, 2009). Although disaster risk reduction should emphasise risk mitigation, the focus is now on the government's capacity to react in the aftermath of a major disaster, specifically regarding finance relief and reconstruction costs (Ghesquiere and Mahul, 2007, p 2). This development is confirmed by the growth in literature pertaining to disaster response, recovery and relief.

The fiscal and economic risk exposure of developing countries has increased significantly, as a result of the concentration of the world's population in vulnerable urban areas, substandard construction practices and low insurance coverage. Over the period 1977–2001, the average damages from large disasters in developing countries represented 7.1% of GDP (Ghesquiere and Mahul, 2007, p 2).

Analysing recent catastrophes, Ghesquiere and Mahul (2007, p 3) found that funding for relief and reconstruction in developing countries generally comes from different sources than in developed countries. In developed countries, losses from natural disasters are typically funded through a combination of private risk financing and an efficient public revenue system that relies on wide and deep taxation systems. In middle and low-income countries, which have relatively low tax ratios and ongoing fiscal policy-funding sources, post-disaster reconstruction tends to be more varied, relying strongly on *ex-post* borrowing and assistance from international donors. Multilateral financial agencies play a particularly important role in middle-income countries, while support from bilateral donors is generally predominant in low-income countries.

Relief operations usually include emergency assistance provided to the affected population, to ensure that basic needs, such as shelters, food and medical attention are adequately met. These costs can be estimated based on a scenario analysis. However, although relief costs are limited, they should be financed in a matter of hours after a disaster event occurs. Therefore, governments' capacity to mobilise resources for relief operations at short notice should be a key component of their risk-financing strategies.

Several techniques can be used to estimate the likely cost of early recovery operations. Catastrophic risk models can simulate the impact of natural disasters, such as earthquakes, on the infrastructure and provide rough estimates of the lifeline infrastructural requirements (e.g. water, electricity and key transportation lines) that are likely to be

damaged in the event of a major disaster, as well as the removal of debris and the establishment of basic safety nets. Such models can also be used to assess the number of people likely to be left homeless and the number of buildings that will have to be rebuilt. One of the important purposes of the early recovery operations is to limit secondary losses and to ensure that reconstruction can start as soon as possible. The early recovery stage can also be used as an opportunity to appoint engineering firms, which can start designing infrastructure works that will have to take place during the reconstruction phase.

For reconstruction operations, catastrophe risk modelling techniques can be used to estimate the potential damage to infrastructure and to any public and private property. Risk assessments can be provided for each group of assets, such as the probable maximum losses during a given return period. This can help the authorities determine the budgetary needs of any such potentially catastrophic events.

Reconstruction operations generally centre on rehabilitating or replacing assets damaged by a disaster. These include public buildings and infrastructure, which are the direct responsibility of the state. However, national or municipal authorities generally have to face obligations that go beyond their own assets. In most cases, government will have to subsidise the reconstruction of private assets, and in particular the housing for low-income families who could not otherwise afford to rebuild their houses. The use of scenario analysis coupled with risk models can also help authorities to understand their potential needs better over time.

All three phases – providing relief, carrying out recovery works and completing reconstruction operations – will also depend on the absorption capacity of the affected economy. The damaged assets cannot all be rebuilt at once, and the government will have to prioritise which key assets to rebuild or rehabilitate first, and which other assets may be restored at a later stage. These choices made by the authorities will influence the timing of financing required for any reconstruction operations.

However, economic theory suggests that countries should ignore uncertainty for public investment and behave as if they are indifferent to risk because they can then pool risks to a much greater extent than private investors. The importance of disaster risk reduction as an ‘insurance mechanism’ for development gains now comes into play.

### 5.3 Financial Tools

Disaster risk reduction can take many forms: reducing exposure to risks, (e.g. land-use planning); reducing vulnerability (e.g. retrofitting high-risk buildings); or creating institutions for better response (e.g. emergency planning). The residual risk can then be managed with insurance and other risk-financing strategies/tools for the purpose of preventing disasters from occurring or providing timely relief and assuring an effective recovery.

The literature suggests a number of financial tools that the South African government needs to consider when drafting an alternative financing model. No evidence was found of a developed or developing state that integrates all of the available tools into a coherent financial model. The research considered the following market-based financial tools: sovereign insurance, risk pooling, reinsurance, index-based insurance, weather derivatives, and micro-insurance and catastrophe bonds.

Linnerooth-Bayer, Mechler and Hochrainer-Stigler (2011) summarises their findings of the pre- and post-disaster risk financing arrangements in Table 5.1.

Beside the *ex-ante* elements in Table 5.1, other available innovative tools include insurance against crop losses droughts infrastructure and other perils, reinsurance, micro-insurance, safety nets and derivatives. Government policies and regulations also play a role as disaster risk-reduction financial instruments.

Before discussing these tools, certain base concepts relating to insurance needs are briefly defined hereafter.



Table 5.1. Examples of pre- and post-disaster risk financing arrangements

	Security for loss of assets (households/businesses)	Food security for crop/ livestock loss (farms)	Security for relief and reconstruction (governments)
Post-disaster (ex-post)			
	Emergency loans Money lenders Public assistance	Sale of productive assets Food aid Diversions	Loans from World Bank and other international financing institutions (IFIs)
Pre-disaster (ex-ante)			
Non-market	Kinship arrangements	Voluntary mutual arrangements	International aid
Inter-temporal	Micro-savings	Food storage	Catastrophe reserve funds Regional pools Contingency credit
Market-based risk transfer	Property and life insurance	Crop and livestock insurance (also index-based)	Insurance or catastrophe bonds (also index-based)

Source: Linnerooth-Bayer et al., 2011

A **basis risk** is when the person insured experiences a loss but does not receive a payment because the index threshold was not reached, or when a person receives a payment but the loss suffered was not as severe as the index indicates (Skees et al., 2007, p 4).

**Systemic risks** (such as widespread of floods that affect large number of farmers simultaneously) are one of the most prominent arguments in favour of government providing, administering and overseeing agricultural insurance programmes. The systemic component of agricultural risks can generate major losses in the portfolio of agricultural insurers. Public intervention is justified to insure against such losses because no private reinsurer or pool of reinsurers has the capacity to cover such a large liability when the risks, even though small, may be difficult to diversify (Mahul and Stutley, 2010, p 31).

**Moral hazards** in the insurance context relate to the insurance purchaser engaging in risk-filled behaviour or behaviour in which fewer precautionary measures are taken because they are insured (Linnerooth-Bayer and Mechler, 2007, p 58). To avoid this moral hazard, insurance contracts should be structured in such a manner as to achieve the optimal trade-off between the conflicting goals of furthering risk spreading and providing appropriate incentives for risk reduction on the part of the insurance purchaser (Pauly, 1974, p 46).

**Adverse selection** refers to insurance cases where the insurer cannot determine some of the characteristics of the insurer that are relevant to the determination of the probability of the future state of nature (Pauly, 1974, p 44). The lack of accurate information means that insurers cannot make an accurate risk assumption, which results in people being over- or un-insured.

### 5.3.1 Sovereign Insurance

Sovereign insurance typically seeks to maintain a well-diversified portfolio of risks, making it very attractive for financing disaster risk. However, this can be a very costly exercise (Linnerooth-Bayer et al., 2007; Linnerooth-Bayer et al., 2011; Mechler, Linnerooth-Bayer and Peppiatt, 2006; Cardenas et al., 2007). Therefore, in some instances a viable strategy could be to transfer risks to the commercial insurance markets, which are well established in developed countries. The degree of their capitalisation and the potential size of pay-outs will determine whether insurance companies are capable of absorbing large disasters. However, reinsurance is another type of insurance available that allows insurance companies to pass on risks that exceed their absorptive capacity (see Section 5.3.3).

While efforts to mitigate and prevent disasters are vital, measures (such as insurance options) that go beyond the current disaster-risk funding scenario are vital. A regional body, established by international donors, normally provides

sovereign insurance to a number of participating countries, which may require catastrophic or disaster risk insurance (Ghesquiere & Mahul, 2007, p 18). Risk financing through insurance and other hedging instruments spreads and pools risks, thus lessening the variability of (but not directly reducing) losses (Linnerooth-Bayer & Mechler 2008; Linnerooth-Bayer *et al.*, 2011).

Catastrophe insurance markets are alternatives that have been on the rise (Hofman and Brukoff, 2006). These markets offer opportunities for the transfer of such risks and can assist by introducing an element of predictability when dealing with post-disaster financing. In addition, risk is transferred to third parties who are better able to absorb it. This represents a *complementary strategy*, where the disaster risk is transferred through purchasing insurance, establishing a form of 'ex-ante risk financing'. It is argued that the use of insurance mechanisms will alleviate budget pressures arising from disasters, as funds would be secured in advance. Hofman and Brukoff, (2006), proposed four insurance-based modalities that can be used to shield public finance resources from disasters: risk pooling, commercial insurance, reinsurance and capital markets. Linnerooth-Bayer *et al.* (2011) provide a more detailed analysis of these components.

### 5.3.2 Risk Pooling

A risk pool is a form of risk management mostly practiced by insurance companies. Under this system, insurance companies come together to form a pool, which can protect insurance companies against catastrophic risks such as floods, earthquakes etc. The term is also used to describe the pooling of similar risks that underlies the concept of insurance. While risk pooling is necessary for insurance to work, not all risks can be effectively pooled. In particular, pooling dissimilar risks in a voluntary insurance market is difficult, unless a subsidy is available to encourage participation (American Academy of Actuaries, 2006).

Risk pooling thus suggests that demand variability is reduced if demand is aggregated across different locations, which will make it more likely that high demand from one customer will be offset by low demand from another. This reduction in variability allows a decrease in safety stock and thereby reduces average inventory.

According to Brenzel and Jones (2010, p 13) the four main types of risk pooling mechanisms are:

1. *National insurance systems*, where funding comes from general revenues, and insurance coverage is provided to the entire population for a fixed set of services (benefits package).
2. *Social insurance systems*, which are funded from mandatory earmarked payroll contributions from individuals and employers. Coverage is provided to contributors, usually in a phased manner. Services are provided based on a defined benefits package that can include certain services. Additional subsidies may come from external assistance or earmarked taxes.
3. *Mutuelles or community-based insurance schemes*, which are generally non-profit prepayment plans for services that are managed at the community level. Funding comes from prepayment into a pooled fund, supplemented by government or donor resources. Coverage is provided to community members, and services are provided by NGOs or public facilities. Benefits are based on community preferences and they may include preventative services.
4. *Private insurance*, where funding of insurance premiums comes from individuals who purchase coverage (out-of-pocket) on a voluntary basis. Coverage is limited to contributors and benefits are pre-defined. Service provision may be through a network of private providers. A study on behalf of the South African Insurance Association argued that private-public partnerships (PPPs) in agricultural insurance tend to improve the financial performance of government-sponsored agricultural insurance programmes: loss ratios (a simple measure of the financial performance of an insurance programme) seem to be lower when programmes are managed by the private sector, sometimes with support from the government through PPPs. This may be a consequence of better implementation of insurance principles, such as sound underwriting procedures and better pricing of risk; lower administrative costs; and greater financial discipline of private insurers.

Risk pooling is beneficial because the costs of insurance are sometimes unpredictable and generally high (Davies and Carrin, 2001). People cannot reliably forecast when a disaster will strike and need disaster recovery services, the cost of which can be significant. Risk-pooling increases the likelihood that those who need disaster recovery will be able to obtain it in an affordable and timely manner. It further allows resources to be transferred to those in need. From the

viewpoint of individuals and households, contributions during times when no disaster has struck can be used to meet costs of recovery in the event of a disaster. In many cases, pooling also contributes towards redistributive goals by making those with higher incomes contribute more in order to subsidise the poor.

However, risk-pooling has its downside. Clients who are insured, and therefore do not have to pay the full cost of services, may be inclined to over-use those services; providers may be happy to let them do so because they will be able to earn more (moral hazard). In addition, those who are more likely to require assistance have a stronger incentive to join a voluntary risk-pooling scheme (adverse selection). Such problems could be reduced in micro-insurance schemes, since their small scale and community focus might provide informal safeguards (Davies and Carrin, 2001). According to Brennan (1993) small groups are at a disadvantage in risk pooling because they lack a diversified pool of purchasers. This means that small groups are not big enough to reflect community-wide risk levels and so are susceptible to poor experience rating and resulting high premiums.

### 5.3.3 Reinsurance

In the period 1985–1999, developing countries experienced great economic losses due to natural disasters. Affected developing nations lost an estimated average of 13.4% of their GDP, whereas developed countries only lost 2.5% (Teh and Martina, 2008, pp 3-4). These types of losses not only devastate the economy but also significantly impede human development in developing countries (O'Brien *et al.*, 2006, p 64). Unfortunately, while many individuals in developed countries have private insurance to assist them to recover from disaster impacts, this luxury is not widespread in developing countries (Walker, 2003, p 3; Goes and Skees, 2003, p 1). Furthermore, developing countries do not spread their covariant risk – a risk, or combination of risks, that effects a large number of the insured items/people at the same, for example an earthquake, or a major flood – into international markets, although the international insurance market is ideally geared to handle large scale risk insurance (Teh and Martina, 2008, pp 3-4). The lack of comprehensive insurance cover for disasters in developing countries needs to be addressed with great urgency, as the changing climate is contributing to the increases in disaster losses (; Hoeppe and Gurenko, 2006, pp 609- 10).

Reinsurance provides an excellent tool that insures by spreading the risk among many insurance companies on the international market (Miranda & Vedenov, 2001, p 650; Walker, 2003, p 3; Croson and Kunreuther, 1999, p 3). Risk spreading is central to the understanding of reinsurance (, p 593; Walker, 2003, p 3; Croson and Kunreuther, 1999, p 4). Reinsurance operates by diversifying risks through the creation of global risk pools. No single company or government can provide insurance for a disaster impact, and so they (insurance companies or governments) limit their own risks by partitioning the risks into smaller units. They then buy reinsurance for the partitioned risk from different global reinsurance companies (e.g. Swiss Re, Munich Re, Merrill Lynch, Aon etc.), thereby spreading the risks globally across many companies (Walker, 2003, p 4, , 1996, p 593; Miranda and Vedenov, 2001, p 654).

As a possible tool to deal with disaster impacts, reinsurance has a couple of advantages. First, by spreading risk over time and at a global level, reinsurance is a disaster mitigation tool that reduces the unexpected and unplanned demands for large levels of funding when disasters strike (Walker, 2003:2). Second, the spreading of risk means that no one company or government runs the risk of becoming insolvent due to large disaster impacts. Instead, risk is spread making it more manageable to handle (, p 593; Walker, 2005, p 5). In cases where central government is the financial intermediary and receives benefits from the use of reinsurance tools, the government can use these benefits to assist directly those communities adversely affected by covariant risk (Teh and Martina, 2008, p 17-18). In countries with high-levels of reinsurance, reinsurance generates foreign income at a time when the national economy may be under strain from a significant disaster (Walker, 2005, p 7).

Reinsurance also has some negative aspects, such as the time it takes for reinsurance to pay out funds to affected communities. Reinsurance requires that claims settlement and audit process be completed before payments are done, resulting in a delay or absence of disaster assistance that only adds to the burden of communities adversely affected by a disaster impact (Teh and Martina, 2008, p 28; Croson and Kunreuther, 1999, p 6). Reinsurance can also be a more expensive option for developing countries compared to CAT bonds (Miranda and Vedenov, 2001, p 650). This is because the global reinsurance market is not very competitive, which leads to premium prices for reinsurance being higher than prices for CAT bonds (Teh and Martina, 2008, p 25; Miranda and Vedenov, 2001, p 650). Furthermore, by not being competitive enough may lessen the global reinsurance market's ability to absorb losses due to large-scale disasters. For developing countries, reinsurance may be a less favourable option because reinsurance contracts have to be renegotiated on an annual basis, which creates an additional element of risk and additional transactions costs (Teh and Martina, 2008, p 25). Finally, the reinsurer could become insolvent and thereby unable to meet all, if any, of its contractual obligations. The implication is that the insured are exposed to credit risk – or at best an extended delay in the payment of indemnity (Teh and Martina, 2008, p 26).

Agricultural reinsurance is usually critical for domestic agricultural insurers to secure enough risk capital in case a major disaster causes catastrophic insurance losses. Some countries (including Costa Rica, Iran, Japan, and Kazakhstan) rely only on public reinsurance. Premium subsidies are the most common form of public intervention, with almost two-thirds of the surveyed countries (at all levels of development) providing agricultural insurance premium subsidies, usually at 50% of the original gross premium. Some countries also offer variable premium subsidies, while a few countries, such as India, offer cap premiums. Premium subsidy programmes are offered mainly under multiple named-peril crop insurance (MPCI) or area-yield insurance; a major exception is South Africa, which offers non-subsidised MPCI to individual farmers. Most peril crop insurance products, such as hail insurance, have been offered for many years without any public subsidies. Government intervention in livestock insurance is much lower than for crop insurance: only 35% of the surveyed countries offer livestock insurance premium subsidies.

Governments also provide public reinsurance (32% of surveyed countries), subsidies on administrative and operational expenses (16%), and loss adjustment subsidies (6%). Public sector support to reinsurance is higher in high-income than middle-income economies. Support ranges from national reinsurance companies to agreements under which governments act as excess-of-loss reinsurers (in such cases, the government charges no reinsurance premium). Governments can also provide support through legislation (51% of crop programmes and 33% of livestock programmes reviewed) and research, development, and training (44% of crop programmes and 33% of livestock programmes reviewed).

Only 11% of the countries have developed special programmes for small and marginal farmers, usually in the form of additional premium subsidies. However, in some countries, such as Chile, rural banks and insurance companies have developed such programmes; in Mexico the public reinsurance company supports small farmers' self-insurance groups. The total public cost of agricultural insurance programmes is estimated at 68% of the 2007 global premium volume, of which upfront premium subsidies represent 44%. On the basis of the World Bank survey in 65 countries, the overall government cost of upfront premium subsidies is estimated at 44% of original gross premiums. When administrative and operating subsidies and claim subsidies are included, the total cost to governments of agricultural insurance provision may be as high as 68% of original gross premiums.

The public cost of agricultural insurance subsidies represents 50%–150% of the premiums paid by farmers in the majority of the countries surveyed. Public support to agricultural insurance in many high-income countries (including Italy, Spain, and the United States) represents more than twice the premium paid by farmers. In contrast, in most middle- and low-income countries surveyed, public support to agricultural insurance represents 50%–150% of the premium paid by farmers. However, subsidies are not always a precondition for high penetration. High levels of agricultural insurance uptake can be found not only for programmes that carry high premium subsidy levels (such as MPCI in Canada, India, and the United States), but also in countries with strong traditions in agricultural insurance through unsubsidised named-peril crop insurance and livestock insurance (such as Argentina, Australia, and Germany).

The survey results thus do not support the argument that premium subsidies are a precondition for farmers and herders to purchase agricultural insurance.

Nevertheless, agricultural insurance cannot replace sound financial practices. Although it can facilitate access to credit by reducing the default risk on loans caused by production shortfalls, agricultural insurance is not a substitute for sound financial discipline and financial risk management.

### 5.3.4 Index-based Insurance

Index-based insurance differs from normal insurance, as conventional insurance is calculated against losses in reality, whereas index-based insurance is calculated against specific physical or economic triggers. Conventional insurance is calculated on the loss itself, but index-based insurance is considered according to the event that causes losses (Linnerooth-Bayer *et al.*, 2011, p 7). Therefore, loss is not calculated based on the individual loss of each of the policyholders but is estimated according to an index (Skees, Murphy, Collier, McCord & Roth, 2007, p 2). The index is calculated by comparing the benefit with the actual value of the loss financially (Skees *et al.*, 2007, p 2). Indexes are calculated for a certain area: in America states and in India districts are used for index calculations and are usually for a certain time period, such as a season or a month. Any variations in variables will then depend on the type of index-based insurance that is needed, for example flooding, drought, storms etc.. As will be seen later, weather derivatives are an example of an index-based insurance tool.

Index-based insurance has a predetermined threshold and a limit that determines the range within which compensation payments may be made (Skees *et al.*, 2007, pp 2-3).

The threshold marks the point at which payments begin. Once the threshold is reached, the payment increases incrementally as the value of the index approaches the limit. For example, an index insurance contract designed to transfer the risk of drought would begin making indemnity payments if rainfall levels, as measured at an agreed weather station, fall below the threshold over a defined time period, such as a month or a season. Indemnity payments would increase proportionately for each millimeter (mm) of rainfall below the threshold until the agreed limit is reached. The maximum indemnity would be paid when rainfall is less than, or equal to, the limit.

Index-based insurance can be explained thus (Linnerooth-Bayer *et al.*, 2011, p7

[C]rop insurance may be based on measures of insufficient rainfall at key points in the growing season or a loss index determined by the correlation between historical weather events and crop yields in a region. The insurer will pay out if rainfall measured by a rain gauge falls below a specified level regardless of crop damage."

Furthermore, policyholders take out what is called an index-insurance contract, and the payment rate is the same for each policyholder of the same contract. The payments are made regardless of the actual losses sustained by individuals, and the amount of the indemnity payment received depends on the value of the insurance purchased. (Skees *et al.*, 2007, pp 2-3).

### **Motivation for use of index-based insurance**

Moral hazard, adverse selection and fraud are common in traditional crop insurance. For many small farms, such as those that dominate in most developing countries, farm-level loss adjustment is simply not practical. For example, the loss-adjustment costs for parcels that are less than one hectare can easily be larger than the premium for the risks (Skees *et al.*, 2007, p 1).

### **Advantages of index-based insurance**

When using index-based insurance, the main advantage is that it is much cheaper than conventional insurance. This is due to reduced transactional and administrative costs because payments rely on a physical trigger and thus avoid expensive claims-settling process (Linnerooth-Bayer *et al.*, 2011, p 7; Skees *et al.*, 2007, p 2; Varangis, Skees and Barnett, 2002, pp 279-294). Index-based insurance avoids the moral hazard that is usually very common in conventional insurance, but farmers (for example) must still make sure that they reduce potential losses as much as possible (Linnerooth-Bayer *et al.*, 2011, pp 9-10; Varangis *et al.*, 2002, pp 279-294). Given that individual assessments are no longer done, index-based insurance is most suited for situations where a group of people or entire communities are affected by natural hazards or disasters, such as droughts, floods or earthquakes (Skees *et al.*, 2007, p 2). Index-based insurance allows payments to be made to many policyholders quickly to minimise the possible impact of the event. Furthermore, index insurance overcomes the problem of moral hazard because the policyholder's behaviour cannot impact whatever the index is measuring, such as rainfall. (Skees *et al.*, 2007, pp 3-4)

### **Disadvantages of index insurance**

One disadvantage of index-based insurance might be the disagreement between the index and individual losses, which is called basis risk. There are also different types of basis risk: spatial basis risk indicates the difference of physical space between where the incident occurs and where the index is measured: too much rain may flood a farmer's land, but at the weather station it is not raining as much. Temporal basis risk considers the crop development stages: rain might affect crops more in an early stage than later on. Lastly, loss specific basis risk is when the index is inadequately related to the losses, and mistakes are then made in the process. (Skees *et al.*, 2007, p 4) Index-based insurance is also not very well suited for areas with "microclimates or highly idiosyncratic risk" (Linnerooth-Bayer *et al.*, 2011, p 17).



### The case of drought insurance in Mexico

(Case study adapted from Skees *et al.*, 2007, p 29)

The Mexican government created a natural disaster fund, FONDEN, to rebuild infrastructure and assist low-income victims in case of any disastrous losses. A subsidiary of this fund – FAPRACC – was created to give immediate relief and assistance to farmers without access to insurance markets. FAPRACC offers conditional payment in the case of any of the following natural events: drought, hail, windstorms, floods and excessive rainfall. In 2002 a government-owned reinsurance company began selling weather-index insurance as a pilot study.

In Mexico, the state determines the losses. Payments made by FAPRACC are divided so that the state that declares the disaster is responsible for 30% and the federal government the other 70%. The Mexican government started to investigate other insurance options to improve disaster-relief funds, as the state and federal budgets had to absorb these costs, which was creating considerable constraints. The pilot project insured maize in the Guanajuato state of Mexico against drought: the government-owned reinsurance company took 50% of the risk, and international reinsurers took the other 50%. Losses were determined using the index developed using statistics from the weather station rather than by the state. Therefore, drought was determined based on the rainfall index and no longer by government, which freed the decision from any political pressure.

After the success of the pilot project, the government-owned reinsurance company extended the programme, each year adding more states and other crops. By 2006, 26 regions of 32 states were being covered on 28% of non-irrigated cropland.

#### Key implementers and funders

Agroasemex (government-owned reinsurance company); FONDEN (government disaster-relief programme); FAPRACC (government disaster-relief programme, subsidiary of FONDEN), SwissRe (international reinsurer).

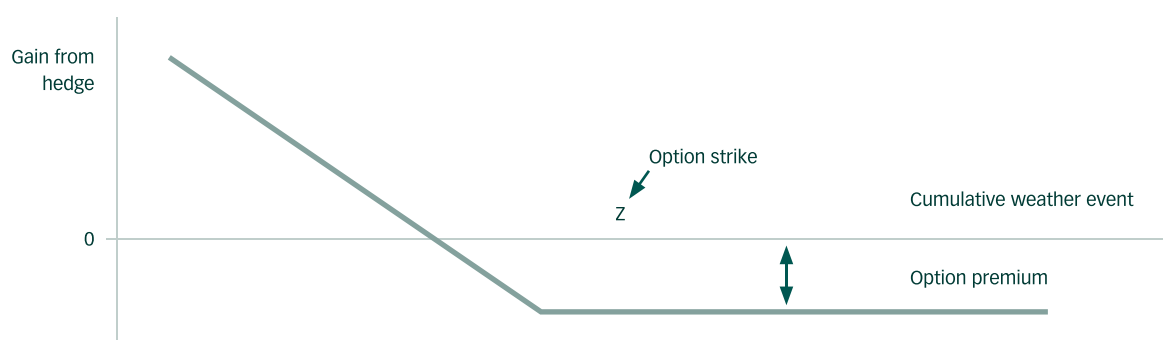
### 5.3.5 Weather Derivatives

Closely linked to index-based insurance are weather derivatives. According to the World Bank (2001), agriculture and agribusiness are the prime income-generating activities in developing countries, with agricultural activities generating an average total of 27% of the overall GDP. This over-reliance on agricultural production is especially exposed during events such as crop failure due to drought or flooding (Morduch, 1999). These events not only cause nationwide economic disruptions but also lead to the collapse of community-based coping mechanisms because the entire community is affected (Hess, Richter and Stoppa, 2002, p 2; Morduch, 1999). Agriculture is greatly affected by the vagaries of weather and possible collapse of informal coping mechanisms following severe disaster impacts, and so more formal tools are needed to protect the agricultural sector of developing nations (Turvey, 2001, p 334; Hess *et al.*, 2002, pp 1-2; Linnerooth-Bayer *et al.*, 2005, p 1045). In this regard, the emergence of weather derivatives provides a viable option for managing the financial impacts of disasters.

According to Stoppa and Hess (2003, pp 2-4), weather derivatives originally emerged with the deregulation of the US energy sector but were later applied to the agricultural sector, as weather events constitute a great economic risk to the sector (Alaton, Djehiche and Stillberger, 2002, p 3). Weather derivatives form part of the broader family of derivatives such as swaps, futures and forwards (Miller and Keipi, 2005, p 20). The specific aim of a weather derivative is to decrease the chance of financial losses due to severe weather by providing a hedge against production rather than price risk in agriculture (Turvey, 2001, pp 334-336; Stoppa and Hess, 2003, p 4; Miller and Keipi, 2005, p 20). In this regard, weather derivatives have been applied with great success in countries such as Ethiopia, Mexico and Morocco (Hess *et al.*, 2002, p 5; Hofman and Brukoff, 2006, p 18; Stoppa and Hess, 2003, pp 7-15).

The World Bank, in cooperation with Moroccan government, initiated a project to determine the viability of weather-based insurance as an alternative to traditional yield insurance (Stoppa and Hess, 2003, p 7). To achieve this, the weather derivative was designed according to the European option model (see Figure 5.1).

Figure 5.1. Pay-off structure for European put option on weather



Source: Turvey, 2001, p 341

The model comprised an option price, which was the cost of purchasing the rainfall insurance by the Moroccan wheat growers, and the strike ( $Z$ ) was the rainfall threshold below which an indemnity was triggered (Hess *et al.*, 2002, p 9; Stoppa and Hess, 2003, p 8). Turvey (2001, p 341) explains that the strike value of the contract can be linked to the amount of rainfall (e.g. five inches) needed for crops to grow during a certain period (e.g. 1 May and 1 August). If rainfall were to dip below the strike value, pay-off would be made in incremental pay-offs worth e.g. 3,000 MAD (Moroccan dirhams) per inch (Turvey, 2001, p 341; Stoppa and Hess, 2003, pp 7-8). Thus, a farmer who received only four inches of rain during the contract period would receive MAD 3,000 and, if he only received three inches, would receive MAD 6,000 worth of reimbursement (Turvey, 2001, p 341; Stoppa and Hess, 2003, pp 7-8).

Weather derivatives have certain innate advantages (Miller and Keipi, 2005, p 20). First, they provide an excellent coping mechanism for farmers affected by high-probability, low-impact seasonal weather events and more intense disaster events such as drought (Linnerooth-Bayer *et al.*, 2005, p 1045). They can also be used to complement existing catastrophe bonds or disaster insurance (Miller and Keipi, 2005, p 20). Weather derivatives also provide a flexible option, as contracts can be structured to cover a specific variable (such as the amount of rain during the contract period) or to cover multiple events, if for example the insurer wants to insure that it rains at least once in any non-overlapping 14-day period. In both instances, a pre-determined lump-sum (e.g. R10,000) gets paid out, if expected conditions do not materialise (Turvey, 2001, pp 341-342). Crucially, weather derivatives also remove the possibility of the moral hazard associated with other types of insurance, as the pay-off is contingent on a specific event occurring and not on the actual crop yield or crop yield indemnities (Turvey, 2001, p 341; Alaton *et al.*, 2002, p 6; Stoppa and Hess, 2003, p 5).

A drawback of weather derivatives, especially for developing countries, is the availability and affordability of comprehensive and accurate weather data. Weather derivatives cannot be formulated without the availability of accurate and comprehensive weather data, and so historical data that has been confirmed to be accurate (comprising of daily information on key parameters for the past 30 years) needs to be accessible and reasonably priced. (Hess *et al.*, 2002, p 6; Stoppa and Hess, 2003, p 4).

Weather derivatives also have certain disadvantages, in particular that of basis risk (Hofman and Brukoff, 2006, p 7; Ciumas, 2009, p 23; Ghiulnara and Viegas, 2010, p 17; Yang, 2010, p 104). This is because with weather derivatives there is no relation (at least *ex post*) between the predetermined pay-out and the actual damage (Hofman and Brukoff, 2006, p 7). This basis risk implies that the insurance claim may either exceed or undershoot the actual loss (Hofman and Brukoff, 2006, p 7; Ciumas, 2009, p 23; Ghiulnara and Viegas, 2010, p 17). This basis risk also tends to increase in highly spatially heterogeneous production areas (Yang, 2010, p 104). Formulating accurate weather derivatives is notoriously tricky, as the temperature varies continuously from region to region, whereas precipitation risk is discrete, often occurring in some fields, but leaving others only yards away dry (Richards *et al.*, 2002, p 2). If, as expected, weather is specific to very small geographic areas, then collecting useable data and defining a relevant index are both vitally important and potentially difficult (Richards *et al.*, 2002, p 2; Yang, 2010, p 104). Ghiulnara and Viegas (2010, p 17) also found that derivatives may generate systemic risks for the whole economy, when a market participant becomes very large relative to particular derivatives markets.



### 5.3.6 Micro-insurance

Micro-insurance is the protection of low-income people against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of the risk involved (Churchill, 2006b, p 12). Micro-insurance is also aimed at the developing world's low-income workers, especially those in the informal economy who tend to be underserved by mainstream commercial and social insurance schemes (ILO, 2010). In other words, micro-insurance is the use of insurance as an economic instrument aimed at the "micro" (i.e. smaller than national) level of society (Dror and Jacquier, 1999, pp 77-78).

Four main delivery models are used for providing micro-insurance (Cohen and McCord, 2003; Churchill, 2006a; Mechler *et al.*, 2006, p 9):

- *Full-service model*: commercial or public insurers provide the full range of insurance services, from the initial development of the product, through distribution, to absorbing the risk.
- *Partner-agent model*: commercial or public insurers, together with micro-finance institutions or non-governmental and other organisations, collaboratively develop the product. The insurer absorbs the risk, and the agent markets the product through its established distribution network, which lowers the cost of distribution and thus promotes affordability.
- *Community-based model*: local communities, micro-finance institutions, NGOs, and/or cooperatives develop and distribute the product, manage the risk pool, and absorb the risk. As with insurance mutuals, commercial insurers are not involved.
- *Provider model*: banks and other micro-finance providers can directly offer or require insurance contracts. These are usually coupled with credit, for example, to insure against the risk of default.

The Micro-insurance Network breaks down micro-insurance into five basic models, which link up with the aforementioned four models. (Micro Insurance Network, s.a.):

- *The partner-agent model* is based on the collaboration between a partner agency (usually a formal insurance company) and a dealing agent that provides services to low-income clients. The company (the partner) feeds the financial resources, sets the premiums, monitors the insurance claims and ensures that legal obligations are observed. The agent ensures that the risks, resources and knowledge are transferred and shared rationally between the formal and informal sectors.
- *The mutualised insurance and other community-based organisations model*, in which credit and savings cooperatives often offer borrower's insurance contracts that cover the balance of a loan to be paid back. Moreover, they offer savings in the form of life insurance, to stimulate saving habits. Some also sell housing, funeral, invalidity and disease insurance, and even (rarely) accident policies. These products are in addition to mainstream credit and savings services.
- *The 'all-in-one insurance' model*, whereby different organisations (micro-finance institutions, insurance companies, etc.) can also sell their policies directly to the poor through agents who are paid a salary or sales commission, or both.
- *The 'franchise' model* is when professional insurers franchise their license, assigning part of their capital to the licensee through a reinsurance treaty. The licensee (generally a micro-finance institution) is in charge of designing the product, setting the prices and handling the losses and gains.
- *The 'supplier' model* applies specifically to health insurance and implies that the insurers provide all or part of the services. Their interest is that they remain in control of the offer, which is a crucial element for client faithfulness.

Micro-insurance brings a number of benefits (Maleika and Kuriakose, 2008, p 2), as it:

- helps protect the poor and their assets from negative external shocks,
- helps compensate the effects of covariate shocks (e.g. natural disasters),

- addresses gender specific vulnerabilities,
- frees up household capital for investment in small enterprise,
- helps households avoid poverty traps,
- helps to expand informal insurance schemes and social protection.

Furthermore, micro-insurance has low transaction costs, (Pierro, 2007, p 4), is more transparent because pay-outs are fixed in advance, and people other than farmers (such as fishermen) affected by the weather can buy micro-insurance. Micro-insurance also can break the cycle of poverty by providing low-income households with access to post-disaster liquidity, thus securing their livelihoods and providing for reconstruction. Furthermore, an insurance contract is a more dignified means of coping with disaster than relying on the ad hoc generosity of donors after a disaster strikes (Mechler *et al.*, 2006, p 6).

Nevertheless, micro-insurance has certain limitations. The main hindrance to micro-insurance worldwide is the gap between the formal and informal sectors, specifically in terms of insurance (Bancel, 2005). The legal environment is often not helpful towards making micro-insurance accessible to the people who need it most. Lastly professional skills and the spreading of product information relating to micro-insurance are lacking. Roth, McCord and Liberf (2007, p 7) argue that the greatest hindrance to micro-insurance is consumer ignorance. The inability to write micro-insurance on a profitable basis, poor people who cannot afford micro-insurance, the lack of demand from poor people, and the lack to access reinsurance, are hindrances to successful micro-insurance (Roth *et al.*, 2007, p 45). The high cost of insuring covariant disaster risk means that individuals can pay substantially more than their expected losses over the long term when donors do not give support (Mechler *et al.*, 2006, pp 6-7)

### 5.3.7 Catastrophe Bonds

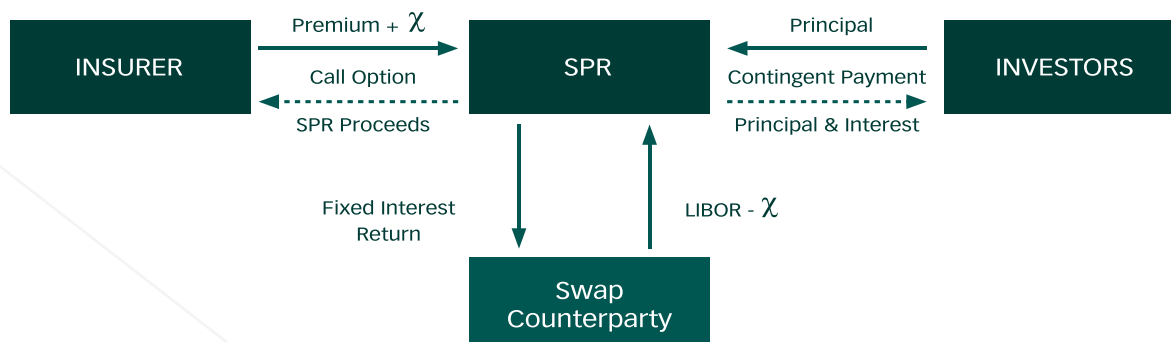
Catastrophe (CAT) bonds can be defined as a financial tool that transfers the financial risks of disasters such as cyclones and earthquakes from insurance companies to the broader capital markets (Fukuyama, 2008). The rise in CAT bonds has been fuelled by uncertainties within the global economy, which has led investment managers to consider CAT bonds as a means of diversifying away from traditional assets invested in markets (Fukuyama, 2008).

CAT bonds are financial instruments that transfer the risk of natural disasters to investors. These investors then receive a yield, in return for agreeing to cover damages they consider unlikely, and lock in funds for disaster relief before disasters strike (Perry, 2011). CAT bonds provide a way to take what is a fairly high risk away from the government to an insurer and reinsurer or capital market investor (Perry, 2011).

CAT bonds were modelled on asset-backed-security transactions, which have been executed for a wide variety of financial assets including mortgage loans, automobile loans, aircraft leases, and student loans (Cummins, 2006). The first successful CAT bond was an \$85 million issue by Hannover Re in 1994). The first CAT bond issued by a non-financial firm was in 1999 and covered earthquake losses in the Tokyo region for Oriental Land Company, the owner of Tokyo Disneyland.

Figure 5.2 provides a basic overview of how catastrophe bonds function.

Figure 5.2. CAT bond with a single purpose reinsurer



Source: Cummins, 2006

The transaction begins with the formation of a single purpose reinsurer (SPR), which issues bonds to investors and invests the proceeds in safe securities such as treasury bonds. Embedded in the bonds is a call option that is triggered by a defined catastrophic event. When the event occurs, proceeds are released from the special purpose vehicle (SPV) to help the insurer pay claims arising from the event (Cummins, 2006).

CAT bonds are an innovative financing solution for transferring disaster risks. However, the concept is actually not a new one and is similar to the practice of bottomry, which dates at least to classical Greek and Roman times. In a bottomry contract, the lender extended a loan to finance a voyage. If the ship returned to port, the loan was repaid with interest, but if the ship sank, the loan was forgiven.

Although approximately 120 bonds have been issued to date in the USA (Cummins, 2006), the amount of risk capital raised remains small relative to the global reinsurance market (Bond Market Association, 2006). It is of interest to explore the possible reasons for the limited amount of risk capital raised to date because of the as-yet unrealised potential of the CAT bond market. One possible explanation is that the bonds appear expensive relative to conventional reinsurance. Structuring a CAT bond deal requires significant expenditures on professional expertise from investment bankers, accountants, actuaries, and lawyers. In addition, the spreads on the bonds have tended to be high – often several times the expected losses on the bonds (Cummins, 2006).

The lack of investor interest is another reason for the limited size of the CAT bond market (Cummins, 2006). Yet, although possibly true at one time, recent data suggests a broad market interest in CAT bonds among institutional investors (likely fuelled by Hurricane Katrina and the 2010/1 Japan disasters).

This spreading of risk, as explained by Lewis (2007), is further emphasised by Fukuyama (2008) who explains that growth in the CAT bond market has been swift. In the two years after Hurricane Katrina devastated New Orleans, the market for CAT bonds roughly tripled to more than \$13 billion. Goldman Sachs estimates the market will exceed \$23 billion by the end of 2011, and John Seo, a hedge fund manager at Fermat Capital Management, expects it to grow to at least \$150 billion in the next 10 to 15 years. So far, insurance companies and investors consider CAT bonds as a win-win investment. After Hurricane Katrina, insurance companies realised their funds were not enough to cover another major catastrophe. With CAT bonds, they are increasingly able to offload some of their risk, especially along vulnerable coastlines.

Catastrophe bonds are predicted to grow, as they bring certain advantages. First, CAT bonds are not closely linked to the stock market or economic conditions and offer significant attractions to investors. For example, for the same level of risk, investors can usually obtain a higher yield with CAT bonds relative to alternative investments. Second, the insurance risk securitisation of CAT bonds shows no correlation with equities or corporate bonds, meaning they would provide a good diversification of risks.

### 5.3.8 Limitations to Insurance Tools

Nevertheless, there are a number of general limitations to using insurance for post-disaster recovery purposes, especially in the developing world. First, the small size of some states prevents them from efficiently pooling natural disasters, and the passage of a hurricane, for example, is a systemic risk that affects the entire economy of the country. Second, the high level of indebtedness of some countries' governments does not allow them to access capital markets in the aftermath of a disaster, thus preventing them from transferring some of the risk to future generations (also referred to as inter-temporal diversification). Third, post-disaster risk financing instruments may not provide quick liquidity after a disaster, creating in most cases a 'liquidity crunch' or bottleneck (also referred to as dynamic liquidity).

Dynamic liquidity can be defined as the potential lack of funds for financing public expenditure at different periods (short, medium and long term) after a natural disaster occurs. This framework make provision for financing the liquidity gaps by using a combination of *ex-ante* risk financing instruments, including reserves, budget reallocations, contingent debt and insurance, and *ex-post* financing instruments, such as borrowing, donor assistance and tax increases. To address the resource and liquidity gap, attention should be given to the budgetary impact of such natural disasters. Natural disasters generally put enormous strain on the budget of an affected country. The budgetary implications are based on the financing needs faced by a government during the three main phases in the post-disaster period: during the relief operations, early recovery operations and reconstruction operations.

An *ex-ante* estimate of the cost of relief operations can be difficult, since it depends on the specific characteristics of the catastrophic event (location, intensity, period of the year [winter or summer], time of the day [day or night]), but is

relatively small compared to the cost of subsequent recovery and reconstruction operations (Ghesquiere and Mahul, 2007, pp 9-10). Under these circumstances, the most cost-effective risk financing strategy that can be developed by a government is to **secure funds ex-ante through reserve funds, insurance or contingent debt** (unless the level of debt is already very high). If the government uses *ex-ante* risk financing instruments, such as sovereign insurance, it should mainly cover the immediate needs, since it is usually more expensive than post-disaster financing. In this case, long-term expenditure should be financed through post-disaster financing, including ex-post borrowing and tax increases. In other words, sovereign insurance should not finance the long-term resource gap, but only the short-term liquidity gap. The liquidity gap can be defined as the potential lack of funds for the financing of government deficit losses at different periods after the occurrence of a natural disaster.

Sovereign insurance presents a matrix of fiscal vulnerability that should help the South African government to analyse potential liquidity gaps and devise optimal insurance strategies. This concept differs from the standard concept of a resource gap; this is usually defined as the long-term gap between financial needs and post-disaster financing instruments.

Nevertheless, the South African insurance market is well developed and in most instances equipped to provide a number of the above-mentioned insurance products.

### 5.3.9 Other Disaster Risk Financing Mechanisms

Although a viable option in some instances, insurance will not be adequate for the South African government in all cases. The proposed model should also consider other options to finance disaster risk. Some of these options are safety nets, government policies and regulations, and accessing alternative funds.

#### **Safety nets**

According to the World Bank, safety nets are “formal and informal mechanisms that protect people against the adverse outcomes of poverty”. Furthermore, the social policy aspect of safety nets is concerned primarily with formal programmes meant to provide or substitute for income (Rogers and Coates, 2002, p 1). Importantly safety nets should be viewed as a means of providing livelihood support (an important disaster risk-reduction mechanism), rather than just a set of transfers of food or cash to affected communities, often after a disaster has occurred (Gentilini, 2005, p 18; Vakis, 2006, p 7).

Safety nets are ideally suited to disaster risk management because they can be deployed as a disaster risk-reduction and resilience-building measure and also during transient periods of poverty following disasters, serving as a permanent, planned means of assisting the chronic or transitory poor population that exists in any country (Rogers and Coates, 2002, p 3). Thus, safety nets provide mechanisms by which governments, households, and businesses can reduce the risk of a disaster impact or recover from disaster impacts in a timely manner. (Linnerooth-Bayer and Mechler, 2007, p 54; Gentilini, 2005, p 18).

Safety nets can be divided into two main categories (Besley, Burgess and Rasul, 2003, p 3): cash or income transfers, such as pensions, child allowances, unemployment benefits, or micro-finance (Gentilini, 2005:17), and transfers of commodities, such as food subsidies, housing subsidies, or energy subsidies (Besley *et al.*, 2003, p 6; Skoufias, 2003, p 1093; Gentilini, 2005, p 17). They may also provide income indirectly by offering vulnerable groups employment in public works programmes or, more broadly, by providing services such as health and education (Besley *et al.*, 2003, p 6; Kotler *et al.*, 2006, p 236). Of these types of safety nets, developing countries rely heavily on food-based intervention as key components in their safety net toolkit (Rogers and Coates, 2002, p 3).

#### **Food-based safety nets**

Food-based safety net programmes aim to increase the household’s real income in the form of food or cash-equivalents associated with food (Rogers and Coates, 2002, pp 1-7). The advantages of food based safety nets are two-fold: the food received can augment existing food supplies, and the food can be sold to increase the real income of a household (Rogers and Coates, 2002, p 2). Both applications of this type of safety net will decrease the vulnerability of a household to disaster risk. A few food based safety nets can be identified.

*Food-for Work (FFW) schemes* are, in essence, not orientated towards income transfer, but to providing employment opportunities, with remuneration in the form of food. The provision of employment and household food security protects households against the decline in purchasing power that often accompanies seasonal unemployment, climate-induced

famine, or other periodic disruptions (Rogers and Coates, 2002:6). FFW programmes are especially advantageous because they do not only ensure household food security but also contribute to community-based regional development, through creating or improving infrastructure using FFW labour (Rogers and Coates, 2002, p 6).

*Food stamps, vouchers and coupons* can be used to transfer income to a targeted population (Rogers and Coates, 2002, p 6; Besley *et al.*, 2003, p 6). Specifically, this food-based intervention allows for great flexibility, allowing communities to access only a few specific foods (those with high nutritional value) or to purchase any food in the market (Besley *et al.*, 2003, p 6; Rogers and Coates, 2002, p 6). These mechanisms have ensured greater food consumption within affected communities in Jamaica, Honduras, Sri Lanka, Mexico, Colombia, and the US. The only disadvantage of food stamps, vouchers and coupons is that, to be implemented effectively requires a well-developed commercial retail sector, a solid banking system and reliable government, which are often missing in low-income countries (Rogers and Coates, 2002, p 6), but not in South Africa.

*Consumer food price subsidies* are used to augment real household income by lowering the amount of money a household spends on food on a monthly basis. This is achieved by purposefully lowering the prices of staple foodstuff consumed by poor households. The advantage of subsidising staple food stuff for poor households is that money can be freed up which can be devoted to purchasing a greater quantity and/or variety of food or other goods (Rogers and Coates, 2002, p 7; Woden and Zaman, 2008, p 12). However, consumer food price subsidies are often expensive interventions. For example, in 1979 subsidies to food accounted for a full 5% of Sri Lanka's GDP (Rogers and Coates, 2002, p 7).

*Emergency feeding programmes* form an integral part of the strategy of international donor organisations and governments to address chronic food shortages within developing nations, such as Ethiopia, India and Zambia (Del Ninno, Dorosh and Kalanidhi, 2007, pp 414-415). Emergency food programmes aim to fortify community lives and livelihoods when existing food entitlements have been adversely affected by a disrupting event such a disaster (Del Ninno *et al.*, 2007, p 429; Rogers and Coates, 2002, p 7).

*Cash-based safety nets* are interventions based on cash transfers aimed at providing direct assistance to affected communities on either a conditional or unconditional basis (Vakis, 2006, p 9). By providing direct cash support, governments and/or donor organisations hope to address both short-term structural poverty and longer term intergenerational poverty following a disaster impact (Vakis, 2006, p 9; Andersson, Mekonnen and Stage, 2009, p 4; Besley *et al.*, 2003, p 6). Importantly, cash transfers provide a flexible intervention tool following a disaster, as the affected community/household can decide on which priority intervention area (housing, food, medicine) to divert the received funds (Vakis, 2009, p 9). The key attributes of cash-based safety net – i.e. their low cost, inherent flexibility and ability to scale up during emergencies – make them ideal disaster risk management tools (Vakis, 2009, p 9; Slater *et al.*, 2006, p 1).

Cash transfers can be either *conditional* or *unconditional*. Unconditional cash transfers impose no restrictions on communities in order to qualify for aid, whereas conditional cash transfers require communities to plough received money back into the communities (such as sending children to school) in order to receive continued financial support (Vakis, 2009, p 9). The Productive Safety Net Programme (PSNP) in Ethiopia is an example of an intervention with an unconditional cash transfer component. The PSNP is a flagship programme by the Ethiopian government to address the chronic food insecurities facing the country. The project takes a proactive approach to improving the efficiency and productivity of transfers to food insecure households, thereby reducing household vulnerability, improving resilience and promoting sustainable community development (Slater *et al.*, 2006, p 1; Andersson *et al.*, 2009, pp 2-3). To achieve this, the project employs two mechanisms: one is a conditional public works who works for cash component, the other is an unconditional component indented to support those within a community (such as the elderly and disabled) who cannot participate in the public works component (Andersson *et al.*, 2009, p 4).

Communities whose livelihoods are destroyed by disasters, such as droughts, floods, hurricanes, plagues, and earthquakes, often engage in coping strategies such as removing their children from school (Skoufias, 2003, p 1088). This provides a short term solution to the problem but in the longer term exacerbates poverty. To prevent this from happening, cash based safety nets often have conditions attached to them. For example, the *Red de Protección Social* system set up in Nicaragua to deal with the impact of droughts came with conditions that households ensure both their children's school attendance and family health through regular visits health service providers (Vakis, 2006, p 10).

*Public works*, such as the PSNP in Ethiopia, provide income for communities. The rationale for public work is two-fold: it provides direct income for a community/household through short-term employment, which helps them to meet consumption shortfalls and other immediate needs; and can contribute to reconstructing damaged infrastructure and creating social development infrastructure and projects (Vakis, 2006, p 10). Importantly, public works interventions



also allow for community involvement and buy-in into development projects. Examples of such schemes include the public employment schemes in Argentina (the Trabajar Program), Bolivia (Emergency Social Fund), Chile, China, and India (Besley *et al.*, 2003, p 6).

*Social funds* provide opportunities for a wide range of actors such as local governments, NGOs, line ministries, community groups and local project committees to cooperate in empowering local communities and, in doing so reduce, their disaster risk (Vaskis, 2006, p 11). Specifically, social funds are built up by establishing small community-run projects (with the help of the above mentioned role-players) that focus on community-specific development problems such as training and micro-enterprise development. These projects are meant to generate a community-wide social fund that can be used to recover from disaster events (Vaskis, 2006, p 11) or as a savings scheme with multiple disaster risk-reduction applications. An example is the Community Development Project (FID IV) in Madagascar where a component of the project was dedicated social protection in urban communities (Vaskis, 2006, pp 11-12). This project was an effective risk mitigation tool during the cyclones that affected Madagascar during 2004 (Vaskis, 2006, p 12).

*Micro-finance schemes* can serve as effective cash-based safety nets (Pitt, 2000), especially in countries and regions, such as Ethiopia (Africa) and Bangladesh (Asia) whose economies are primarily based on agriculture (Slater *et al.*, 2006, p 1; Andersson *et al.*, 2009, pp 2-3, Vaskis, 2006, p 12). Specifically, micro-finance schemes should provide funds to farmers that would allow them to diversify their incoming earning activities. According to Vaskis (2006, p 12) the efficacy of micro-finance interventions has already been proved in Bangladesh where the 1988 and 1998 floods had a minimal impact on farmers, since their economic activities were diversified, and no longer season specific (Vaskis, 2006, p 12).

### 5.3.10 Government Policies and Regulations

Local budget appropriations and executive regulations need to be considered when analysing budgetary requirements (Ghesquiere and Mahul, 2007, p 11). Some countries have developed emergency legislation that allows for emergency procurement before a financing source has been identified, but most countries have maintained more conservative legislation. For example, in some countries, tenders for emergency works cannot start until Parliament has approved full budget appropriations.

An optimal risk-financing strategy will need to ensure that funds are available at the appropriate time both pre- and post-disaster. It should also aim to amend out-dated legislation that may prove to be a burden in the aftermath of a major catastrophic event. As will be seen later, an argument is made for the amendment of the *Fund-Raising Act 107 of 1978* (FRA) and the DMA.

### 5.3.11 Accessing Alternative Funds: The National Lottery

According to the National Lottery Distribution Trust Fund (NLDTF), any NGO can apply for lotto funding in case of a national or local disaster (Sehlola, 2011). Yet disaster response funding does not fall into any of the NLDTF's three categories, which are sports and recreation, arts and culture, and charities. Thus, a miscellaneous application may be submitted to the NLDTF for the release of emergency funds at any time throughout the year (without waiting for the annual call for applications). Emergency funds can be applied for at national level or local level – for example, a river floods and prohibits children from going to school, or a large-scale disaster hits the entire country. However, despite applying for emergency funds, the NGO will have to undergo the regular application process, which is strict and time consuming. What is clear is that the distribution of miscellaneous funds is scarce.

### 5.3.12 International Comparative Study: Alternative Funding Arrangements

A proposed alternative financing model for disaster risk reduction for South Africa will be incomplete if it does not consider the lessons learnt and best practices from around the world. To this end a comparative study was undertaken of a number of countries, including Nigeria, India, Australia and New Zealand, with attention being given to NGO initiatives.

Olokesusi (2005, p 17) suggests that a number of funding alternatives for disaster risk management should be explored in **Nigeria**, including the following:

- Public-private partnerships
- A disaster risk insurance pool for households

- A Disaster Risk Mitigation Fund managed by the State through a formal institutional structure
- A Disaster Mitigation Trust Fund managed by the private sector
- Lotteries and fund-raising events
- Bilateral and multilateral assistance at international level
- Special taxes and levies
- Accessing the Global Environmental Facility (fund of the World Bank).

In **India**, the government maintains the National Disaster Fund for the purpose of providing instant relief when instructed to by the National Commission. The current Calamity Relief Fund is seen as the National Disaster Fund and is maintained by the government. In addition to the National Disaster Fund, a National Disaster Contingency Fund meets urgent expenses for disaster risk management. Furthermore, the National Commission decides how funds are spent from the National Disaster Contingency Fund. Each state government must maintain their own State Disaster Fund, and the State Commission decides how the funds are spent. Every District Administration must maintain a District Disaster Fund, which is managed by the District Councils (Government of India, 2005; 2008).

**Australia** does not have any legislation that focuses specifically on disaster risk management (Commonwealth of Australia, 2000, p 41) because government policy has been to deal with emergency management administratively. Thus, different ministers within the government assume different administrative responsibilities for disaster risk management. For instance, as the minister administering the Appropriations legislation including payments arrangements between the Commonwealth and the States, the minister for finance and administration is responsible for the Natural Disaster Relief Arrangements (NDRA). In general, each level of government should contribute one-third of the cost of disaster risk assessment and mitigation measures. The Natural Disaster Resilience Program is one of the main funding mechanisms for disaster mitigation and preparedness in Australia. The Commonwealth Attorney-General's Department provides this programme to support State and Territory initiatives to reduce the impact of natural disasters, enhance community resilience and support emergency volunteer

National emergency management legislation in New Zealand emphasises that every department, civil defence emergency management group, local authority, emergency service, and lifeline utility and any other person required by this Act to undertake civil defence emergency management or to perform any functions or duties, must take all necessary steps to undertake civil defence emergency management or to perform those functions and duties (New Zealand, 2002). This logically includes implementing funding arrangements to respond effectively to and recover from disasters. Although all the role-players legally have a role to play in funding disaster risk management, New Zealand's central government provides most of the funding.

In South Africa, Section 164(1)(a)(i) of the *Local Government: Municipal Finance Management Act No 56 of 2003* (MFMA) states that: "No municipality ... may conduct any commercial activities otherwise than in the exercise of the powers and functions assigned to it in terms of the constitution or national or provincial legislation". (South Africa, 2003) Performing a function without the requisite constitutional mandate has serious consequences for a municipality, as any associated act would be unlawful and unconstitutional, and expenses incurred in managing disaster risk would be in violation of the MFMA. Schedules 4B and 5B in the Constitution do not give local government the mandate for disaster management functions, but the *Disaster Management Act*, as national legislations does make this allocation. So the constitutionality of the DMA can rightfully be questioned, which has some significant impact on how funding is allocated and used for disaster risk management purposes.

## 5.4 South Africa's Current Funding Arrangements

A number of legislative frameworks govern the funding for disaster risk management in South Africa, including:

- *Public Finance Management Act No. 1 of 1999* (PFMA), which governs the release of funds for disaster events. Sections 16 and 25 allow the minister of finance or MEC to appropriate funds from their revenue funds for use of emergency situations (which in this case can mean disasters). However, the limitation is that the fund may not exceed a certain percentage of the total amount appropriated in the annual budget.



- *Municipal Finance Management Act No. 56 of 2003, (MFMA)*. Section 29 allows the mayor of a municipality to authorise unforeseeable and unavoidable expenditure in emergency situations (which in this instance can mean disasters). Such expenditure must be appropriated in the adjustment budget within 60 days, otherwise the spending becomes unauthorised. Again, the amount of funds available to respond to emergencies is restricted to a prescribed percentage of the budget.
- *Amended Municipal Systems Act, 2000*. Section 10 states that the Cabinet member, MEC or other organ of the state initiating an assignment of a function or power to a municipality in terms of Sections 9 and 10 must take appropriate steps to ensure that sufficient funding and capacity-building initiatives are available for the performance of such assigned function. For disaster risk management, the assignment for the function or power imposes a duty on municipality, and that duty falls outside the functional areas as listed and discussed above for Schedule 4B and 5B of the Constitution. According to this Act, disaster risk management imposes new constitutional obligations on local government. In the sense that disaster risk management encompasses a wide range of activities requiring funding (risk reduction, preparedness and response and recovery), appropriate measures or steps need to be taken to ensure that adequate finance and capacity are met.

In the DMA, only Sections 56 and 57 refer to funding mechanisms, and only for post-disaster recovery and rehabilitation after certain conditions have been met as described in the Act. Other than that, no guidelines are provided to cover funding of disaster risk management or alternative funding mechanisms.

The NDMF sets out the design and structure of funding mechanisms for disaster risk management and the role of each sphere, based on five categories or activities:

- **Start-up activities/costs.** The fund is through a conditional grant and is a once-off payment, so that the respective spheres are able to establish the centres as required by the Act. The use of conditional grants will result in some uniformity in response times and lessen cross-boundary effects. However, the NDMF acknowledges that creating a grant to fund this once-off cost may be inefficient. The question that arises is whether all the minimum requirements for setting up the centres can be met through this funding.
- **Ongoing activities/costs.** This category is funded through the department's operational budget rather than (ideally) through disaster-management funding, or as a standalone programme within the disaster management programme. To judge whether respective spheres would meet (or not) the objectives would require dedicated monitoring mechanisms to be in place, to establish if the category has been funded adequately.
- **Disaster risk reduction.** Funding for this category is mainly for disaster risk assessment and risk reduction, which the spheres need to include in their budgets and their strategic plans, as emphasised by the NDMF. Therefore, the spheres of government must make this as part of their routine processes and need to be monitored.
- **Response, recovery and rehabilitation strategies.** The response and recovery fund includes activities such as early warning, disaster response and recovery operations, relief measures etc. The NDMF is aware that no dedicated funding mechanisms are in place for this category, which delays the release of resources. Applying the PFMA, which is used as a mechanism to release funds, has some challenges, including the bureaucratic process to be followed, which increases the lead time between the declaration of the disasters and access to the funds. While the NDMF indicates that funds for this category need to come from own budgets (so funds can flow quickly to support response and recovery efforts), the sphere can only request assistance from national government when funds are exhausted. Financial assistance is considered after taking into account disaster risk-reduction principles prior to the event.

What is crucial is the separation of the contingency reserve from policy reserve so that funds can be quickly accessed, as recommended by the Commission in the 2003/2004 annual submission.

Lastly, according to the NDMF, costs associated with education, training and capacity-building programmes need to be recovered from SETAs, and costs for research into disaster risk management should be funded through the budgets of the disaster centres, the private sector and NGOs. The NDMF acknowledges that the provinces and national spheres have budget for this, but accreditation is lacking.

These funding arrangements build on the disaster-management funding recommendations made by the Commission in its 2003/2004 annual submission and its 2002/2003 assessment of the financial implications of the Disaster Management Bill (FFC, 2002a). Yet while having these strategies in place is vital, it alone is not adequate. Other alternative mechanisms

are needed to add or complement existing mechanisms, to increase the available public finance resources, as suggested by international literature.

The NDMF has acknowledged another challenge to the effectiveness of disaster risk management: the lack of information about the costs associated with past disasters. Without having data on past disasters that can be used to project potential costs, quantifying and budgeting for disaster risk management is difficult. Until minimum guidelines are prescribed and costed, designing a specific mechanism detailing how much funds should flow among and within the spheres of government will be difficult.

Besides the legislative and policy background to disaster risk management funding in South Africa, a number of declared disasters exposed the weaknesses in the current funding mechanisms. The roles of the National Treasury and of the Commission become important when considering the development of an alternative financing mechanism.

#### 5.4.1 Role of National Treasury

Prior to introducing conditional grants for disasters in the latest 2011 Medium Term Expenditure Framework (MTEF), government was not putting specific allocations aside to deal with disasters (Makinta, 2011). Instead, all expenditure was deferred from the adjustments of estimates. The source of such funding is usually the Contingency Reserve, which is budgeted for nationally. The funding of natural disasters would always flow through a short-term in year grant(s). The amount would be allocated during the adjustment period in October for immediate expenditure (or rolled over in the case of infrastructure-related repairs).

In the new MTEF cycle in 2011, the government implemented a policy driven by conditional grants with full frameworks of expenditure, under which these funds are immediately accessible from their budgets, although with conditions (Makinta, 2011). The Treasury has always been wary of a possible exploitation of this window of funding. However, since 2009 and the xenophobic attacks in South Africa, National Treasury has been under much pressure to ensure adequate funding is available for emergencies.

Clearly the current mechanisms and *status quo* are not completely adequate. Since 2002/2003, the Commission has been directly involved in seeking a revised model which would address all of the deficiencies in the current system.

#### 5.4.2 Financial and Fiscal Commission

The Commission's submission in 2002/2003 assessed the financial implications of the then Disaster Management Bill and identified some of the funding gaps. The Commission found that no dedicated funding mechanisms were in place for disaster risk management. In some instances, they were severely limited and, where they did exist, were in the form of relief funds and/or contingency reserves. The initial research was later followed by the 2003/2004 annual submission on disaster risk management funding.

Government did not respond to the Commission's recommendation on start-up costs, ongoing institutional costs and prevention and mitigation projects. However, it noted that the current framework does not set predetermined proportions to be contributed by each sphere in the event of a disaster. It also did not indicate whether the Commission's proposal on the thresholds has been accepted. The Commission recommended that a more defined legal basis be provided for the central contingency reserve, which would be allocated for two emergency purposes: macroeconomic stability and response to natural and manmade disasters. Such an arrangement would allow funds to be accessed quickly when needed. Government agreed with the core of the Commission's proposals but did not see the need to divide the current contingency into a policy reserve and contingency reserve.

### 5.5 Methodology

- A qualitative research design was used, and a literature study looked at international literature on the topic, including:
- International disaster risk-reduction strategies, plan and policies
- International scientific research on the funding of disaster risk reduction

- International case studies on the decentralised funding of disaster risk reduction which will included the countries of Nigeria, Australia, India and New Zealand
- Reports from international, multi-national and inter-governmental organisations.
- Some elements of historical research were used in analysing the planning documents – the IDP and Service Delivery and Budget Implementation Plan – and the approved annual and medium term budget documents.
- Using purposive sampling, semi-structured interviews were conducted with selected knowledgeable individuals (n=24) in the disaster risk management and public financial management domains at all levels of government and across different government sectors.

## 5.6 Findings and Discussions

The data from the semi-structured interviews was analysed, and two prominent themes were identified: funding for disaster risk management and funding for disaster recovery. It became clear that the current funding model of government has gravitated towards this unwritten distinction, which also correlates completely with the literature review, international best practices and acceptable funding mechanisms at all levels of government.

However, first the known limitations in the current system, as highlighted by the respondents, should be considered, as they provide fertile ground for the development of an alternative model. One of the key drivers of funding risk management remains the post-disaster funding focus (i.e. a disaster has occurred and therefore funding is needed, as opposed to integrating funding into development initiatives to reduce the risk of disasters from happening), mostly because of a lack of understanding or ignorance of what this entails. The research identified the following gaps and bottlenecks within the current process, especially within disaster recovery and response.

### 5.6.1 Disaster Relief and Recovery Funding

The state provides social security during times of crises, and these relief measures are known as social relief. Within the South African legislative environment, two broad categories address social relief: social relief for individuals and social relief for community (Myburgh, 2005, p 179). The nature of disasters – as events that exceed communities' ability to cope with the adverse consequences of their impacts – makes it important to focus on those pieces of legislation that address community social relief funding.

According to Myburgh (2005, p 180), government provides community relief during community-wide disaster situations (such as flooding and fires) that have caused excessive damage to both personal property and livelihood (e.g. destruction of crops). The funding for community social relief has two main sources:

- General government funds collected through taxation; and
- Fund-raising activities in terms of the *Fund-Raising Act 107 of 1978* (FRA).

Of these two funding sources, the FRA is crucially important because the general funds collected through taxation are often inadequate, or some cases non-existent, in most national, provincial and local government departments. The perceived impracticality of budgeting for events that might or might not happen mean that funds collected through taxation are often used for other budgets items. To serve as additional sources of funding, the following funds have been set-up in terms of Section 16 of the FRA (Myburgh, 2005, p 181):

- The Disaster Relief Fund
- The South African Defence Force Fund
- The Refugee Relief Fund
- The State President's Fund
- The Social Relief Fund.

The **Disaster Relief Fund** renders assistance to any person who has suffered damages or loss caused by disaster. Importantly, a Board appointed by the Minister is responsible for managing the fund and for ensuring that assistance is rendered where deemed necessary (Myburgh, 2005, p 181). The Department of Social Development (DSD) manages the Disaster Relief Fund. Although a Board is in place to manage the fund, its current functioning is problematic. According to respondents from the DSD, the Disaster Relief Board Members are not all instantly available when a disaster occurs. As a consequence, officials have to wait for an undefined period of time for the Board to meet and approve funding relief efforts.

Although the FRA is a crucial source of funding for disaster-relief efforts, agencies that need to respond timeously to the impacts of disasters often find it difficult to access the funds (Van Zyl, 2011a, p 40). One of the major problems inhibiting the release of funds relates to the declaration of a state of disaster. According to the FRA, the process to release disaster-relief funds can only be initiated once the president has declared a disaster (Van Zyl, 2011a, p 40). This situation is not ideal because long reporting lines to the Office of the Presidency and bureaucratic red tape from local level (where a disaster happens) severely hamper the flow of information and consequently the release of funds for relief and recovery efforts. The above is also in conflict with the DMA.

According to respondents from the DSD, more synergy is needed between the DMA and FRA when a state of disaster is declared. As the discussion below shows, the research suggests significant changes to the legislation governing disaster-relief funds.

### 5.6.2 General Problems Hampering the Release of Disaster Relief Funds

Currently DSD faces several challenges that hamper its ability to distribute funds to affected communities once monies have been released from the Disaster Relief Fund. Firstly, relevant structures are not in place to streamline the distribution of funds. According to the DSD, one major structural problem is that the department currently has no internal disaster risk management unit, as required by the DMA. As a consequence, no dedicated team drives the DSD's disaster-relief component. Secondly, unlike most other line departments within government, the DSD does not have decentralised offices at a local government level (where relief is needed following a disaster). This means that funding takes a long time to reach affected communities. To overcome this problem, DSD officials suggest that the distribution of social relief following a disaster is cascaded down to become a provincial government level responsibility. Officials also felt that the South African Social Security Agency (SASSA) should no longer be involved in the distribution of disaster-relief funds, as the SASSA is geared towards broader social relief rather than disaster-relief issues.

The location of disaster risk management centres (DRMCs) is also a stumbling block to the distribution of funds following disasters. In many instances the location of DRMCs differs from province to province, and from municipality to municipality, which often hampers the DSD's ability to contact their counterparts at provincial and/or local level. As a result, the DSD has in the past struggled to coordinate effectively the distribution of funds to affected communities.

Human resource issues add to the problem of distributing funds to affected communities, as the DSD is currently severely understaffed. This means that national government level employees become involved in the operational activities at local level whenever a disaster strikes. No-one is playing an oversight role, which is the actual mandate of the DSD, and so nobody monitors whether funds are reaching affected communities in the shortest time possible.

A final problem relates to the current lack of adequate disbursement systems that can provide access to relevant statistics and reports on persons affected by disasters. Without an adequate statistics system in place, it is difficult to determine how many people need disaster relief and how much relief they need, which slows down the distribution of relief funds. To speed up the distribution of relief funds, the DSD should be linked to the information and database systems of both the NDMC and the Department of Cooperative Governance.

### 5.6.3 Declaration of States of Disasters

The DMA (Sections 23, 26, 27, 41 and 55) and the NDMF (Key Performance Area 4 – Section 4.2) provide for the classification and declaration of states of disaster at municipal, provincial and national level. Both the DMA and NDMF call for uniform standards to be developed for the assessment of a proposed disaster. Yet, although all of the "key performance indicators" linked to Section 4.2 of the NDMF refer to "guidelines and uniform methods", these standards still have to be developed (with the exception of the priority guidelines mentioned earlier). In light of this, the classification and declaration of a state of disaster at all levels will continue to be ambiguous, with an obvious impact on the allocation of funding.

The first time a state of disaster was declared in South Africa under the DMA was in June 2008, when xenophobic attacks occurred in the Western Cape and Gauteng provinces (South Africa, 2008a; 2008b). Since then, a number of states of disasters have been declared, the most significant being the 2010/2011 floods in most parts of South Africa. The declaration of these events tested the functionality and measures of the government's response. The process and procedures for declaring states of disasters were found to be unclear and cumbersome. In almost all instances, the difference between the classification and declaration was unclear (despite the explanations provided in the NDMF). Similarly, the roles of the district municipalities, provinces and the NDMC were muddled. This should not be surprising considering the lack of clear guidance on this issue and varying opinion even at national level.

The NDMC's role in classifying and declaring a state of disaster is also questionable, as one of the founding aims of the DMA was the decentralisation of disaster risk management. Yet, the classification and declaration of a state of disaster remains the NDMC's role. An event remains a local disaster until the NDMC classifies it otherwise, which basically prevents municipalities from declaring a state of disaster. This situation leads to a lack of taking responsibility and the perception that the NDMC will in any event intervene.

Furthermore, how a disaster is scaled up to a 'new' classification by the NDMC is not clear. For example, if after assessment the NDMC classifies a local disaster as a provincial disaster, the provincial premier still has to declare a provincial state of disaster. Neither the DMA nor the NDMF provides for this reclassification process. Another, related issue is the NDMC's internal capacities. As one respondent remarked, the NDMC can hardly do its most basic functions (with its current human resource capacities) yet is expected (with its already limited human resources) to become involved in operational issues.

The last criticism is the duplicate declaration that occurs once other legislation is invoked. The FRA is the only other Act to make provision for the declaration of a disaster and requires the president to declare a disaster (as opposed to the DMA declaring a state of disaster). The FRA's aim is to relieve social distress emanating from a disaster event. In assessing the two Acts, contradictions and duplications clearly exist. On the one hand, the DMA aims to decentralise the declaration of a state of disaster and makes provision for such declarations before a hazardous event has turned into a disaster (hence the 'state' of disaster). On the other, the FRA can only be used to declare a disaster (an event that already exceeds the ability and resources of the affected community to deal with its consequences), and only the president can make this declaration (whereas provincial premiers and municipal councils can declare local and provincial states of disaster).

An assessment of the declared (states of) disasters since 2002 confirms these hypotheses. In all instances, the FRA was used to declare the disaster. Only since 2008 has the DMA been used, but the FRA was also invoked, thus effecting a dual classification. The DMA and the FRA need to be aligned, and very clear guidelines for the assessment, classification and declaration of states of disasters must be developed and disseminated to all spheres of government.

#### **5.6.4 Timely Release of Funds**

The time between when a disaster occurs and when funds are released often takes up to two years to reach affected communities. The current budgetary process, structures, systems and documentation greatly slows all spheres of government's ability to provide an environment conducive to the quick release of funds for disaster response, relief and recovery (Van Zyl, 2011b, p 7).

Firstly, following a disaster, the rapid assessment process impedes the timely release of funding for relief and recovery efforts. Legislation requires that all spheres of government (i.e. the local municipality) conduct a rapid assessment of the damage and, if it exceeds their capacity, to request the involvement of the relevant provincial government; the provincial government then conducts a verification assessment, and the process is repeated at national level (Van Zyl, 2011b, p 7). Although this process is needed to assess the total impact of a disaster, the duplication of assessments at all levels of government significantly delays the release of urgently needed funding for recovery and response. (Van Zyl 2011, p 8). One solution might be to put in place Response and Recovery Steering Committees (RSCs) in order to eliminate the assessment process at all spheres of government, thereby reducing the time delay in releasing the needed funds (Van Zyl, 2011b, p 9).

Secondly, funds budgeted for disaster relief and response often cannot be spent in one particular financial year, as is the case with the repair of infrastructure. When funds cannot be spent in a short space of time, inevitably the surplus funds have to be rolled over to the next financial year, creating instability (due to funds being reassigned to other projects) and delays in the flow of funding (Van Zyl, 2011b, pp 9-10). One way of overcoming these problems is for line departments,



national, provincial and local authorities not to budget for the post-disaster recovery, rehabilitation and response, as prescribed by the Act; instead the NDMC in collaboration with the Treasury should hold the funds for these functions (Van Zyl, 2011b, p 11). Respondents from provincial and local government level echoed this sentiment. Furthermore, the transfer of funds to provincial departments and local authorities should be based only on claims or internal transfers (Van Zyl, 2011b, p 11).

### 5.6.5 Constraints in Current System/Legislation

The funding regulation provided under chapter 6 of the DMA is also subject to Sections 16 and 25 of the *Public Finance Management* (PFMA) No 1 of 1999 (South Africa, 1999), which provide for the use of funds in emergency situations (Myburgh, 2005, p 183). Section 16 of the PFMA is especially problematic for the rapid release of funds, specifically the release of emergency funds from the National Revenue Fund, which requires ministerial approval to release funds (Visser and Van Niekerk, 2009, pp 38-39). The need for this approval delays the rate at which funds can be made available for response and recovery operations.

Section 25 of the PFMA also creates problems for the release of disaster response and recovery funds at a provincial government level. Subsection 25(2) of the legislation states that, in the case of an unforeseen emergency, a maximum amount equalling about 2% of the annual provincial budget can be released from the Provincial Revenue Fund. This limitation is problematic, as response and recovery operations can be extremely costly, and the 2% of funds released is often insufficient for sustained response and recovery activities. Another aspect relates to Subsection 25(3b), which states that the release of funds should be subject to a vote of the provincial legislature. This further delays the release of funds.

According to DSD officials, the PFMA also creates a clash of accountability with regards to the Disaster Relief Fund. On the one hand, the PFMA says that DSD officials are accountable to the departmental director-general (DG) at all times; thus officials must inform the DG before proceeding with any task. On the other hand, in disaster or emergency situations DSD officials are also accountable to the Disaster Relief Fund Board. The confused reporting lines and additional bureaucratic procedures that need to be followed greatly hamper the quick release of funds.

Whereas the PFMA governs the release of disaster response and recovery funds to national and provincial tiers of government, the MFMA (South Africa, 2003, Section 29) governs the release of fund at municipal level (Visser and Van Niekerk, 2009, p 27). This Act creates similar problems at local level as the PFMA does at national and provincial level for the efficient release of funds for disaster response and relief (Visser and Van Niekerk, 2009, p 27). Specifically, although a municipality is allowed to authorise unforeseeable and unavoidable expenditure arising from an emergency situation, this expenditure is limited to a set minimum percentage of the budget, which is insufficient for prolonged response and relief efforts (Visser and Van Niekerk, 2009, p 27). The municipal council also needs to ratify the emergency expenditure before the funds can be released, and so release of funds will be delayed if all the councillors are not available.

Disaster recovery and rehabilitation funds are made available through the present budgetary process, which starts long before any disaster is reported (the exception might be a prolonged drought). Funds can also be made available for unforeseen expenditure such as disasters in the Medium Term Budget Policy Statement (MTBPS), which is normally made in October/November each year. Financing of these disasters happens from in-year allocations gazetted during these months, and so any disasters occurring between that time and March (end of the financial year) are not considered. Where the magnitude and severity of a disaster calls for a full rehabilitation of infrastructure or is the result of a persistent drought, funds are normally rolled over, provided that such funding was requested and approved before the November adjustment period.

#### **Lack of capacity**

Municipalities and provincial and national organs of state face a lack of capacity. Municipalities or provincial structures do not employ enough qualified engineers and other professionals with the necessary skills to deal with disasters.

As a result, assessment verification often lack professional inputs, which delays the completion of many rehabilitation projects; projects can on average take almost twice as long to complete as originally envisaged. These delays occur for various reasons:

- Lack of capacity to implement such projects,

- Delays in the procurement of funding for projects,
- Misunderstandings about procedures for releasing funds.

In order to address the above, various multi-disciplinary disaster assessment teams need to be established, and national guidelines for assessing and verifying disaster events should be developed and implemented.

### ***Municipal Infrastructure Grant (MIG)***

Once funding for a disaster is approved in line with the stipulated statutes, the requested funds are made available through the MIG structure. A municipality must comply with the following conditions:

- Submit financial statements to the Auditor-General on time.
- Demonstrate its capacity to manage the infrastructure investment programme.
- Prepare and submit all monthly reports on how the grant was used in a prescribed format by a specified time.
- Allocate MIG funds in the municipal budget.
- Prepare a project business plan for each project (which conforms with the requirements of the MIG programme).
- Register projects on the national MIG database.

The current system of channelling funds is a source of frustration for municipalities and the relevant government departments: a business plan has to be compiled and approved at a provincial and national level before being registered as a Provincial MIG. A large number of bottlenecks are found in the management of the projects registered under MIG structure.

### ***Financing of disasters through conditional grants***

Schedule 9 of the *Division of Revenue Act* (No. 6 of 2011) provides for funds to be released immediately to provinces and municipalities in response to disasters (*provincial and municipal disaster grants*). This process does not have an adjustment period before funds can be dispersed to provinces and municipalities. The Commission welcomes and is in support of this approach, which will help reduce the lead-time between the natural disasters occurring and the release of funds. The Commission also notes the conditions attached to the grant, in particular the need “for municipalities to fund the portion of the costs of the disaster based on the revenue raising capacity of the respective municipalities”. Strict adherence to this condition will encourage municipalities and provinces to take preventive and risk-reduction measures when a disaster strikes.

However, this process does not resolve the challenges engulfing the financing and management of disasters in the intergovernmental relations system. The process and institutions for declaring a disaster area need to be clarified. All spheres have a responsibility, but municipalities (especially districts municipalities) have difficulty implementing the provisions of the DMA and the guidelines provided in the National Disaster Management Framework (NDMF) of 2005. This is because of inadequate funding for planning and prevention, as provincial and municipal budgets do not have the fiscal space for this purpose – conditional grants for natural disasters are *ex post* allocations. As natural disasters increase, public finance is unlikely to be able to cope with the reconstruction demands. Therefore, in the long-term, alternative measures must be considered to reduce the physical destruction caused by natural disasters. These measures include land-use planning, building standards that ensure a level of robustness, developing and regulating domestic insurance markets, including introducing innovative market-based financing of disaster relief and recovery, such as risk pooling, reinsurance, derivatives, micro-insurance and catastrophe bonds.

#### ***Principles in the use of conditional grants***

In its submission to the Select Committee on Finance, the Commission proposed that conditional grants should be used either when there are strong reasons to suggest the existence of spill-over benefits or to deal with programmes of national priority (FFC, 2002b). In the latter, conditional grants should be used for sub-national governments to institutionalise the programmes so that they can gradually be phased into the equitable share.



The Commission reiterates its previous recommendations from the 2007/2008 annual submission on the principles for instituting conditional grants in the intergovernmental fiscal relations (FFC, 2006):

- Conditional grants to provinces and municipalities should only be used to address problems of spill-over benefits and to deal with the funding of programmes identified as matters of national priority. Such conditional grants should be phased into the equitable share once provinces and municipalities have institutionalised the programmes.
- National government departments should clearly define minimum norms and standards for delivery in areas of concurrent responsibility and monitor the performance and compliance of provinces.

#### **5.6.6 Monitoring and Evaluation**

The quality of rehabilitation work and the more general maintenance of facilities are problematic. In some cases, the expected life of facilities and their capacity to withstand further disasters are seriously reduced. Moreover, many rehabilitation projects do not include monitoring and evaluation as part of the plan, which may result in the misappropriation of funds.

Mechanisms need to be developed for reducing delays in processing and administering requests – the length of time between a disaster occurring and funds being requested and approved is too long and frustrating. Such delays lead to problems in damage assessment, in providing of information on the scale of damage and related requirements, and in timely issue of emergency relief acts. Project review and monitoring arrangements are needed to ensure rapid and smooth implementation of rehabilitation. For example, to ensure improved maintenance, various measures could be introduced, including more funds, increased monitoring and greater public participation. Mechanisms or strategies for each type of disaster differ, although the basic principles or approach to disaster management are the same. Each disaster needs a different assessment, response and recovery approach.

#### **5.6.7 Disaster Risk Reduction**

Disaster risk-reduction funding is mostly perceived as funding linked to the everyday disaster-risk management activities of the various government spheres. However, the majority of the respondents indicated that funding for disaster risk reduction remains one of the most problematic areas, especially within sector departments. The various DRMCs seem to have more success budgeting for disaster risk reduction and being allocated funds through the equitable share. This can mainly be ascribed to the fact that the disaster risk management function is known through the implementation of the DMA.

Many officials and politicians still see disaster risk management as part of a DRMC's activities, with very little link to the multi-sectoral approach. Similarly, the general perception is that very few sector departments fully understand their responsibilities related to disaster risk reduction, which obviously leads to lack of budgeting. Sector departments also do not integrate disaster risk reduction into their normal day-to-day functioning. Although disaster risk reduction should be integrated into normal sectoral activities, additional funding will still be needed. The problem appears to be twofold: on the one hand officials do not budget for disaster risk reduction, and on the other the accounting officers do not demand it. Sector departments clearly need capacity development for disaster risk reduction.

#### **5.6.8 Current Financial Management Systems**

Most of the stakeholders consulted are content with the current public financial management system used for normal day-to-day operational funding. Funds are allocated to projects and aligned with the annual performance management system of the respective sphere of government. In general, most DRMCs have access to operational budgets, although some constraints remain in mobilising funds for capital projects. These types of disaster risk-reduction projects normally run into millions of rands and are the least likely to be funded adequately.

The general perception is that funding allocation is inadequate. In all instances, the MTEF was found to enable all disaster risk management functionaries to budget for disaster risk reduction. However, one of the greatest problems identified is provincial and municipal financial managers' lack of understanding and comprehension of disaster risk reduction. Creating greater understanding among these officials would mean a much more favourable budget allocation for disaster risk reduction. Although the MTEF allows for a fair accounting system, better reporting practices are needed, especially in disaster recovery.

### 5.6.9 Budgeting By Sector Departments of Disaster Reduction

The research shows that sector departments do not budget for the implementation of disaster risk-reduction activities. Most of the funding is masked as developmental projects (which it rightfully should be). However, the lack of knowledge and understanding of disaster risk reduction means that this integration happens almost by accident. Therefore, it could be argued that a crucial link to a new funding model is to develop and enhance the capacity of sector department officials to deal with disaster risk-reduction matters.

Once the multi-sectoral and multi-disciplinary nature of disaster risk reduction is understood, evidence of disaster risk reduction activities can be expected to appear in the various budgets, which will be financed by the *Division of Revenue Act* on an annual basis. One of the recommendations made is the implementation of a specific line item for disaster risk reduction for all organs of state. This will serve to highlight the need to think about disaster risk reduction in daily

operations. Such a line item must be governed by specific guidelines to ensure that it is used for disaster risk reduction. A major constraint to the current funding of disaster risk reduction is that local and provincial political heads do not understand the crucial role of disaster risk management within their municipalities (in DRMCs and sector/line departments). Municipal and provincial officials tend not to want to fund something that “might not happen”, which makes getting funds for pro-active disaster risk-reduction projects difficult. In general, disaster risk management officials have difficulty accessing funding because of protracted deliberation processes with municipal and provincial decision makers. This eventually leads to decision makers removing disaster relief, preparedness and mitigation funding from their list of priorities.

Politics also limits the release of disaster risk management funds. Politicians often do not want to provide pro-active funding because of the innate lack of publicity associated with disaster risk reduction. In the past, local government politics have also delayed access to disaster risk management funds – one political party may want to portray another party in a bad light over their management of a disaster situation.

Furthermore, as funds are only released once a state of disaster is declared, politicians may not want to declare a state of disaster for fear of economic disinvestment and losing the support of voters. Local government officials proposed that the declaration of a state of disaster should be totally removed from politicians and be handled by DRMCs.

The study found that one of the bigger systemic problems facing disaster risk management funding is that the disaster risk management function “is not owned by any one department”, and so no department budgets for the disaster risk management activities.

### 5.6.10 Private Sector Involvement

In most instances, the private sector is not involved in disaster management activities within their municipal areas. However, some exceptions were noted. For instance, in one district municipality, private sector companies are already involved in risk-assessment processes (although the specific DRMC is not given access to the data collected by these private sector companies). Stakeholders agreed that the private sector has a role to play in managing disaster risk. In particular, since companies often create a risk situation within a specific area, they should contribute to the mitigation of the risk by putting risk-reduction measures in place. Furthermore, private sector companies should be encouraged to participate in disaster risk-reduction projects, as part of their overall Corporate Social Responsibility (CSR). These CSR projects can be joint ventures between the private and public sector (represented by the DRMC of the district).

Most stakeholders agreed that the insurance industry is not yet sufficiently involved. The insurance industry has a role to play in disaster risk management activities, and more information is required on the services that they can provide.

### 5.6.11 Community Funding for Disaster Risk Reduction

Community-based funding mechanisms are still very limited, and the dependency on government recovery interventions is great. For the most part, communities depend on their extended family to help them recover from disaster impacts. It is important to note that the funds provided by family members are not used to assist with disaster risk-reduction activities. Furthermore, communities also use *stokvels* and private loans, but these coping mechanisms only provide relief to those in the community who can afford it. These interventions are generally expensive because of the exorbitant

interest rates charged by either the *stokvel* members or microlenders. Communities, especially the most marginalised and poor, also have difficulty accessing funding from institutions such as banks to assist them with the recovery process.

## 5.7 Conclusion

The study revealed some weaknesses in the legislative, policy and institutional frameworks for disaster risk management. Although institutional frameworks contain guidelines, these are clear only about who must declare and classify the disaster (NDMC). Other than that, the functions and processes, from the centres down to the municipalities, are confusing and duplicated. In addition, although local municipalities are the first point of call when a disaster occurs, the DMA says nothing about their role, discussing only the roles of the metropolitan and district municipalities.

Although progress has been made in disaster-management financing in South Africa, some flaws remain. The dedicated funding mechanisms focus on funding the disaster through own budgets and grants, and no other alternative financing mechanisms are in place. This puts a severe strain on public finance resources and results, among other things, in slow response and recovery when an emergency strikes because of the processes that have to be followed to access and receive funding. In addition, while the enabling legislation and policies emphasise the need for risk-reduction methods, these are limited and not fully exercised. No punitive measures are in place for those who do not take into account of the mitigation strategies, or incentive structures for those who comply. The role of private sector, community and NGOs is critical in disaster risk management and can contribute greatly to mitigating the associated risks and avoiding the 'Samaritan's dilemma' that communities face.

The literature review found that, for disaster management to work efficiently and effectively, a combination of legislation, clear roles and responsibilities, the allocation of funding and other funding mechanism in the form of insurance measures are critical – optimal risk financing strategy is the key for both the pre- and post-disasters. Case studies reviewed, indicate that some roles, function and funding are best centralised, while others need to be decentralised.

## 5.8 Recommendations

With respect to alternative financing mechanisms for disaster management, it is recommended that:

- The Minister for Cooperative Governance and Traditional Affairs should streamline guidelines and gazette uniform standards governing and guiding the classification, declaration, assessment and response to disaster events in terms of the *Disaster Management Act* (DMA) and *National Disaster Management Framework* (NDMF). The absence of a standardised and coordinated approach to damage assessment and relief provision to people affected by disasters results in unnecessary duplication of effort and funding across government and delays in response and rehabilitation efforts.
- The Department of Cooperative Governance (DCoG) should, through the DMA, require municipalities, starting with the most vulnerable, to incorporate in their Integrated Development Plans (IDPs) disaster risk-reduction evaluations, strategies and measures, including:
  - o The development and enforcement of *land-use planning* and management measures so as to reduce infrastructure being built on seismic fault lines, in coastal regions subject to storm drainage and river shorelines subject to frequent floods;
  - o The development and enforcement of *buildings standards* (or retrofitting requirements) to ensure adequate robustness against earthquakes or cyclones.
  - o Engineering interventions to mitigate the degradation of environmental assets (such as soil erosion) through the creation of *dams* for flood control, *fire breaks*, and *sea walls* to break storm surges; and
  - o Financing strategies for these measures.

- Government should develop a policy framework for municipal disaster risk financing that:
  - o Differentiates between municipalities based on their vulnerabilities and fiscal capacities;
  - o Leverages private resources to fund long-term disaster risk management by combining private risk financing, intergovernmental grant financing (including the Green Fund) and municipal own revenues;
  - o Encourages and incentivises, where appropriate, the use of innovative market-based financing of disaster relief and recovery. Instruments that can be considered include sovereign insurance, risk pooling, reinsurance, index-based insurance, weather derivatives, micro-insurance, and catastrophe bonds.
- The National Treasury should require that environmental management and vulnerability objectives are explicitly incorporated into the design of existing key municipal grant programmes. These objectives should promote disaster risk-reduction methods (*ex ante* approach) and enhance municipal resilience to climate change through mitigation and adaptation methods. They should:
  - o Include the Integrated Housing and Human Settlement Development Grant, the Urban Settlements Development Grant, the Municipal Infrastructure Grant, the National Electrification Grant, the Public Transport Infrastructure and Systems Grant and the Regional Bulk Infrastructure Grant;
  - o Incorporate a statement of environmental and climate resilience objectives in each grant programme, together with measurable indicators;
  - o Prioritise the most vulnerable municipalities when determining the horizontal division of available resources in each programme;
  - o Provide for beneficiary municipalities to conduct appropriate climate-resilience evaluations on existing infrastructure over the medium term, subject to disaster risk-reduction methods being incorporated in respective IDPs;
  - o Be accompanied by capacity support to and engagement with the most vulnerable municipalities to ensure that they are able to identify and address disaster risks comprehensively.

## Annexure 5A. The NDMC's Response to the FFC Recommendations

The National Disaster Management Centre (NDMC), as the principal functional unit for disaster risk management in the national sphere, appreciates the work that has been undertaken by the Financial and Fiscal Commission and generally supports the findings of the report.

The NDMC has embarked on a process to review the *Disaster Management Act* (2002) to identify areas where legislation may promote tangible results at the community level. Through the process of reviewing the *Disaster Management Act*, the NDMC also intends to ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.

Some of the key issues that the NDMC hopes to address through the review process are also challenges identified in the report and include matters on funding, classification and declaration processes, roles and responsibilities of sector departments and optimising the relationship between district and local municipalities in respect of disaster risk management issues.

One of the mechanisms to deal with the challenges in the implementation of the Disaster Management Act is the development of regulations and guidelines. The FFC report can greatly enhance and support the process of developing the required regulatory framework for implementation.

### Comments on the specific recommendations of the report:

- a) ***“The placement of the various Disaster Risk Management Centres*** needs urgent attention with clear roles between district and local municipalities. The incorrect placement of these centres has a significant impact on the perceived importance of disaster risk management and thus also an influence on adequate funding for disaster risk management.”

**NDMC comment:**

The NDMC recognises the importance of the level and placement of the disaster risk management function within the various spheres of government. However, even more critical is the reporting and accountability for DRM in municipalities and provinces to the highest executive level and the priority given to instil the principles of disaster risk reduction in the IDP and budgeting processes.

- b) ***“Norms and standards must be introduced*** minimum guidelines on the funding mechanism in place need to be prescribed and costed as acknowledged by the National Disaster Management Policy Framework.”

**NDMC comment:**

The recommendation is not clear. However, the NDMC will also be developing regulations on funding for disaster risk management in terms of the Disaster Management Act.

- c) ***“Significant emphasis must be given to capacity development and awareness creation of disaster risk reduction*** with politicians, top management in the public sector, private sector partners and all sectoral and line departments in Government.”

**NDMC comment:**

The NDMC supports the principle to provide significant emphasis on disaster risk reduction and that it should be mainstreamed across sectors. The principles as outlined in the NDMF should be implemented more effectively and supported across the spheres of government. It is also recommended that reporting to the National Disaster Management Centre as custodian for disaster risk management in the country, be strengthened.

- d) ***“Clear guidelines for the assessment, classification and declaration of a state of disaster*** need to be developed so as to avoid confusion and duplication processes currently in place. More so, to the Rehabilitation and Response category funding.”

**NDMC Comment:**

The NDMC supports the recommendation and also recommends that Regulations be developed to spell out the process regarding the classification and declaration of a disaster. Furthermore provision should be made for a standardised approach to damage and needs assessments.

- e) ***“Incentive and punitive measures to be effective and strengthened.*** In the former, encourage those spheres that have assisted others through some form of surety/reimbursement. For the latter, punitive measures to be exercised for spheres not abiding/ not complying (e.g. 2% of budget to deal with disasters).”

**NDMC Comment:**

The NDMC supports the recommendation in principle. Further investigation on the implications is required prior to implementation.

- f) ***“A combination of private risk financing arrangements and pool of funding*** from the Government (hybrid pool of resources to fund disaster risk management). Varied approach to disaster management is needed so as to cater for differentiated fiscal capacity of municipalities.”

**NDMC Comment:**

The recommendation is supported.

- g) **"Catastrophic risk models as part of disaster risk assessments"** are needed to assess the number of people that are likely to be homeless and the number of buildings that will have to be rebuilt. In the case of reconstruction operations, disaster risk modelling techniques can be used to estimate the potential damage to the infrastructure, as well as to any public and private property. This can assist the authorities determine the budgetary needs caused by any such potentially catastrophic events."

**NDMC Comment:**

The principle is supported. All organs of state across sectors and spheres of government are required to conduct proper risk assessments, including costing of potential disasters.

- h) **"Development and regulation of domestic insurance markets"** including the introduction of innovative market based financing of disaster relief and recovery such as sovereign insurance, risk pooling, reinsurance, index-based insurance, weather derivatives, micro-insurance, and catastrophe bonds, should be investigated."

**NDMC Comment:**

The principle is supported and should be investigated.

- i) **"Specific reserve funds"** based on either strategic investment or risk-based insurance is necessary. This recommendation is in line with the FFC's previous recommendation of two reserves: one for macroeconomic stability and one for the response to disasters."

**NDMC comment:**

The establishment of a specific reserve fund for disasters, which is not linked to the normal budgeting cycle, is supported. It is recommended that criteria be developed to determine the circumstances when the reserve fund can be utilised which should include certain large scale risk-reduction projects such as for example the relocation of a community at risk.

- j) **"Ex ante strategies such as investing in disaster risk-reduction"** methods through proper and integrated development planning, land use planning, and buildings standards for sustainable financing is necessary. Coordinating that with legislative requirements of cooperation, coordination, the intergovernmental process and municipal systems act as required."

**NDMC Comment:**

The recommendation is supported and furthermore a percentage of municipal and provincial budgets should provide for specific disaster risk-reduction activities on an annual basis.

The example of investing in disaster risk-reduction (*ex ante*) measures such as land use planning so as to reduce and prevent development in low-lying areas, coastal regions subject to tidal waves and on seismic fault lines and in dolomite areas cannot be over-emphasized. These measures need to be integrated into IDPs.

- k) **"Disaster management need to be part of comprehensive strategy for"** climate change mitigation and adaptation strategies with funding thereof."

**NDMC Comment:**

The NDMC supports the principle of having more robust conditions on disaster risk reduction (and climate change adaptation), also as part of conditional grant funding. Investing in disaster risk-reduction measures is critical.

- l) "The South African Government must consider **public-private partnerships for both disaster risk reduction** (e.g. disaster risk management fund) and disaster relief and recovery (disaster relief and recovery trust fund). Such arrangements can include restructuring debt payment to banks by individuals and families affected by disaster or disaster risks."

**NDMC Comment:**

The NDMC supports the principle, although the implications of each such PPP should be analysed and carefully considered.



- m) "Top-up of disaster risk-reduction funding through other funds such as the National Lottery must be considered."

**NDMC Comments:**

The NDMC supports the principle, although the implications should be analysed within the legal framework for the allocation of lottery funds before such a decision is taken.

- n) "Disaster management **to be linked broader funding for municipalities** (including basic services)."

**NDMC Comments:**

The NDMC supports the principle and recommends that provision be made to utilise MIG funds (ring- fenced for this purpose), especially to provide for start up costs of providing disaster management and fire services which can be regarded as "basic services" to communities.

## References

- Alaton, P, Djehiche, B and Stillberger, D. 2002. On modelling and pricing weather derivatives. *Applied Mathematical Finance*, 9(1):1-20.
- American Academy of Actuaries. 2006. Wading through medical insurance pools: a primer. *Issue Brief*, September, p 10 Available: [http://www.actuary.org/pdf/health/pools\\_sep06.pdf](http://www.actuary.org/pdf/health/pools_sep06.pdf). Accessed on 30 Jun. 2011.
- Andersson, C, Mekonnen, A and Stage, J. 2009. Impacts of the productive safety net program in Ethiopia on livestock and tree holding of rural households. Discussion paper. *Environment for Development*, p 29.
- Bancel, J-L. 2005. Is microinsurance a new frontier for the insurance industry? Paper read at the *1st International Microinsurance Conference*. Munich. 18–20 October 2005. Available: <http://www.munichre-foundation.org/NR/rdonlyres/EC763DF5-4CB8-4511-9F1A-80CF40E64A8C/0/Panel2BancelMicroinsurance.pdf>. Accessed on 28 June 2011.
- Besley, T, Burgess, R and Rasul. I. 2003. Benchmarking government provision of social safety nets. Social Safety Net Primer Series. World Bank Institute, p 95.
- Brennan, TA. 1993. An ethical perspective on health care insurance reform. *American Journal of Law and Medicine*, 19(1-2): 37-74.
- Brenzel, L and Jones, A. 2010. *Immunization Financing Toolkit: A Resource for Policy-makers and Program Managers*. Washington DC: World Bank, p 72. Available: <http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1292531888900/IMMUNIZATIONFINANCINGTOOLKITFINAL121410.pdf> Accessed on 30 June 2011.
- Cardenas, V, Hochreiner, S, Mechler, R, Pflug, G and Linnerooth-Bayer, J. 2007. *Sovereign financial disaster risk management: the case of Mexico*. Environmental Hazards, 7(1), p 40–53.
- Cardenas, V. 2009. *Improving Public Finance in Developing Economies through catastrophe risks management strategies*. Paris, France: OECD
- Ciomas, C. 2009. The Romanian insurance market and the potential effects of the crisis upon it. *The Journal of Faculty Economics*, 3(1): 126-130
- Churchill, C. (ed.). 2006a. *Protecting the Poor: a Microinsurance Compendium*. Geneva: International Labour Organization, p 654.
- Churchill, C. 2006b. What is insurance for the poor? In Churchill, C. (ed.). *Protecting the Poor: a Microinsurance Compendium*. Geneva: International Labour Organization, pp 12-24).
- Cohen, M and McCord, MJ. 2003. Financial risk management tools for the poor. In ADA (ed.). *Microinsurance Centre Briefing Note #6*. Microinsurance Centre. Available: [http://www.microfinanceopportunities.org/docs/Financial\\_Risk\\_Management\\_Tools\\_for\\_the\\_Poor\\_%20CohenMcCorddec2003.pdf](http://www.microfinanceopportunities.org/docs/Financial_Risk_Management_Tools_for_the_Poor_%20CohenMcCorddec2003.pdf). Accessed on 29 June 2011.
- Commonwealth of Australia. Australian National Audit Office. 2000. Commonwealth emergency management arrangements. Canberra: Australian National Audit Office. 157 p.
- Croson, DC and Kunreuther, H. 1999. Customizing reinsurance and cat bonds for natural hazard risks. *Working Paper 99-05-15*. Philadelphia, PA: Wharton Risk Management and Decision Processes Center, University of Pennsylvania.
- Cummins, JD. 2006. Should the government provide insurance for catastrophes? *Federal Reserve Bank of St. Louis Review*, 88(4):337-379, Jul/Aug.
- Davies, P and Carrin, G. 2001. Risk-pooling - necessary but not sufficient? *Bulletin of the World Health Organization*, 79(7), July.



- Del Ninno, C, Dorosh, PA and Kalandidhi, S. 2007. Food Aid, domestic policy and food security: contrasting experiences from South Asia and Sub-Saharan Africa. *Food Policy*, 32(4):413-435, August.
- Dror, D.M. & Jacquier, C. 1999. Micro-insurance: extending health insurance to the excluded. *International Social Security Review*, 52(1):71-97, 19 Dec.
- FFC. 2002a. *Assessment of the Disaster Management Bill*. Midrand: FFC.
- FFC. (Financial and Fiscal Commission). 2002b. *Annual Submission of the Division of Revenue 2003/2004*. Midrand: FFC.
- FFC. 2006. *Annual Submission of the Division of Revenue 2007/2008*. Midrand: FFC.
- FFC. 2011/2012. *Submission Response to the Division of Revenue Bill*. Midrand: FFC.
- Freeman, PK, Keen, M and Mani, M. 2003. Dealing with Increased Risk of Natural Disasters: Challenges and Options. *IMF Working Paper/WP/03/197*.
- Fukuyama, F. 2008. Shelter from the storm. *Foreign Policy*. Available: [http://www.foreignpolicy.com/articles/2008/08/12/shelter\\_from\\_the\\_storm](http://www.foreignpolicy.com/articles/2008/08/12/shelter_from_the_storm) Accessed on 1 June 2011
- Gentilini, U. 2005. Mainstreaming safety nets in the social protection policy agenda: A new vision or the same old perspective? *The Electronic Journal of Agricultural and Economic Development*, 2:133-157.
- Ghesquiere, F and Mahul, O. 2007. Sovereign insurance against natural disaster for developing countries: a paradigm shift in catastrophe risk financing. *Policy Research Working Paper*. September. p 24 Available: [http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2007/09/10/000158349\\_20070910112223/Rendered/PDF/wps4345.pdf](http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2007/09/10/000158349_20070910112223/Rendered/PDF/wps4345.pdf) Accessed on 30 Jun. 2011.
- Goes, A. & Skees, J.R. 2003. Financing natural disaster risk using charity contributions and Ex Ante index insurance. Paper presented at the American Agricultural Economics Association Annual Meetings held on 27-30 July in Montreal, Canada.
- Government of India. 2005. *Disaster Management Act 53 of 2005*. New Delhi, India.
- Government of India. 2008. *National Action Plan on Climate Change*. p.56 Available: <http://pmindia.nic.in/Pg01-52.pdf> Accessed on 30 Jun. 2011.
- Ghiulnara, A and Viegas, C. 2010. Introduction of weather-derivative concepts: perspectives for Portugal. *Journal of Risk Finance*, 11(1): 9-19
- Hess, U, Richter, K and Stoppa, A. 2002. Weather risk management for agriculture and agri-business in developing countries. In Dischel, RS (ed.). *Climate Risk and the Weather Market: Financial Risk Management with Weather Hedges*. London: Risk Books.
- Hochrainer-Stigler, S. 2011. Disaster financing and poverty traps for poor households: Realities in Northern India. *International Journal of Mass Emergencies and Disasters*, 29(1): 57-82
- Hoeppe, P and Gurenko, E. 2006. Scientific and economic rationales for innovative climate insurance solutions. *Climate Policy*, 6(6): 607-620
- Hofman, D and Brukoff, P. 2006. Insuring public finances against natural disasters: a survey of options and recent initiatives. *Working Papers*, p 22. International Monetary Fund (IMF).
- ILO (International Labour Organization). 2010. *What is Microinsurance?* Available: <http://www.ilo.org/public/english/employment/mifacility/about/whats.htm>. Accessed on 27 Junr 2011.
- Kaplow, Louis. 1991. Incentives and government relief for risk. *Journal of Risk and Uncertainty*, 4(2): 167-75
- Kotler, P, Roberto, N and Leisner, T. 2006. *Alleviating poverty: a macro/micro marketing perspective*. *Journal of Macromarketing*, 26(2):233-239
- Kunreuther, H. 1996. The role of compensation in siting hazardous facilities. *Journal of Policy Analysts and Management*, 15(4): 601-622
- Lewis, M. 2007. In nature's casino. *New York Times*, 26 August 2007. Available: <http://www.nytimes.com/2007/08/26/magazine/26neworleans-t.html> Accessed on 1 June 2011
- Linnerooth-Bayer, J. 2005. *Risk and vulnerability program: research plan 2006-2010*, p18 Available: <http://www.iiasa.ac.at/Research/RAV/ravresearchplan.pdf>. Accessed on 30 June 2011.

- Linnerooth-Bayer, J and Mechler, R. 2007. Disaster Safety nets for developing countries: Extending public private partnership. *Environmental Hazards*, 7(1):54-61.
- Linnerooth-Bayer, J and Mechler, R. 2008. Insurance against losses from natural disasters. *DESA Working Paper*, p 35. Available: [http://www.un.org/esa/desa/papers/2009/wp85\\_2009.pdf](http://www.un.org/esa/desa/papers/2009/wp85_2009.pdf). Accessed on 30 June 2011.
- Linnerooth-Bayer, J, Mechler, R and Hochrainer-Stigler, S. 2011. Insurance against losses from natural disasters in developing countries: evidence, gaps and the way forward. *Journal of Integrated Disaster Risk Management*, 1(1):1-23.
- Linnerooth-Bayer, J, Amendola, A, Okada, N and Shi, P. 2007. Disaster risk management: pro-active financing to reduce vulnerability. *Environmental Hazards*, 7(1):1-6.
- Linnerooth-Bayer, J., Mechler, R. & Pflug, G. 2005. Refocusing disaster aid. *Science*, 309(5737):1044-1046, 12 Aug.
- Mahul, O. & Gurenko, E. 2006. The macro financing of natural hazards in developing countries. World Bank Policy Research Working Paper 4075. [http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2006/12/05/000016406\\_20061205151452/Rendered/PDF/wps4075.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2006/12/05/000016406_20061205151452/Rendered/PDF/wps4075.pdf) Date of access: 15 Jun. 2012.
- Mahul, O and Stutley, CJ. 2010. Government support to agricultural insurance challenges and options for development countries. *UN/DESA Working Paper*. Geneva: United Nations Department of Economic Countries. 31-32. Available [www.worldbank.org](http://www.worldbank.org).
- Makinta, V. 27 May 2011. DRM Funding Model. National Treasury. E-mail to: Van Niekerk, D. (Dewald.vanniekerk@nwu.ac.za)
- Maleika, M and Kuriakose, AT. 2008. Microinsurance: extending pro-poor risk management through the social fund platform. *Social Funds Innovation Notes*, 5(2):1-8.
- Mechler, R, Linnerooth-Bayer, J and Peppiatt, D. 2006. *Disaster insurance for the poor? a review microinsurance for natural disaster risks in developing countries*. Geneva: Provention Consortium and IIASA, p 31. Available: [http://www.proventionconsortium.org/themes/default/pdfs/Microinsurance\\_study\\_July06.pdf](http://www.proventionconsortium.org/themes/default/pdfs/Microinsurance_study_July06.pdf). Accessed on 30 June 2011.
- Miller, S and Keipi, K. 2005. Strategies and financial instruments for disaster risk management in Latin America and the Caribbean. *Sustainable Development Department Technical Papers Series*.
- Miranda, MJ and Vedenov, DV. 2001. Innovations in agricultural and natural disaster insurance. *American Journal of Agricultural Economics*, 83(3): 650-655
- Morduch, J. 1999. Between the market and state: can informal insurance patch the safety net? *World Bank Research Observer*. 14(2): 44-62
- Myburgh, P. 2005. Personal and community crisis. In Strydom, EML, Le Roux, PAK, Landman, AA, Christianson, MA, Dupper, OC, Myburgh, P, Barker, FS, Garbers, CJ, Basson, AC, Dekker, A and Esselaar, V. (eds.). *Essential Social Security Law*. Cape Town: Juta. p 179-184.
- New Zealand. 2002. *Civil Defence Emergency Management Act 33 of 2002*. Wellington, New Zealand.
- O'Brien, G, O'Keefe, P, Rose, J and Wisner, B. 2006. Climate change and disaster management. *Disasters*, Volume 30, issue 1, March, pp 64-80.
- Olokesusi, F. 2005. Financing disaster mitigation in Nigeria: the imperative of public- private partnership. *Disaster Reduction in Africa – ISDR Informs*, (6): 17 - 19, Dec.
- Pauly, MV. 1974. Overinsurance and public provision of insurance: the roles of moral hazard and adverse selection. *Quarterly Journal of Economics*, 88(1): 44-62.
- Perry, M. 2011. Australia urged to use catastrophe bonds as disaster risk rises. *Reuters*, 10 February 2011. Available: <http://www.trust.org/alertnet/news/australia-urged-to-use-catastrophe-bonds-as-disaster-risk-rises>. Accessed on 31 May 2011.
- Pierro, R. 2007. *Micro-insurance and DRR: Challenges and Opportunities in the Context of Climate Change*. Available: [http://www.climategovernance.org/docs/Micro-insurance\\_CCA\\_DRR\\_ChristianAid.pdf](http://www.climategovernance.org/docs/Micro-insurance_CCA_DRR_ChristianAid.pdf). Accessed on 28 June 2011.
- Pitt, M. 2000. *The relevance of microfinance for disaster mitigation*. Providence: Brown University.
- Rogers, BL and Coates, J. 2002. *Food Based Safety Nets and Related Programs*. Washington, DC: World Bank, p 53. Available: <http://siteresources.worldbank.org/SOCIALPROTECTION/Resources/SP-Discussion-papers/Safety-Nets-DP/0225.pdf>. Accessed on 30 June 2011.
- Roth, J, McCord, MJ and Liber, D. 2007. *The Landscape of Microinsurance in the World's 100 Poorest Countries*. Appleton, WI: Micro Insurance Centre, p 107.

- Sehlola, P. 2011. National Lottery Distribution Trust Fund. Telephonic interview. 31 May.
- Skees, JR, Murphy, A, Collier, B, McCord, MJ and Roth, J. 2007. *Scaling up index-based insurance: what is needed for the next big step forward?* Report prepared for: Kreditanstalt für Wiederaufbau (KfW) German Financial Cooperation. Available: <http://www.microinsurancecentre.org/UploadDocuments/080911a%20Scaling%20Up%20Index%20Insurance%20Final.pdf> Date of access: 30 Jun. 2011
- Skoufias, E. 2003. Economic crises and natural disasters: coping strategies and policy implications. *World Development*, 31(7): 1087-1102.
- Slater, R, Ashley, S, Tefera, M, Buta, M and Esubalew, D. 2006. *Policy, programme and institutional linkages*. Report prepared for Ethiopia Productive Safety Net Programme. London: Overseas Development Institute, p 55. Available: <http://www.odi.org.uk/resources/download/3034.pdf>. Accessed on 30 June 2011.
- South Africa. 2002. *Disaster Management Act*, No 57 of 2002. Pretoria: Government Printer.
- South Africa. 2003. *Local Government: Municipal Finance Management Act*, No 53 of 2003. Pretoria: Government Printer.
- South Africa. 2008a. *Classification of a Disaster: Western Cape Province*. (Proclamation no. 640, 2008.) Government gazette, 516:050. (National Gazette no. 31130.)
- South Africa. 2008b. *Classification of a disaster: Gauteng Province*. (Proclamation no. 641, 2008.) Government gazette, 516:051. (National Gazette no. 31130.)
- Stoppa, A and Hess, U. 2003. Design and use of weather derivatives in agricultural policies: The case of rainfall index insurance in Morocco. Paper read at the *Agricultural Policy Reform and the WTO: Where are we Heading?* Capri, Italy, 23–26 June, p. 17.
- Teh, T-L. & Martina, A. 2008. Developing countries spreading covariant risk into international risk markets: subsidised catastrophe bonds of reinsurance, or disaster assistance? ANUCBE School of Economics Working Papers. <http://cbe.anu.edu.au/research/papers/pdf/wp492.pdf> Date of access: 18 Jun. 2012.
- Turvey, CG. 2001. Weather derivatives for specific event risk in agriculture. *Review of Agricultural Economics*, 23(2):333-351.
- UNISDR (United Nations International Strategy for Disaster Reduction). 2009. *Living with Risk: A Global View of Disaster Reduction Initiatives*. Geneva: UNISDR
- Vakis, R. 2006. *Complementing Natural Disasters Management: The Role of Social Protection*. Washington DC: World Bank. p 21
- Van Zyl, K. 2011a. *The potential role of crop insurance in the South African agricultural sector within the context of the South African disaster risk management and new agricultural finance strategy on behalf of the South African insurance association*. Apr. p 166
- Van Zyl, K. 2011b. *Guidelines for the mainstreaming the funding mechanism for recovery and response as part of disaster risk management*. Agri SA. Feb. p 39
- Varangis, P, Skees, J and Barnett, B. 2002. Weather indexes for developing countries. In Dischel, RS. *Climate Risk and the Weather Market: Financial Risk Management with Weather Hedges*. London: Risk Books.
- Visser, R and Van Niekerk, D. 2009. *A Funding Model for Disaster Risk Management Function of Municipalities*. Pretoria: NDMC. p 86
- Woden, Q and Zaman, H. 2008. Rising food prices in sub-Saharan Africa: poverty impacts and policy responses. *Policy Research working paper*. Washington DC: World Bank, p 28.
- Yang, Yi-xian. 2010. Review of disaster backup recovery of information system. *Journal of Beijing University of Posts and Telecommunications*.
- World Bank. 2001. *World Development Report 2000/2001: Attacking Poverty*. Washington DC: World Bank, p 266.
- UNISDR (United Nations International Strategy for Disaster Reduction). 2009. *UNISDR Terminology on Disaster Risk Reduction*. Geneva: UNISDR. p 30
- Walker, G.R. 2003. Engineering disaster insurance schemes for the 21st century. Paper presented at the 2003 Pacific Conference on Earthquake Engineering held on 13-15 February in Christchurch.

# Chapter 6

## FINANCING OF WASTE MANAGEMENT IN SOUTH AFRICA

Nomonde Madubula<sup>1</sup> and Vincent Makinta<sup>2</sup>

### 6.1 Introduction

In terms of the *Money Bills Amendment Procedure and Related Matters Act* (No. 9 of 2009), the Financial and Fiscal Commission (the Commission), is required to undertake research and make annual recommendations on the equitable sharing of nationally raised revenues among the three spheres of government. The Commission has, both internally and through stakeholder engagements, identified the financing mechanisms of waste management in South Africa as a key service and a sector that needs to be addressed in the 2013/2014 Annual Submission to Parliament.

Numerous studies have been undertaken on waste management in South Africa, but most have largely focused on operational management, environmental aspects and the legislative framework. Very little research has been dedicated to addressing the funding mechanisms and policies affecting and influencing the financing of waste management projects in municipalities across South Africa. The Commission has identified and highlighted a number of key and critical policy issues and other factors, which include:

- The implications of classifying waste management as a free basic service (FBS).
- The lack of a standardised approach for setting appropriate and equitable tariff structures for waste management services.
- 'Ring fencing' funds from the Municipal Infrastructure Grant (MIG) for capital expenditure on specific infrastructure.
- The distribution of funding for waste management across the three tiers of government – (national, provincial and local government).
- Ambiguous functions, powers and institutional arrangements across government, which affect access and budgetary control of waste management projects.
- Poor optimisation of operational and maintenance costs of waste management projects in municipalities.
- Poor costing of capital, operational, maintenance and environmental implications of waste management projects in municipalities.
- The lack of and/or poor implementation of proper financial and asset management systems for waste management assets and infrastructure within municipalities.
- Failure to operate waste management services with sustainable cost recovery models, especially in indigent municipalities.
- Lack of clear guidance on sources and requirements for alternative financing of waste management projects.
- Lack of will to develop and implement innovative waste management projects in municipalities that will provide for job creation, improved service delivery, cost reduction and revenue creation.

<sup>1</sup> Financial and Fiscal Commission, Cape Town, South Africa.

<sup>2</sup> Financial and Fiscal Commission, Cape Town, South Africa.

### 6.1.1 Aims and Objectives of this Research

The aim of this research is to explore how waste management can be a viable, sustainable service with the potential to generate revenues and create jobs. From the research will emerge policy recommendations for possible and practical funding mechanisms for waste management.

In order to do this, the Commission has set out the following research questions:

- What institutional, policy and legislative fragmentations are giving rise to inadequate and inequitable funding of waste management in South Africa? Is the funding mechanism adequate and effective in addressing waste management? What are the challenges related to the setting of tariffs.
- What incentive measures can be used to make waste attractive to municipalities as another way of raising revenue? What would be the impact on municipal revenue of classifying waste management as a FBS?
- What are other feasible, alternative funding mechanisms for waste management in South Africa? Can these alternative funding mechanisms be another way for municipalities to raise revenues?

Further to the above, the research must address the following key themes:

- Institutional, policy and legislative framework
- Waste management and climate change linkages in the green economy
- Current funding mechanisms
- Alternative funding mechanisms.

### 6.1.2 Emerging Issues and Concerns of Key Stakeholders

As part of this research, the Commission held an initial key stakeholder consultation at which a number of important issues and concerns were raised. Stakeholders were drawn from various organisations and institutions including national, provincial and local government, National Treasury, waste management units of some metropolitan municipalities, and Commissioners. Future consultation will involve a much wider and broader representation of stakeholders. The issues and concerns identified at this initial workshop are summarised in the Table 6.1.

Table 6.1. Key issues from stakeholder workshop

Commentator/stakeholder	Issue of concern
Commissioner Krish Kumar (municipal manger eThekweni):	<ul style="list-style-type: none"> <li>What are the cost drivers of waste management?</li> <li>Job creation versus free basic services.</li> <li>Regionalisation of waste management.</li> <li>Collection of tax on waste management services.</li> </ul>
Commissioner: David Savage	<ul style="list-style-type: none"> <li>There is volume of work done where are we adding value?</li> <li>Waste management as a free basic service.</li> <li>Enforcement is a challenge where tariffs need to be collected.</li> </ul>
Commissioner Lucienne Abrahams	<ul style="list-style-type: none"> <li>Use of knowledge and technologies in waste management for cost saving.</li> <li>How do we encourage innovation?</li> </ul>

Commissioner Tania Ajam	<ul style="list-style-type: none"> <li>• What are the financial vs. environmental costs</li> <li>• What is the implication on compact cities vs. incinerators</li> <li>• What is the scope of cross-subsidisation between industrial and domestic waste?</li> <li>• EPWP on social grants in terms of job creation, are there replications?</li> <li>• Use of new technology and biotechnology routes in waste management.</li> </ul>
Ekurhuleni Metropolitan Municipality	<ul style="list-style-type: none"> <li>• There seems to be lack of understanding of what municipalities want and broader market legislation inhibits progress in this area – A need for creation of a market and long term financing?</li> <li>• Recycling and job creation</li> <li>• The market for recyclable material is extremely volatile e.g. demand for plastic fluctuates drastically.</li> <li>• Explore levy on plastic to guarantee fixed price. Mechanism of use of recyclables to have a stable price structure.</li> <li>• Legislation on use of PPP needs to follow Systems Act 76 inhibits progress.</li> <li>• MFMA investment is deterred by the requirements not to keep contracts beyond 3 years. Private sector see no guarantee if it was to invest in Waste Management (WM). Thus there is not enough budget to invest in waste to energy (incinerators) hampered by MFMA. In Italy contracts run up to 15 years and provide good security.</li> <li>• On the funding model, tariffs should be cost reflective.</li> <li>• Willingness to pay for recycling at source is not successful.</li> <li>• There is a need to look at a case study where recycling was a success.</li> <li>• The allocated budgets should be geared towards long-term sustainable (buy-back centres) that create jobs in return.</li> <li>• In principle there is a need to increase recycling activities and not budgets.</li> <li>• Separation at source is a potential for revenue as recyclables are carrying value.</li> <li>• FBS zero-rated for informal settlements</li> <li>• Removal of illegal dumping, carcasses, street sweeping are not covered anywhere.</li> <li>• What about a cost reflect tariff and implementation thereof?</li> <li>• Waste minimisation – recycle at source, should not be looked at as potential revenue, but a saving because there are serious transport costs.</li> <li>• People who cannot afford the service are located further away from the service</li> </ul>
Gauteng Department of Agriculture, Conservation and Environment (GDACE)	<ul style="list-style-type: none"> <li>• Challenges for the province include waste collection standards.</li> <li>• Waste at local municipalities is not properly resourced both in terms of financing and human capacity.</li> <li>• The capacity to manage waste as a science – from finance to landfills to recycling – is not properly understood.</li> <li>• Job creation (workfares) – use of unemployed labour/graduates subsidised through social development grant EPWP link and offer training to manage waste, policing and creation of awareness.</li> <li>• Recycling cooperatives receive income benefiting the poor, unlike using the industry, thereby protecting livelihoods throughout the value chain.</li> <li>• Informal recyclers are not interested in being registered.</li> <li>• Indigent register (SALGA) needs to be kept up to date.</li> <li>• All positions on waste should be filled with qualified people.</li> </ul>



City of Johannesburg	<ul style="list-style-type: none"> <li>• There is a need for cost reflective tariff “volumetric based”.</li> <li>• Is it possible to merge and cross-subsidise services?</li> <li>• Green economy job funds EPWP funds.</li> <li>• Pikitup remodeling</li> <li>• Waste plant processing</li> <li>• Training and decision makers – informing councillors without empowering them.</li> <li>• Life-cycle approach</li> <li>• By-law enforcement-illegal dumping. What enforcement powers do we have? How much capacity do we have to enforce?</li> <li>• There is a need for internal capacitation, and not outsourcing to international companies will build capacity.</li> <li>• JHB spend R100 million for cleaning up after illegal dumping. What is the cost of fines and cleaning?</li> <li>• Greening: roads cooperation is hampered by unsustainable budgets.</li> <li>• Education awareness</li> <li>• School greening</li> <li>• Buy-back centres</li> <li>• Office recycling</li> <li>• Waste pickers formalisation (cooperatives)</li> <li>• High-density building recycling</li> <li>• Waste events</li> <li>• Electronic waste</li> </ul>
PIKTUP	<ul style="list-style-type: none"> <li>• Landfill air space depletion means only 8 years left, therefore alternatives need to be considered e.g. home-based composting</li> <li>• Municipalities should continue being creative without creating a burden on ratepayers.</li> <li>• Community-based initiatives vs. those where municipalities are forced to incur the cost.</li> <li>• Waste management jobs compete with a choice for increased wage bill.</li> <li>• Absorption of output-based contractors.</li> </ul>
National Treasury	<ul style="list-style-type: none"> <li>• Regulation and enforcement.</li> <li>• Recycling and collusion (KZN)</li> <li>• Equitable shares allocations are not for the benefit of the poor exclusively, therefore, under funding of the service.</li> <li>• Job creation and influence of unions</li> <li>• Working co-operatives in KZN and Limpopo</li> <li>• There is a need for skills in municipalities to properly cost the service.</li> <li>• There is a need for cross subsidisation.</li> </ul>
Department of Environmental Affairs	<ul style="list-style-type: none"> <li>• Norms and standards</li> <li>• What is the cost of waste management?</li> <li>• Role of SALGA in waste management.</li> <li>• Levies for industry</li> <li>• Job creation.</li> </ul>

A number of other issues were identified, including:

- Municipal councils, which are responsible for budget allocations, do not recognise waste management as a priority service. As a result, waste management budgets tend to be relatively low compared to those of other services.



- Centralised tariff systems for all services mean little relationship between waste revenue and waste expenditure.
- Generally tariffs are not linked to the volume of waste generated. While considered best practice, this linking is generally very difficult to implement and requires sophisticated weighing equipment and revised billing system, which translates into increased technical costs.
- Collection rates are low, and municipalities generally struggle with enforcement.
- Rural municipalities often fail to account for the waste service function.
- Budget increases do not mirror waste volumes handled.
- Using the Municipal Infrastructure Grant (MIG) to fund solid waste-related capital investments is a challenge because of the MIG funding restrictions. For example, the MIG cannot be used to fund vehicles, which municipalities consider to be capital assets.
- Capital investment in landfill sites and transfer stations is typically very 'lumpy', which implies difficulties financing as part of annual Capex allocations via MIG or other facilities.
- Direct financial recovery of certain waste services, such as litter picking and removal of illegal dumping, remains. For example, at the City of Johannesburg, the funding for non-income generating waste services comes from the grant for social services managed by the Office of the Mayor. At the eThekweni Metropolitan Municipality, the costs for non-income generating services are recovered from the ratepayers via the property assessment rate.
- Rate collections do not fund regional waste disposal sites operated by district municipalities, as rates are typically collected by the affected local municipalities that manage waste collection and transportation.
- Available airspace on existing facilities is diminishing because of increased waste volumes.
- Public access to landfill sites is often difficult because of distances, restricted operating hours etc., resulting in illegal dumping of waste within suburbs.
- The permitting requirements for landfill facilities are stringent and require a high level of engineering skills.
- Insufficient landfill operating budgets result in inefficient on-site operations and maintenance. Increased crime and vandalism further exacerbate the situation.
- Few municipalities are planning ahead for new landfill sites in the future.
- Complex land acquisition procedures make identifying new sites a lengthy and tedious process.
- The provincial environmental department's capacity for compliance monitoring and enforcement is low.

### 6.1.3 Relationship to Research Strategy and Past Commission Work

The proposed project is in line with the Commission's *Five-Year Research Strategy* (FFC, 2008), within the themes of accountable institutions and equitable growth and distribution of resources. In this instance, accountability is about municipalities making sure that their budgeting and planning is in line with the demand for their waste management activities. In respect of equitable growth and distribution of resources, municipalities are expected to raise their own revenue, so that they can provide services to their constituencies on an equitable basis. Municipal services can contribute to growth through their potential to have a high impact on job creation, which is important in the current environment.

### 6.1.4 Foundations of a Knowledge-based Economy

South Africa's policies are aimed at creating inclusive economic development, but a policy review shows that only a few measures have been used towards such development (FFC, 2011/12).

Therefore, this study looks at innovative, alternative financing and incentives for sustainable waste management. In particular, it examines the financial planning methods used (i.e. proper budgeting and accounting), clean development mechanisms (CDM), waste minimisation and reduction, recycling initiatives, clean technologies, the 'polluter-pay' principle (both for producers and consumers using variable fees) and public-private financing. In addition, the developmental role of sub-national governments, especially the local government, is examined, ensuring that waste management activities are part of their integrated development plans and that the by-laws and regulations are enforced and implemented.

## 6.2 Literature Review

### 6.2.1 International Perspective

Internationally, municipal solid waste is defined as including refuse from households, non-hazardous solid waste from industrial, commercial and institutional organisations (hospitals), market waste, yard waste and street sweeping. Semi-solid wastes (sludge and night soil) are considered the responsibility of liquid waste management systems, while sustainable solid waste management systems should be designed to fit the socio-economic circumstances and locality (Schübeler, Wehrle and Christen, 1996).

The principles of sustainable waste management strategies are to minimise waste generation, to maximise waste recycling and reuse, and to ensure the safe and environmentally sound disposal of waste. The *National Waste Management Strategy* (NWMS) acknowledges these principles and identifies initiatives (DEAT, 1999). Effective municipal solid waste management (MSWM) needs to include the following (Schübeler *et al.*, 1996):

- i) **Planning and management**, taking into account the strategic planning, legal and regulatory framework, public participation, financial management (cost recovery, budgeting and accounting), institutional arrangements including private sector and disposal facility siting.
- ii) **Waste generation relative to waste characterisation** (source, rates and composition) and waste minimisation and source separation.
- iii) **Waste handling regarding waste collection, waste transfer, treatment and disposal and special waste** (medical and small industries). From the local government perspective, the criteria for successful solid waste management need to include financial viability, the by-laws and regulations, political interests and approval by higher government authorities. Its effectiveness depends upon the adaptation to political, social, economic and environmental contexts.

In the South African context, waste is defined as any "undesirable or superfluous by-product, emission or residue of any process or activity which has been discarded, normally accumulated or stored for the purpose of discarding or further processing through treatment" (DEA, 2000). In 2007, the country generated 533 million tonnes *per annum* (MT/a) of waste, comprising mining waste (at about 88%), domestic and trade waste (1.5%) and sewage sludge (0.1 %) (DEA, 2011).

In 2006/07, general waste (domestic and trade) disposed at landfill sites amounted to 24.1 MT/a (Purnell, 2009). The six largest metropolitan municipalities – the City of Johannesburg, Cape Town, City of Tshwane, Nelson Mandela, Ekurhuleni, and eThekweni – disposed of about 8.9 MT/a of municipal solid waste (Von Blottnitz *et al.*, 2006).

In comparison to mining waste, domestic waste generation is arguably insignificant. However, a comparison of households showed that middle-class households produce about 2.7 MT/a of waste (Geben and Oelofse, 2008), indicating that municipal waste generation differs according to *per capita* income. *The State of the Environment Report* identified population growth accompanied by increased economic development as one of the main drivers of waste generation (DEA, 2010).

Of the 1 203 general waste landfill sites in the country, only about 524 are registered (the rest are not legally permitted), which results in backlogs for landfill sites (DEA, 2011). Both the licensed and unlicensed landfill sites are not being operated and maintained according to the required regulatory standards (Purnell, 2009). Other pressing challenges faced by municipalities in the waste management sector range from illegal dumping and illegal dumping sites, to the use of unpermitted landfills, inadequate waste collection service, lack of recycling initiatives by municipalities, inadequate waste minimisation, and regulation and enforcement (DEA, 2010; GDACEL 2004).

## Financing of municipal waste

Three financing mechanisms are used for financing MSWM: municipal taxes (property tax), user charges and grants, including in countries such as India, Malaysia, Thailand, Japan and Indonesia. In urban areas in India, solid waste management accounts for 25–50% of the municipal budget of which 70–85% is spent on salaries. Similarly, in Malaysia about 50% of the municipal's operating budget is spent on MSWM, of which 70 % is spent on collection. Cost-recovery methods are increasingly being used, in the form of deposit refund systems and volume-based methods. for MSWM in Bangkok, Singapore, Tokyo and Jakarta (UNEP, [Sa]). The laws in place encourage recycling, by specifying mandatory deposits and returns, with the aim of shifting the burden back to manufacturers. The scenario also applies to the volume-based system, where levies are either charged directly (based on waste volume) or indirectly through property tax, although these methods have only just been able to cover operating costs. If capital costs have to be taken into account other alternative financing mechanisms are required. This is why subsidies and grants are used in India, where the Indian Finance Commission allocates funds for solid waste management. The federal state then uses a different allocation formula to fund local cities to balance out the different economic circumstances across the country.

In respect of waste management as a source of potential revenue, most households are willing to pay for the services, but they normally do not pay the full cost of solid waste management, while estimating the actual cost is a challenge (Appasamy and Nellyatt, 2007). Expenditure on proper disposal is similar to pollution abatement policies; if not regulated or properly enforced, municipalities will emulate industries and save money by under-investing in disposal technologies (Appasamy and Nellyatt, 2007).

Other financing options have recently been sought, including public-private partnerships (PPPs) and carbon taxing with the intention of promoting efficiency through better technologies (Appasamy and Nellyatt, 2007). In line with the UNEP, a combination of government and privately run services is needed for effective, efficient and accountable MSWM services – in India, successful PPPs have been replicated elsewhere in the country. Other options are the use of carbon financing (which needs to be explored further), transforming waste at landfill sites into compost to generate greenhouse gases, and promoting the use of clean developmental mechanisms (CDM).

Of the 20 case studies reviewed (including the Financing and Incentive Schemes for Municipal Waste Management conducted by the European Commission), most concluded that, although the approaches were innovative, no 'one size fits all' exists, as specific methods are needed for specific areas. For instance, in Belgium, municipal waste is financed through a household waste tax or environmental tax, which is fixed and payable annually. The payment is for waste bags or containers used and charged by the frequency of waste collected (called variable household levies). In Denmark, households pay a fee differential collection scheme, i.e. weight-based and volume-based. Small- or medium-sized and rural municipalities use weight-based for domestic waste from households, smaller companies and institutions. In Italy, the 'tagged bag' scheme is used, where waste is separated at source and bags are distributed free to the households – the fee is either variable (depending on weight) or fixed (collection or recyclables and bio-waste).

Lessons learnt from these financing mechanisms are: estimating the actual cost of solid waste management is difficult, as components of the MSWM are not known; no one size fits all; tax evasion is rife; collection rates are low; administrative costs are high, especially when the property tax financing is used; when using PPPs, roles between parties involved need to be thoroughly clarified in order to reduce the potential for conflict. On the other hand, charging a fee creates an economic incentive to reduce waste and encourages recycling and separation of waste at source, and where PPPs have been successful, the results have been remarkable. However, caution needs to be exercised when adopting an equitable policy in developing countries where the majority of households are poor.

Some of the different financing options for solid waste management are (Koller, 2010):

- Tax system (or special purpose tax such as for using landfill)
- User fee system (where municipalities set certain fee and charges residents for residual waste per household, per square metre living space), which is used in Vienna and for specific purposes (e.g. integrated disposal fee)
- Deposit system (for certain waste types such as glass or plastic bottles)
- The full cost-recovery system (which covers all services and certain waste types and the producer responsibility system for packaging, where municipalities partly pay and the system pays part of the cost)

- The additional cost system (for certain waste types where the stakeholders share costs involved in packaging waste).

### 6.2.2 South African Institutional Frameworks on Waste Management

Chapter 2 of South Africa's Bill of Rights states that "everyone has the right to an environment that is not harmful to their health or well-being". This right includes the need to have a protected environment "for the benefit of present and future generations, through reasonable legislative and other measures", including prevention and sustainable measures. Government has the duty to ensure these rights are upheld. The notion of a healthy environment is further entrenched by Sections 152(1) (b) and (d) of the Constitution, which assigns a variety of functions to the local government sphere (South Africa, 1996).

A number of pieces of legislation are in place to manage and govern waste: the *Environment Conservation Act* (South Africa, 1989), *National Environmental Management Act* (South Africa, 1998b), *Health Act* (South Africa, 1977), and *Air Quality Act* (South Africa, 2004). The revised *National Environmental Management Act: the Waste Act* (South Africa, 2008), addresses institutional arrangements and planning fragmentation in the waste management sector. It advocates integrated waste management planning by all spheres of government and role-players in the sector. Most importantly, it provides national regulating norms and standards, licensing and control of waste management activities and, lastly, compliance and enforcement of the national waste information system.

The NWMS is an integrated waste management framework, whose approach is 'from cradle to grave', or from waste generation to waste disposal. Waste management processes need to adopt the principles of reducing waste at source, recycling and reuse, treatment and handling, with disposal of waste seen only as a last resort. The *White Paper on Integrated Pollution and Waste Management* (DEAT, 2000) deals holistically with pollution and waste management, including pollution prevention and minimisation at source.

Government's commitment to waste management strategies can be traced back to the Polokwane Declaration (DEAT, 2001), whose vision is "to reduce waste generation and disposal by 50% and 25% respectively by 2012 and develop a plan for zero waste by 2022".

Government recently tabled the *Draft Municipal Waste Sector Plan* "to develop, implement and maintain an integrated waste management system which contributes to practical, sustainable waste service delivery and a measurable improvement in the quality of life of all people and environment" (DEA, 2011). The focus of the sector plan is more on shifting the paradigm, from dumping waste in landfills to minimising and reducing waste, and to providing domestic collection services to all. The *National Domestic Waste Collection Standards* (South Africa, 2011a) aims to correct the imbalances in the waste collection services, with the objectives of ensuring that the level of service is equal across the country, extending waste collection to areas where no services were before, and encouraging separation of waste at source, recycling initiatives and community involvement.

In 2011, the *National Policy for the Provision of Basic Refuse Removal Services to Indigent Households* was tabled (South Africa, 2011b), in line with the *Free Basic Services Policy* adopted in 2001 that aims to provide a basket of free basic services to citizens, including solid waste, water, sanitation and electricity (South Africa, 2001). Its purpose is to ensure that poor, disadvantaged households have access to basic waste removal services, recognising that these households do not adequately benefit from refuse removal services because of their locations. It also sets out basic refuse removal standards, which municipalities need adhere to when providing those services and include in their budgets. A key component is the need to keep an up-to-date registration and record of the indigent, which is currently a challenge.

All three spheres of government (and the private sector) have roles and responsibilities related to waste management activities, as summarised in Table 6.2 (full details can be found in Appendix 6A). National government, through the DEA, has to set policy, legislate, coordinate, enforce, monitor and build capacity. The responsibility of the provincial government is to develop environmental implementation plans, monitor compliance with those plans, develop and enforce provincial regulations for general waste collection and support local government in implementing waste management activities. Local government is assigned waste management (refuse removal, refuse dumps and solid waste disposal), and the *Municipal Systems Act* (South Africa, 1998a) provides the framework for local government functions (including matters related to service delivery). Powers at local government are split between district and local municipalities.

Table 6.2. Functional roles and responsibilities for solid waste management in South Africa

Component	Broad Function	Activity	Current Assignment				Issue
			Nat	Prov	Local	Pvt	
Policy Making Regulation	Standard Setting	Norms & Standards	X	X			What is to be provided
		Access Targets	X		X		
	Planning	Plans for service expansion		X	X	X	Adequate facilities and
		Plans for service improvement		X	X		
Service Provision	Asset Creation	Social Capital			X		Adequate facilities and
		Physical Capital			X	X	
	Financing	Tariffs			X		Financial Sustainability
		Subsidies to Consumers			X		
		Grants to Service Providers	X				
		Consumer selection			X		
		Recurrent expenditures					
		General Area cleansing			X	X	Effective and Sustainable Services
	Operation	Waste minimisation			X	X	
		Waste Collection			X	X	
		Waste Transport			X	X	
		Waste disposal			X	X	
		Maintenance			X	X	
		Staffing			X		
Policy Making Regulation	M & E	Economic	X	X	X		Quality of Service deliver
		Financial	X	X	X		
		Operational	X	X	X		
		Monitoring and Evaluation	X	X	X		

Source: Savage, 2009

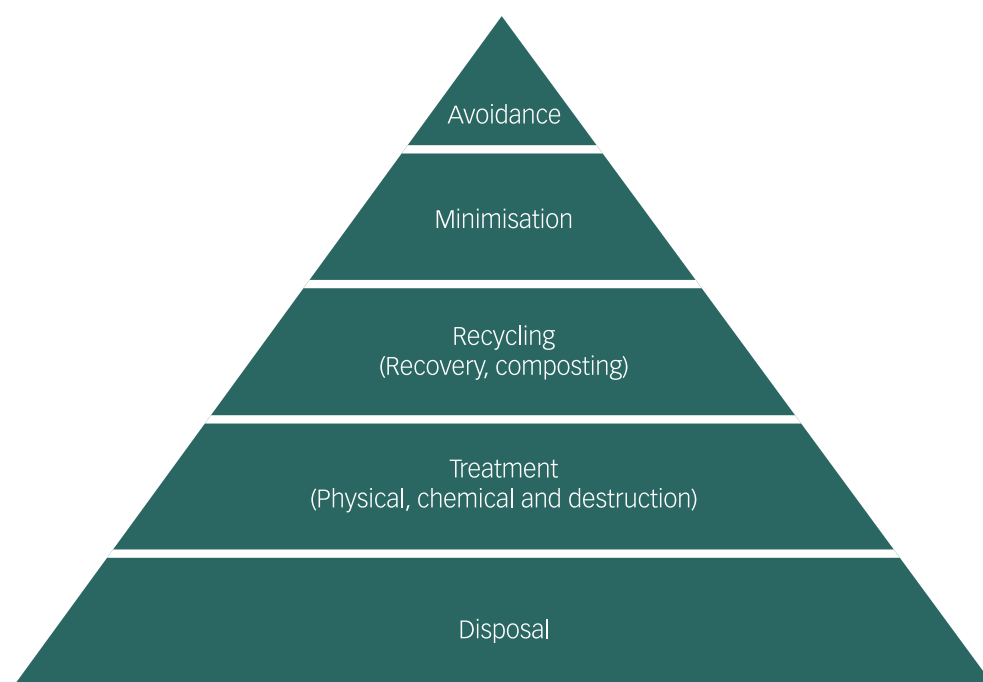
The *Amended Municipal Structures Act* (South Africa, 2000) lists the district municipalities' waste functions, which are limited to solid waste disposal: the districts need to determine a waste disposal strategy and regulation, and establish, operate and control waste disposal sites, bulk waste transfer facilities and waste disposal facilities for more than one local municipality in the district.

Local and metropolitan municipalities are responsible for providing holistic waste management activities, such as compiling and implementing general waste management plans, collecting data for the Waste Information System, providing waste collection services and managing waste disposal facilities within their jurisdiction, implementing public awareness campaigns and implementing and enforcing appropriate waste minimisation and recycling initiatives (DEA, 2011).

Linked to Table 6.2 is the waste hierarchical structure in Figure 6.1 that was adopted in the NWMS (DEAT, 1999). The waste hierarchy is a shift from traditional methods of treating and disposing waste to methods that prevent and reduce waste. Avoidance and minimisation are the founding principles and encompass the use of cleaner methods to waste management activities as the first choice. Where waste cannot be avoided, a second choice is to recycle or reuse. The third choice is to treat the waste prior to disposing of the waste in accordance with regulations and standards – only as the last resort is waste disposed in landfills.

The implementation of the waste hierarchy requires a concerted effort by both the private and public sectors involved in waste management activities. Table 6.2 clearly states the role of both the local government (municipalities) and the private sector (industries and business) in relation to service provision – the waste hierarchical structure in Figure 6.1.

Figure 6.1. Waste hierarchical structure



Source: DEAT, 1999; 2004

### 6.2.3 Classification of Waste Management as a Free Basic Service

One of the key features of a developmental state is to ensure that all citizens – especially the poor and other vulnerable groups – have access to basic services. These ‘free basic services’ (FBS) can be defined as municipal services provided at no charge by the government to poor indigent households. South Africa’s Constitution places the responsibility on government to ensure that such services are progressively expanded to all, within the limits of available resources.

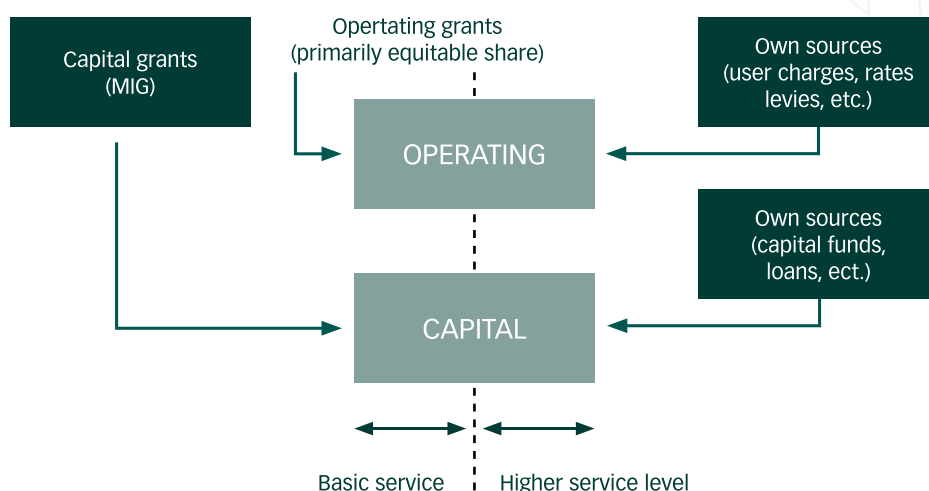
For poor households, the current basket of municipal services includes water, sanitation, electricity and energy, and refuse removal. Over the past 15 years, South Africa has seen a continuous paradigm shift in policy and thinking around the implementation of municipal services. The basic services approach has progressively developed – from government-funded capital costs for new services infrastructure and the user (households) paying for the operation and maintenance of that infrastructure – to the current situation where the need for FBS has become more apparent and pressing. Abject poverty, unemployment and the high running costs of many schemes has meant that poorer people cannot afford to pay the full cost of essential municipal services. The consensus is that municipalities, especially the indigent municipalities and those with low gross domestic product (GDP), cannot sustain and equitably continue to provide these basic services.

Of great concern is the inclusion of refuse removal in the package of municipal FBS, with many questioning the ability of municipalities to sustainably provide this service. Free refuse removal services are intended mainly for the rural population and poor households in informal settlements on the outskirts of the cities, which are classified as indigent in terms of the indigent persons policy.

Municipalities in South Africa finance the provision of services (water, sanitation, refuse removal and electricity) through revenue collected from payment of fees, or tariffs. The provision of FBS is a form of subsidisation of indigent persons, and the burden rests unequally on the citizens of the municipalities. Therefore, the intergovernmental fiscal transfers have to be consistent with the increased demand placed on municipal revenue as a result of the FBS and the indigent policies. The transfer of funds to local government must ensure that services are provided equitably and deal with both the capital and operating costs of providing services and infrastructure as illustrated in Figure 6.2.



Figure 6.2. Illustration of the fiscal framework



Source: Adopted from National Framework for Municipal Indigent Policies – Free Basic Services (DPLG, 2005)

Additional resources will have to be provided in order to meet the huge backlogs and to make the access to FBS reliable and really beneficial. The biggest challenge faced by many (especially poorer) municipalities is that the revenue received from indigents does not generally meet the cost of delivering the services.

The growing list of FBS that municipalities need to provide has decisively changed the sustainability of municipal services, and the current allocation of state expenditure between national and local government needs to be reassessed. Free refuse removal for indigent populations results in revenue loss, which has a direct bearing on budgets for developing infrastructure, operations and maintenance of municipal assets for waste management services. Therefore, adequate funding for this FBS must be devolved to local municipalities.

#### 6.2.4 Economic Instruments for Waste Management

Like most developing countries, South Africa's environmental policy has been predominantly based on a command-and-control (CAC) approach. This involves direct regulation, and monitoring and enforcement systems, and relies primarily on applying regulatory instruments, such as standards, permits and licenses, and land and water use controls. The CAC approach gives the regulator a reasonable degree of predictability about by how much pollution levels will be reduced. Strategies have been partly successful in meeting environmental objectives but have not addressed the economic sustainability of providing equitable services to the poor, especially in the current economic downturn.

In recent years, many (primarily industrialised) countries have adopted economic instruments (EIs) that bring more flexibility, efficiency, and cost-effectiveness into resource, environmental and waste management. These important tools can reinforce and implement the CAC strategies while simultaneously contributing to sustainable development. Specifically, EIs for solid waste management promise to lessen the size of the solid waste management problem and do improve the delivery of solid waste collection and disposal services. Although prevailing social and economic issues and conditions vary from country to country, the growing consensus is that using CAC and EIs can have significant positive results.

South Africa will have to workshop and analyse which permutations and choice of EIs will have a long lasting sustainable impact on the financing of waste management and meeting the social needs and objectives of the country's waste management legislation.

#### Objectives of EIs for waste management

In general, EIs introduce more flexibility, efficiency and cost-effectiveness into solid waste management. Furthermore, EIs can stimulate the development of pollution control technology and expertise in the private sector; provide government with a source of revenue to support waste management programmes; and eliminate requirements for larger amounts



of detailed information needed to determine the feasible and appropriate level of control for each plant or product. Specifically, in solid waste management, EIs can be used as a tool to:

- Reduce the amount of waste generated
- Promote waste minimisation
- Promote recycling, re-use, recovery of waste streams
- Reduce the proportion of hazardous waste streams generated.
- Promote more efficient and cost-effective integrated waste management systems and waste hierarchies for the collection, transfer, transportation, recycling, treatment, and disposal of waste.
- Minimise the adverse environmental impact related to solid waste management, including pollution and climate change impacts.
- Generate revenues through cost recovery mechanisms.
- Create jobs and alleviate poverty
- Incentivise innovation and technological advances in waste management.

#### **Legal mandate for EIs for waste management**

The *National Environmental Management: Waste Act* (South Africa, 2008) provides a legal framework for the use of various EIs for waste management. These EIs are to be applied within the context of the overall fiscal and taxation policy established by National Treasury and the specific measures for environmental fiscal and taxation reform announced by the Minister of Finance in the annual budget tabled to Parliament. The selection and use of EIs, including pricing, taxation, subsidies, incentives and fiscal measures will also be aligned with the principles established by *National Environmental Management Act*, including the 'polluter pays' principle. The EIs highlighted by the *National Waste Management Strategy* that need further research include, but are not limited, to the following:

- Deposit refund schemes
- Waste disposal taxes
- Product taxes
- Tax interventions for hazardous waste disposal
- Tax rebates and benefits
- Wastewater discharge levies
- Levies of specific waste streams
- Landfill taxes at municipal level
- National Remediation Fund
- Solid waste project development and finance

Research on the introduction and application of EIs suggests that policy could be designed in such a way that instruments are implemented incrementally, beginning with relatively simple instruments and becoming increasingly sophisticated as institutional capacity grows (Pearce and Turner, 1994; Bell and Russell, 2002; Russell and Vaughan, 2003). Components of EIs could be implemented as part of an integrated waste management framework, in progressively more institutionally demanding stages, with the focus on gradually developing capacity (Pearce and Turner, 1994; Bell and Russell, 2002; Russell and Vaughan, 2003). It is also important to develop a culture where compliance is the norm and illegal dumping is socially unacceptable (Russell and Vaughan, 2003). Placing a tax on products at the point of manufacture or sale, or monitoring waste entering landfill sites or generated by large producers, should initially be easier than attempting to monitor the quantity of waste generated by individual households and illegal dumping. It may also be possible to implement deposit-refund schemes, or expand existing schemes to cover other types of products (Bell and Russell, 2002)

### ***Typologies of EIs for waste management***

The literature review revealed that three broad typologies are used to describe the wide range of applicable EIs in waste management:

- Revenue-generating instruments,
- Revenue-providing instruments, and
- Non-revenue instruments.

Table 6.3 provides a summary of the EIs employed globally in waste management.

#### **6.2.5 Knowledge Gaps**

Research into the use and applicability of EIs in waste management South Africa needs to answer the following questions:

1. What is the current status of solid waste management services among South African municipalities?
2. What is the current situation regarding charging for waste collection services?
3. Is there a need for EIs to be implemented in the field of solid waste management in South Africa?
4. Over what timeframe should the EIs be implemented?
5. Which actors (producers, households, municipalities or private waste management companies) and which waste streams should EIs target?
6. Should EIs aim to change incentives or to generate revenue, or both?
7. What should be done with the revenues that are generated, and how should they be channelled toward this use (i.e. full, partial or no earmarking)?
8. What are the opportunities – and constraints – associated with implementing EIs for solid waste management in South Africa?
9. Which specific EIs are likely to be appropriate?

Table 6.3. Taxonomy of economic instruments for waste management

Typologies of Economic Instruments	Description	Examples
<b>Revenue-raising instruments</b>	These include the various kinds of user charges (levies or taxes) for the provision of collection, transportation and final disposal services. These are directed at 'internalising' the externalities associated with the production, transportation and disposal of wastes. The revenue raised from such charges may then be earmarked for solving the specific problem for which the charge was levied.	<ul style="list-style-type: none"> <li>• Pollution charges, based on pollutant loading</li> <li>• Waste generation charges, based on waste quantities and degree of waste hazard</li> <li>• Waste user charges, based on collection and disposal services received</li> <li>• Waste tipping charges, to unload at transfer or disposal facilities</li> <li>• Product charges or fees to handle disposal of problem products, such as batteries, tyres and refrigerators</li> <li>• Disposal taxes, added to disposal charges to influence disposal choices</li> <li>• Pollution taxes, added to user charges to influence pollution reduction choices</li> <li>• Eco-taxes, added to non-renewable energy production or fuels to influence energy demand and fuel choices</li> <li>• Presumptive taxes, based on presumed levels of pollution</li> <li>• Renewable resource taxes, on virgin materials to influence demand for their use and motivate recycling of secondary materials.</li> </ul>
<b>Revenue-providing instruments</b>	These include different kinds of subsidies that seek to reward directly desired behaviour (waste reduction, improved management, or recycling) rather than penalise the behaviour to be discouraged. Subsidies can be direct payments, reductions in taxes or other charges, preferential access to credit, or in-kind transfers such as the provision of land or other resources. These instruments tend to reduce revenues available to the authorities.	<ul style="list-style-type: none"> <li>• Tax credits and tax relief, allowances on property taxes, customs duties, or sales taxes to motivate investment in waste management improvements</li> <li>• Charge reduction, based on proof of recycling or reuse, for reducing wastes requiring collection or disposal</li> <li>• Tax rebates, for pollution savings or energy efficiencies</li> <li>• Environmental improvement funds, established to support pollution reduction, resource protection, energy efficiency</li> <li>• Research grants, to stimulate technology development</li> <li>• Carbon sequestration funds, to encourage purchase of lands that rejuvenate air quality, sometimes as a trade-off by polluters</li> <li>• Host community compensation, i.e. incentives given by host communities to accommodate waste transfer or disposal facilities</li> <li>• Development rights, long-term leases of land and development rights provided to private companies building waste treatment and disposal facilities, or to those finding remedy to and reclaiming old disposal sites.</li> </ul>
<b>Non-revenue instruments</b>	These EIs are unlike traditional EIs, as they do not provide revenue. However, they are particularly important for motivating consumers and producers to recycle. They also provide powerful motivators for the private sector to invest in solid waste service delivery and provide the tools that most influence their performance. Non-revenue instruments include trade-off arrangements, deposit-refund systems, take-back systems, product and production change incentives, liability law, performance disclosure, and procurement policies.	<ul style="list-style-type: none"> <li>• Product life cycle assessment, which predicts overall environmental burden of products and can be used in certification programmes</li> <li>• Deposit-refund, deposit paid and refund given upon product return for reuse</li> <li>• Take-back systems, where manufacturers take back used products or packaging</li> <li>• Procurement preferences, evaluation criteria adding points for products with recycled content or reduced resource demand</li> <li>• Eco-labelling, which notes product's recyclable content and whether product is recyclable</li> <li>• Recycled content requirements, laws and procurement specifications noting the precise recycled content required</li> <li>• Product stewardship, which encourages product designs that reduce pollution, include the full cost of solid waste recycling and disposal, reduce wastes and encourage recycling</li> <li>• Disclosure requirement, in which waste generators are required to disclose their pollution</li> <li>• Manifest systems, precise cradle-to-grave tracking of hazardous wastes</li> <li>• Blacklists of polluters, published lists enable consumers to consider whether to buy from polluting companies</li> <li>• Liability insurance, liability assurances by contractors and private operators</li> <li>• Bonds and sureties, guarantees for performance by contractors and private operators</li> <li>• Performance-based management contracting where oversight contractors commit to overall service improvements</li> <li>• Clean City competitions, which reward neighbourhoods and cities that have improved cleanliness.</li> </ul>

In order to address some of the key issues and challenges facing the financing of waste management in South Africa, detailed research into the above EIs will need to be undertaken.

### 6.2.6 Financing Waste Management from Climate Change Adaptation

The main causes of increased concentrations of 'greenhouse gases' (GHG) in the atmosphere are known to be human activity, the unrelenting explosion of populations, the drive for industrialisation and urbanisation. The expected result is a significant warming of the earth's surface and irreversible changes in climate. The GHGs that contribute the most to global warming are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), which are all produced during the management and disposal of wastes (Friedrich and Trios, 2011). The post-consumer waste sector is said to contribute 3–4% of the total global man-made emissions of GHG, ranging from 50x10<sup>9</sup> to 60x10<sup>9</sup> tonnes of CO<sub>2</sub> equivalent/year (e/year) (Bogner, 2003; Christensen, 2009).

Previous studies on the contribution of waste management to GHG emissions has mainly focused on emissions of methane (CH<sub>4</sub>) released from landfill sites. Little research has looked at the negative and positive net contributions from components of the entire waste management system and cycle.

These basic contributing factors are necessary to fully understand and exploit the potential of waste management contribution to GHG. There is a direct relationship between the quantities of greenhouse gases generated from waste, the type of waste, its composition, and the socio-economic profile of the area where it is generated (Bogner, *et al.*, 2008; Cointtreau, 2006).

#### **Waste generation and waste stream analysis**

Studies have shown that developed countries and affluent areas generally generate high quantities of waste (kg/capita/day) compared to developing countries and less affluent or poor areas. An OECD study determined that developed countries in the European Union (EU) and United States (USA) generally produce 1.51 kg/capita/day and 2.08 kg/capita/day respectively, while developing countries (including China, Brazil and India) produce an average of 0.58 kg/capita/day (Troschinetz and Mihelcic, 2009).

In South Africa, the high disparity in the socio-economic profile of cities and towns means that the quantity of waste varies from 0.3 to 1.2 kg/capita/day. The composition of waste also varies: waste streams in less affluent areas and countries contain more biodegradable or organic waste, while in more affluent areas and countries a higher content of recyclable material, such as paper, plastics, aluminium cans, glass and rubber, is found. In most African countries, average waste contains as much as 60% of biodegradable waste. The implication of these findings is that poor or less affluent areas not only face the challenge of higher GHG emissions from biodegradable waste, but also have less material available for potential cost recovery through recycling.

#### **Waste collection and transportation and climate change**

Although very low compared to landfill emissions, the contribution of waste collection and transportation to GHG emissions is important for estimating the overall GHG contribution of a waste management system. Collection and transportation emissions are generally from nitrous oxide, carbon monoxide and sulphur dioxide and can be indicators of the efficiency and optimisation of waste collection and transportation routes (Salhofer, Schneider and Obersteiner, 2007).

Low emissions from collection and transportation also indicate the level of service delivery for refuse removal: areas with higher collection rates generally have higher carbon footprint from collection vehicles than poorer areas with low collection rates. The environmental and social cost of poor collection far outweigh the GHG emissions contribution from transporting the waste (Shimura, Yokota, and Nitta, 2001).

The most important factors to consider regarding GHG emissions when collecting and transporting refuse include:

- Mode of transport: compared to rail, road transport generally contributes more per tonne of waste (Salhofer, Schneider, and Obersteiner, 2007). In South Africa, East London, Knysna and Cape Town have investigated but not fully implemented the waste-by-rail (WBR) option, where transfer stations and waste disposal facilities are located along railway routes. The WBR option not only is a climate change adaptation option, but also provides a comprehensive waste transfer system that links waste management facilities (transfer stations, recycling centres and regional landfill sites) using the existing Spoornet/Transnet railroad grid. The advantages of a WBR system are a safer, more environmentally sustainable and economical revolutionary bulk waste transportation system (Joynes and Dean, 2011). Municipalities can reduce waste transportation costs using the rail option where practical and possible.

- Distance travelled: the longer the distance vehicles travel to waste management facilities, the higher contribution of GHG emissions. Furthermore, in the long term, the cost of wear and tear and maintenance of refuse trucks becomes unaffordable for municipalities. An optimisation study is required into the financial and environmental cost of the regionalisation option of landfill sites, where a number of municipalities can use a single regional landfill versus the cost effectiveness of transportation of waste over long distances.
- Population densities: transportation of waste from densely populated areas is more efficient, economical and contributes less GHG emissions than collections from sparsely populated rural areas (Larsen *et al.*, 2009). The implication is that spatial planning of South African towns should take into account the financial and environmental cost of waste management and service delivery.

### **Waste recycling and climate change**

Recycling fractions of municipal waste offers the highest benefit with regard to GHG savings from waste management (USEPA, 2006; Christensen, 2009; Smith *et al.*, 2001). Economic and technical data shows that the effect of recycling on GHG emissions presents definite advantages for all municipalities in all countries, regardless of the social and economic disparities (e.g. van Beukering and van den Bergh, 2006 and Uiterkamp, Azadi, and Ho, 2011).

Table 6.4. GHG savings from recycling of municipal waste (tonnes of CO<sub>2</sub>/MT of waste)

Waste Fraction/Material	EU Countries	USA	Developing Countries
Paper (Mixed)	-0.60	-3.19	-0.58
Plastic (HDPE)	-0.49	-1.26	-0.44
Plastic (PET)	-1.76	-1.40	-1.74
Glass	-0.25	-0.27	-0.23
Metal (Iron)	-1.48	-1.63	-1.25
Aluminium	-9.07	-12.31	-5.06

According to the Paper Recycling Association of South Africa (PRASA), in 2009, South Africa imported 73 tonnes of recycled paper and exported 17 tonnes of recycled paper. South Africa remains a very small contributor to the global recycling market compared to other countries. For example, in the same period the United Kingdom (UK) exported 4.7x10<sup>6</sup> tonnes of paper and 0.5x10<sup>6</sup> tonnes of plastic to China (WRAP, 2010).

### **Composting and climate change**

Composting uses micro-organisms to oxidise biodegradable wastes into carbon dioxide and water vapour (oxygen in the air is the oxidising agent). The humus-like residue can then be used as a soil conditioner in agriculture or land reclamation, or possibly as a growing medium in gardening or horticulture. Use of compost may have beneficial effects on GHGs fluxes, by replacing other products such as fertiliser and peat and may also lead to increased storage of carbon in the soil (carbon sequestration).

In many developed and developing countries, composting is used to deal with the biodegradable fraction of their municipal waste (Bogner *et al.*, 2008). Composting offers real advantages for saving landfill airspace, which is at a very high premium in most of South Africa's metros and cities, and for improving food security through increased production. Since the decomposition process is aerobic, composting also generates less GHG than landfilling. Europe contains about 2 000 composting facilities for household organic waste (Boldrin *et al.*, 2009) and has a successful policy to divert organic wastes from landfilling into composting.

Composting is a viable alternative for South Africa because of the high biodegradable content in waste streams from most municipalities. However, many of the large-scale, earlier composting initiatives failed in some countries, whereas the smaller, decentralised operations seem to be currently more successful (Cofie *et al.*, 2009).

The clean development mechanism (CDM), part of the United Nations Framework Convention for Climate Change (UNFCCC), has a programme for certified emission reduction (CER) projects. These projects include AM0025 (large-scale projects), which use alternative waste treatment processes to avoid emissions from organic waste, and AMS-III.F

(small-scale projects), which avoid methane emissions through composting. For South African municipalities, these programmes are a way of reducing both waste management emissions and costs.

### **Anaerobic digestion and climate change**

Similar to composting, anaerobic digestion has huge potential for GHG emission savings and for cost recovery. Anaerobic digestion is a biological process, which takes place in sealed vessels in the complete absence of air. The process converts biodegradable waste to a biogas containing methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>). The biogas is then used as a fuel, potentially displacing fossil fuels. Anaerobic digestion is essentially a controlled and accelerated decomposition process using the same types of micro-organisms that produce methane in landfills. The volume-reduced solid residue (digestate) is used as compost, usually after a period of maturation. However, clean source-segregated feedstock is essential if the compost is to be suitable for marketing.

The CDMs projects AM0025 and AMS-III.F are applicable to AD and represent opportunities that South Africa should explore further.

### **Incineration and climate change**

Incineration accounts for over 130x10<sup>6</sup> tonnes of waste per year in over 600 plants worldwide (Bogner *et al.*, 2008) and is becoming a major energy source and fuel replacement. Although the policy seems to favour controlled incineration, this process is not widely used in South Africa because of the authorisation of incinerators and the very high costs of operation. Another negative factor is the high composition of organic fraction, high moisture content and lower calorific value in local waste streams (Barton, Issaias, and Stentiford, 2008). GHG emissions from incineration are considered small at around 40x10<sup>6</sup> tonnes CO<sub>2</sub> per year, or less than one-tenth of the emissions from landfills (Bogner *et al.*, 2008).

### **Waste disposal by landfill and climate change**

The majority of studies investigating GHG emissions from waste management systems have focused on landfills and their methane emissions as the major contributing component. In 2004–2005, about 1.4x10<sup>9</sup> CO<sub>2</sub>e/year, or approximately 18% of the global anthropogenic methane emissions, were estimated to be from landfills and wastewater treatment processes (Bogner *et al.*, 2008). The amount of landfill gas generated from these sites depends on a number of factors, including the type and composition of waste deposited, the biodegradability of the waste and the age of the waste body (Komilis, Harn, and Stegmann, 1999; Thompson *et al.*, 2009).

## **6.2.7 The Cost of Waste Management**

An important question raised by the DEA during the stakeholder engagement was the cost of waste management in South Africa.

In South Africa, municipalities (and in some instances industry) are mandated by law to develop and implement sustainable, integrated management plans and systems. In most cases the responsibility of municipalities to provide waste management services are in line with the hierarchy illustrated in Figure 6.1 and include collection, sorting, transportation, recycling, and treatment<sup>3</sup> and disposal of waste.

In order to meet these obligations and services, municipalities have to develop sufficient waste management systems, institutional capacity, enabling policies and legal requirements, administrative budgets, environmental awareness and, importantly, a full cost accounting (FCA) system.

Studies of the development and effectiveness of accounting systems for MSWM, or cost benefit analysis (CBA) agree that, for a municipal waste management system to be cost effective, the level of service or performance must be maximised and the environmental impact of the services must be minimised (Haddix, 1975; Goddard, 1995; Bel and Warner, 2008).

A narrow view of cost-effectiveness focuses on the monetary values of the service or product in the markets. However, a broader approach considers South Africa's socio-economic challenges, equity policy, the Bill of Rights and the environmental

<sup>3</sup> Although waste treatment is a higher priority in the South African waste hierarchy, municipalities have not relegated this option to the private sector. Reasons for this could be the high technology, skills and intensive capital and operational requirements of waste treatment technologies.



cost and impact of waste management, all of which may result in significant costs and impacts that are not counted in the current financial accounting systems for waste management in most municipalities.

To address these challenges and deficiencies, an integrated CBA or FCA for municipal waste management should be encouraged and implemented. The FCA encompasses both internal (i.e. financial) and external (e.g. macro-economic, environmental and social) items simultaneously with a variety of environmental applications (ADB, 1997; Costanza *et al.*, 1997, 1998; USEPA, 1997; Pearce, Atkinson and Mourato, 2006; Moutavtchi *et al.*, 2008; TEEB, 2010).

### **Full cost accounting (FCA) of waste management**

FCA is an accounting and decision support tool that refers to the process of collecting and presenting information for the available alternatives, in order to arrive at a decision. It recognises, quantifies and allocates cost-related items to a process, or a product, by counting the environmental and social cost (USEPA, 1996; Higgins, 1999; Shore and Duchesne, 1997). FCA is an accounting practice that can help local governments identify and manage the actual costs of waste management systems and services. It differs from other common government accounting practices because it facilitates decision making by assigning value to the direct and indirect operating costs along with upfront (past) and back-end (future) expenses (USEPA, 1996).

FCA can help municipal solid waste and financial planners to (USEPA, 1996; Hogg, 2002; Miranda *et al.*, 1994):

- Plan and analyse future budgets for waste management;
- Identify the costs of acquiring equipment and materials, siting and constructing new infrastructure, rehabilitating ageing infrastructure, collecting, processing and marketing of recyclables, and transportation.
- Identify and evaluate the operating and maintenance costs of waste management facilities (e.g., transfer stations, landfills, and materials recovery facilities).
- Identify the costs and benefits of waste management programmes, such as clean-up campaigns of illegal dumping and littering.
- Identify and evaluate the cost and impact of closing waste management facilities (e.g. landfill closure and post closure).
- Identify and evaluate the cost of awareness programmes and waste-wise promotions.
- Identify the costs of administration/overheads and any other hidden cost.
- Trace and reform the inefficiencies of a waste management system, project or service;
- Evaluate scenarios financially and the potential impact on the quantity and quality of the waste.
- Investigate the potential for implementing new and/or innovative systems for waste minimisation, collection, recycling, treatment and related charges for these services;
- Investigate and analyse the impact of free basic services, tariffs for waste management and financial incentives for reducing waste generation

### **Benefits of full cost analysis**

FCA offers municipalities short-, medium-, and long-term benefits, including the following:

- Transparency and better explanation of costs: the *Municipal Finance Management Act* (MFMA) Act No. 56 of 2003 (South Africa, 2003), called for accounting officers of municipalities to maintain systems for sustainable quality financial statements and accounting management information for the various municipal assets, functions and roles. Each year, a number of municipalities receive 'qualified' audits for reasons that include poor accounting for waste management, obscuring the cost of providing solid waste services in the general fund, lack of financial resources dedicated to operating and maintaining waste management facilities and closing illegal dumpsites. The



FCA allows for all waste management costs to be revealed, enabling solid waste managers and decision-makers to explain budgets to the Auditor-General and to the public.

- Ability to learn the full costs of MSW services in communities. FCA provides a systematic approach to isolating MSW costs, so that they do not get lost among other expenditures. Knowing what drives waste management costs will enable local officials to make more informed decisions about how to manage their services.
- Accurate picture of total waste management programme costs. Using depreciation and amortisation, the FCA reveals peaks and valleys in expenditures rather than focusing solely on cash flow.
- More cost-efficient waste management. By assessing the actual cost of services, FCA allows local government to identify a more systematic approach to waste management.
- Improved negotiating power. Municipalities that understand the costs involved in providing waste management services are in a stronger position when negotiating with vendors and the private sector (especially if seeking to privatise services). FCA can also help municipalities that run their own operations to determine whether their costs are competitive with the private sector.
- Accurate costs of managing waste. The FCA can help municipalities to achieve important solid waste management goals, by identifying actual costs and potential cost savings, thereby providing a sound basis for deciding whether to provide services in-house or to privatise.
- Benchmarked waste management financing. The use of FCA can aid financial planners at national, provincial and local government levels by documenting current benchmarks for financing and CBA of waste management services.

Other key benefits include assisting municipalities to:

- o Make decisions
- o Set tariffs, rates and tipping fees
- o Defend budget requests
- o Evaluate options and alternatives
- o Evaluate privatisation decisions
- o Communicate cost information
- o Plan new facilities
- o Determine actual programme costs
- o Make investment decisions
- o Target cost reductions.

### ***CBA of waste management services***

Although the benefits of FCA are undisputed, some have argued that the original model of FCA emphasises cost estimates rather than benefits (USEPA, 1996) and internalities rather than externalities (Weng and Fujiwara, 2011). External costs and benefits (e.g. environmental and social benefits) appear to be considered only when the environmental costs are prevented in the FCA framework. Studies of the externalities and CBA of landfill sites in Sweden and South Africa concluded that, although the external (environmental and social) costs of waste management facilities or activities such as landfill operations are difficult to quantify in monetary terms, they are not generally reflected in municipalities' accounting systems for waste management (Moutavtchi *et al.*, 2008; Nahman, 2011).

The result is a bias against alternative waste management options, such as recycling, composting and treatment, all of which may be more expensive and require high initial capital outlays and skills than traditional dumpsite or landfill sites, if looked at from a purely financial perspective (Nahman, 2011). However, these alternatives are often preferable from an environmental and social perspective.

Given the above, municipal waste management and financial planners need to take into account external aspects (environmental and social benefits) when quantifying costs. The alternatives and options can then be compared based on their overall costs to the user, as well as the financial and external costs.

A study estimating the external costs of landfill sites in the City of Cape Town found that they are currently R111 per tonne of waste. However, these costs could decline if energy is recovered, or if the existing urban landfills are replaced with a new regional landfill (Nahman, 2011).

Table 6.5, although not exclusive, outlines some of external environmental and social cost benefits that can be explored in waste management systems planning and accounting.

Table 6.5. Externalities/cost benefits of waste management options

Externality	Description	Cost Benefit Items
Waste reduction	<ul style="list-style-type: none"> <li>Waste generation reduction</li> </ul>	<ul style="list-style-type: none"> <li>Less environmental degradation because of the increased waste quantity (benefit)</li> <li>Landfill air space saving (benefit)</li> </ul>
Resource recovery	<ul style="list-style-type: none"> <li>Recycling of resources</li> <li>Recovering energy</li> </ul>	<ul style="list-style-type: none"> <li>Lower environmental costs of raw resources excavation (benefit)</li> <li>Lower environmental costs of pollutions from high-polluted energy production processes (benefit)</li> </ul>
Air pollution	<ul style="list-style-type: none"> <li>Pollution from truck fleets, landfills, stacks and other waste facilities</li> </ul>	<ul style="list-style-type: none"> <li>Medical spending because of effect on human health (cost)</li> <li>Recovery costs of the global warming mitigation (cost)</li> <li>Changes in the values of neighbouring real estate (cost)</li> </ul>
Water pollution	<ul style="list-style-type: none"> <li>Leachate and contaminated run-off pollution of water resources</li> </ul>	<ul style="list-style-type: none"> <li>Remediation costs of polluted soils and waters (cost)</li> <li>Recovery costs of the affected ecosystems (cost);</li> <li>Medical spending because of effect on human health (cost)</li> <li>Changes in the values of neighbouring real estate (cost)</li> </ul>
Landscape	<ul style="list-style-type: none"> <li>Visual intrusion on the neighbouring area</li> <li>Remediation of a decommissioned landfill</li> </ul>	<ul style="list-style-type: none"> <li>Changes in the values of neighbouring real estate (cost)</li> <li>Recreation values of the remediated site (benefit)</li> <li>Ecosystem service values of the remediated site (benefit)</li> <li>Changes in the values of neighbouring real estate (benefit)</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>Traffic impact of refuse trucks</li> </ul>	<ul style="list-style-type: none"> <li>Changes in the values of neighbouring real estate (cost)</li> </ul>
Social and macro-economic	<ul style="list-style-type: none"> <li>Creation of job opportunities.</li> <li>Infrastructure</li> <li>Level of service</li> <li>Urban safety risks</li> </ul>	<ul style="list-style-type: none"> <li>Economic impacts owing to the increases of job opportunities (benefit)</li> <li>Changes in the values of real estate (benefit)</li> <li>Changes in the values of neighbouring real estate (cost)</li> </ul>

Most municipal Integrated Waste Management Plans clearly show a huge gap in considering the externalities of the various alternatives and options for waste management.

### 6.2.8 Job Creation from Waste Management

Waste recycling can create three forms of jobs, direct, indirect and induced (Friends of the Earth, 2010). For example, direct jobs can be created in public and private waste recycling facilities, while indirect jobs can be created through businesses that purchase recyclable commodities, such as brokers and processors (compost manufacturers and scrap metal dealers). Induced types of jobs include remanufacturers or reusers of recyclable materials and charity shops that sell used merchandise.

Creating jobs within the waste management sector is about creating valuable and sustainable 'green jobs', or jobs in sectors that demand less excessive carbon emissions. As landfilling – the traditional source of waste disposal – has become more expensive because of closures and stricter operating requirements, recycling is becoming an alternative for waste disposal (Halstead, 1994)

Even though the data has gaps, internationally, especially in the USA, UK and EU, recycling has been shown to contribute significantly to the economy through gross value add (GVA), tax revenue and job provision. The value-add studies looked at the difference between the value of goods and services produced and the cost of materials and supplies used to produce them (Halstead, 1994). The studies caution against jobs displacement within this sector, as waste and resource allocation policies too often overlook employment and social dimensions. The Friends of the Earth (2010) suggest that these challenges can be met through creating opportunities for valuable and sustainable 'green jobs'. In the USA, recycling generates more than twice the revenue of the landfill and incineration industry. Recycling also produces 10 times more jobs because it recovers greater economic value bound up in discarded products and equipment.

In South Africa, the 2011 *Local Government Budget and Expenditure Review* indicates a potential to create jobs through community-based delivery mechanisms, which are unfortunately limited (National Treasury, 2011). National government has begun piloting labour-intensive approaches to expand the solid waste services, which has the potential to create an estimated 3 000 permanent jobs in the non-public sector.

Goal 1 of the South African *National Waste Management Strategy* (NWMS), as prescribed by the *National Environmental Management: Waste Act* (Act no. 59 of 2008), is "securing ecologically sustainable development while promoting justifiable economic and social development" (South Africa, 2008). The objectives are to: ensure the protection of the environment through effective waste management measures; protect the health and well-being of people by providing an affordable waste collection service; grow the contribution of the waste sector to GDP; increase the number of jobs within waste services, recycling and recovery sectors; and promote small, medium and micro enterprises (SMMEs) in the waste sector. Three of the six objectives are directly linked to employment, job creation and creating opportunities for generating income and improving livelihoods, particularly for the poor and previously disadvantaged communities. The NWMS goes further and sets out key performance indicators (KPI) and targets for these objectives as shown in Table 6.6.

Table 6.6. Employment, job creation and GDP indicators from waste sector

Externality	Description	Cost Benefit Items
Waste reduction	Waste sector as a % of GDP	Waste sector to contribute 2% to GDP
	% increase in jobs within waste services, recycling and recovery sectors	10% increase in employment within waste services, recycling and recovery sectors
	Number of SMMEs operating sustainably in waste sector	20% increase in SMMEs within waste sector

Source: DEA, 2010

The above targets may be ambitious and unrealistic, but the consensus is that jobs and employment need to be created and SMME activity promoted in the waste sector.

Within the waste industry, the effect of the current and ever-changing policy and regulatory framework in South Africa has been much debated. Alternative waste management options, such recycling, reuse and recovery, can trigger and create opportunities for employment particularly for the poor and previously disadvantaged and/or the low skilled. At the same time, the increased cost of waste management services may lead to the loss of (potentially higher quality) jobs in other sectors of the economy.

More debate is needed, and further research is required to explore all potential avenues that can unlock the latent potential for job creation and employment within the waste sector. This study does not go into the detail but highlights key areas of the waste management sector that can unlock employment and job creation in South Africa.

The literature review revealed a number of hypotheses that support the linkage between employment, job creation and waste management, including:

- Evidence that well-designed policies can offer opportunities to create positive effects on employment.
- The demand for low-skilled labour is high because of the labour-intensive nature of waste management services e.g. street cleansing, refuse collection, sorting and recycling of wastes, especially in less industrialised countries with less mechanised systems; hence the opportunity for job creation and employment.
- Waste management services in municipalities should create such jobs and employment opportunities for the poor and previously disadvantaged through community-based waste collection systems and recycling programmes.
- The lack of skilled personnel in South Africa may hamper other opportunities, as handling of certain types of (e.g. hazardous) wastes may pose higher occupational health and safety risks and require semi-skilled, skilled and higher qualified labour. This gap needs to be addressed within the education sector, where higher learning institutions and FET colleges provide very limited training in waste management.
- Waste management measures can give rise to costs and related impacts that influence the competitive position of industry, which can in turn affect employment levels.
- Advanced technologies and waste minimisation measures, which may be encouraged through implementing high standards for waste treatment, can have significant business benefits.

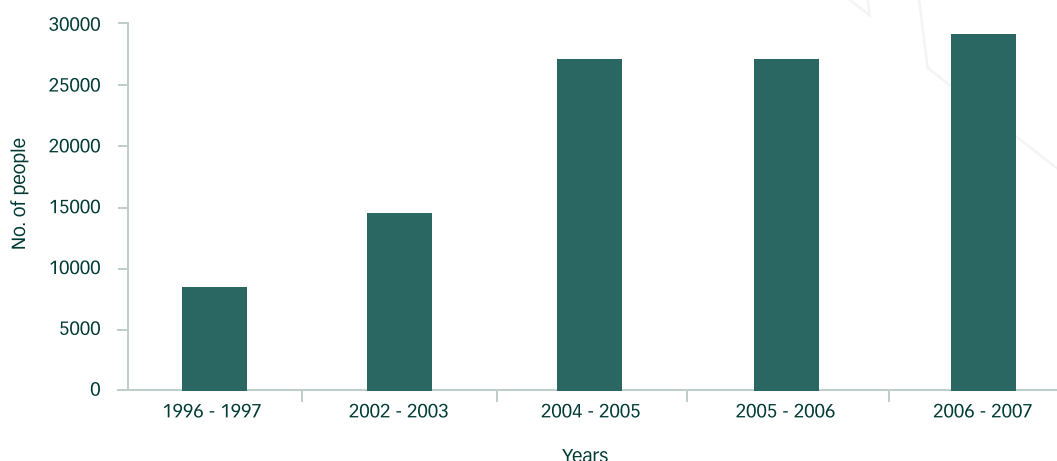
A review of statistics on employment from different regions around the world paints a good picture of the waste management sector's potential for job creation and employment. (ECOTEC, 1997; OECD, 1997) The overall level of employment in the environment industry in Europe totals between one and three million people, or between 0.4% and 1.2% of overall employment.

Table 6.7. Employment from waste collection, treatment and disposal services

Year	Employment	% Growth
1996–1997	9107	
2002–2003	14386	7.90%
2004–2005	26617	36.00%
2005–2006	26492	-0.50%
2006–2007	27347	3.20%

Source: ABS, 2008

Figure 6.3. Employment from waste collection, treatment and disposal services



Source: ABS, 2008

### ***Job creation from recovery, reuse and recycling of waste***

The recycling industry in South Africa is growing: from 2006 to 2009, the tonnes of plastic recycled rose by approximately 32% (SAPRO and PFSA, 2011). Recycling (rather than disposing in a landfill) one additional tonne of waste would pay R1,095 per tonne more in salaries, produce R4,905 more in goods and services, and generate a further R1.3 million in sales. South Africa has an estimated 200–220 plastics recycling manufacturers, employing approximately 4 800 people and creating over 35 000 indirect jobs, which translates into an annual payroll of R250 million (SAPRO, 2011). The DEA estimates that the country's recycling industry provides approximately 90 000 jobs (DEA, 2010). Most of these jobs are in the collection and sorting phases of recycling, as well as informal recycling activities such as 'waste-picking' on landfills. Government is keen to expand and promote the involvement of SMMEs, co-operatives and EPWP projects, through implementing separation at source and establishing buy-back centres and materials recovery facilities.

### ***Is community-based waste management a solution?***

The general consensus is that South Africa faces serious challenges in waste management, including inadequate waste services for low-income communities and inequalities in the provision of waste services and unemployment. Inadequate and inequitable waste services involve poor to no collection, recycling, treatment and waste disposal services and infrastructure.

As no single solution can meet all these challenges, a multi-faceted and integrated approach needs to be adopted. Community-based waste management (CBWM) is a possible solution to some of these problems. Low-income and rural communities suffer from inadequate solid waste services, as narrow lanes and unpaved roads hamper the access of conventional refuse collection vehicles. Other concerns include the low-income communities' lack of political power, unauthorised and unplanned character of their areas, and lack of technical and financial means of local governments to serve low-income communities.

Case studies, in South Africa and internationally, provide insights into the role community participation can play in solving some of these challenges. Community-based structures can (Barrientos, 1989; Hawkins, 1989; Panneer Selvam, 1993):

- provide local administrative structures,
- participate in planning appropriate waste management systems,
- participate in decision making,
- participate in financial control and treasury,
- participate in awareness and education for training,

- provide voluntary, paid or subsidised labour for waste collection, recycling and disposal systems,
- communicate about the coordination of primary and secondary collection systems,
- exercise political pressure on the municipality,
- forward complaints about performance service,
- act as community watchdogs for behavioural change,
- mobilise the community for waste management activities e.g. clean-up campaigns,
- provide an opportunity for women and youth to participate equitably in waste management and job creation. Examples of active participation of women and youth in waste management are found in Nelson Mandela Bay Metro Municipality in the Eastern Cape and many developing countries, including India, Pakistan, Indonesia, Ivory Coast, Zambia, Peru, Columbia and in the Caribbean.

A number of different configurations of community-based solid waste management organisations are employed in South Africa and around the world. Table 6.8 describes three common organisational structures.

Table 6.8. Typologies of community-based waste management organisations

Typologies of CBWM Organisation	Description	Application
Community-based micro-enterprises.	Micro-enterprises are cooperative businesses with 8–25 members who share responsibilities and income and who operate together a waste collection scheme, street sweeping, etc. Sometimes (but not always) members of a micro-enterprise live in the community where they operate a service. They are included as part of community management only when community members have some control over the service. Community-based organisations (CBOs) derive their members from and operate in a specific community (township or village, in a rural context).	<ul style="list-style-type: none"> <li>• These CBO and micro-enterprises may work together to manage and operate a solid waste service in a community, sometimes with separate objectives. A CBO usually works more from the operational perspective, while a micro-enterprise will generally focus more on generating income.</li> <li>• Generally the CBO has management and supervision tasks, while the micro-enterprise is responsible for operating the service.</li> </ul>
Municipality or local government working together or facilitating community-based organisations.	Local governmental and governmental institutions assist the CBOs. These institutions may be the governmental agency responsible for solid waste management or, more commonly, the local governmental authorities, either administrative bodies or government-led development committees. Usually these governmental institutions have relative autonomy from the central government and are motivated by their need to control all community services.	<ul style="list-style-type: none"> <li>• Such institutions are usually involved in the overall supervision of the solid waste service, but in some cases their participation extends to financial control or technical support, e.g. the provision of a refuse collection vehicle. In this organisational structure, the service is operated and managed by several CBOs, which are either motivated by income generation or by the interest in clean communities.</li> <li>• Examples of this structure, whereby local municipalities intentionally establish and support CBWM are in Nelson Mandela Bay Metro Municipality: Buyisa e Bag and Indhalo Yethu, which are section 21 companies established by the DEA to fund and support CBWM, especially recycling projects.</li> <li>• Examples of such CBWM structures have been found to work effectively in many developing countries around the world.</li> </ul>

Non-governmental organisations and community-based organisations	Community-based solid waste services can also be managed by a cooperation of non-governmental organisations (NGOs) and community-based organisations (CBOs). The clearest difference is that NGOs usually operate on a larger geographical scale, at city, regional, national or even international level. NGOs usually set up community-based solid waste management as a development project and work together with CBOs only in operating and managing these services.	<ul style="list-style-type: none"> <li>• The role of NGOs is confined to overall supervision, but very frequently also includes financial assistance and control, training and recruitment of management committee members and of operators, and other technical support.</li> <li>• CBOs play several roles in operation and management, similar to when cooperating with governmental institutions.</li> <li>• A number of NGOs support and fund waste management projects in South Africa and other countries.</li> </ul>
Funding and donor agencies, local government and community-based organisations (CBO)	Funding agencies and international donor agencies also form funding contracts and agreements with structures to support community-based solid waste services. Funding agencies typically use local government (municipalities) as the vehicle for funding the CBWM projects	<ul style="list-style-type: none"> <li>• The role of funding and donor agency is confined to overall financial assistance and monitoring and evaluation of the projects.</li> <li>• The funding agency may use the municipality as the vehicle for control, training and recruitment of management committee members and of operators, and other technical support.</li> <li>• CBOs play several roles in operations and management, similar to when cooperating with governmental institutions.</li> <li>• Examples of these include projects funded by agencies such as Development Bank of Southern Africa (DBSA), DANIDA, SIIDA World Bank /IFC.</li> </ul>

## 6.3 Methodology

After the literature review, an analysis of the existing funding arrangements captures the budget and expenditure patterns, to determine the extent of expenditure that has been properly channelled and determine areas where funding mechanisms have worked.

The status quo was established by sending survey questionnaires to a sample of municipalities. Secondary data on municipal waste management data was gathered from the General Household Survey, the Municipal Demarcation Board (MDB) and other government departments and institutions.

## 6.4 Findings and Discussions

### 6.4.1 Municipal Budget and Expenditure Trends in South Africa

The revenues and expenditures of municipalities determine their ability to deliver services (National Treasury, 2008). Waste management has become significant to the metros' revenue-raising potential (National Treasury, 2011). Ensuring that waste management is both environmentally and financially sustainable could contribute significantly to the financial sustainability of the municipalities.



Table 6.9. Aggregate waste management budget trends

Rands millions	2008/09			2009/10		
Province	Budget	Expenditure	Surp/Def	Budget	Expenditure	Surf/Def
Eastern Cape	R 108,43	R 100,05	R 8,38	R 528,70	R 585,30	-R 56,60
Free State	R 39,95	R 53,36	-R 13,42	R 251,57	R 241,59	R 9,97
Gauteng	R 414,29	R 507,41	-R 93,12	R 1 181,62	R 2 187,58	-R 1 005,96
Kwazulu-Natal	R 133,85	R 283,53	-R 149,68	R 1 048,63	R 1 336,99	-R 288,36
Limpopo	R 47,27	R 49,53	-R 2,26	R 133,60	R 160,26	-R 26,66
Mpumalanga	R 36,02	R 41,15	-R 5,14	R 196,14	R 439,75	-R 243,60
Northern Cape	R 9,09	R 9,51	-R 0,42	R 121,56	R 113,93	R 7,63
North West	R 25,37	R 33,06	-R 7,69	R 239,54	R 323,85	-R 84,32
Western Cape	R 298,41	R 460,40	-R 161,99	R 1 459,60	R 1 945,28	-R 485,69
<b>Total</b>	<b>R 1 112,65</b>	<b>R 1 538,01</b>	<b>R 425,34</b>	<b>R 5 160,96</b>	<b>R 7 334,54</b>	<b>R 2 173,58</b>

Source: National Treasury, 2009/10

Table 6.9 shows that municipalities spent R7.3 billion on waste management in 2009/10. The total recorded net deficit of R2.17 billion implies that municipalities are under budgeting for this service. Across provinces, the big difference in total expenditure to total revenue reflects the extent to which this service is under budgeted for in municipalities and its urban bias. Rural-based provinces, such as Limpopo, Mpumalanga and the Northern Cape, trail behind urbanised provinces such as the Western Cape, Gauteng and KwaZulu-Natal. One challenge for rural provinces with relatively high populations, for example, Limpopo and Mpumalanga, is pollution that may affect the livelihood of communities if not managed.

Among municipalities, waste management budgets vary considerably and are inconsistent from year to year. The situation is more pronounced in rural municipalities, which could be because the service is classified as basic, therefore subsidised. This means that, even though municipalities receive compensation to offer the service to communities at a reduced rate, rural municipalities do not have a sufficient tax base and so choose not to impose a surcharge on waste management.

Table 6.10. Metros' operating revenue, 2003/04–2009/10

	Apr-03	May-04	Jun-05	Jul-06	Aug-07	Sep-08	Oct-09
R million	Outcome			Estimate	Medium-term-estimates		
Operating Revenue							
Property rates	9 967	11 531	12 157	12 725	14 844	15 832	16 744
Service charges	23 268	24 477	25 456	28 506	30 522	32 311	34 432
Regional Service Levies	3 341	5 031	5 401	115	20		
Investment revenue	1 081	1 388	1 558	1 940	2 703	2 735	3 046
Government grants	2 371	4 513	4 019	11 425	12 487	13 004	1 286
Public contributions and donations	33	474	495	598			
Other own revenue	3 603	4 511	4 875	6 496	10 539	10 920	10 948
<b>Total revenue</b>	<b>43 665</b>	<b>51 926</b>	<b>54 961</b>	<b>61 804</b>	<b>71 115</b>	<b>74 802</b>	<b>66 456</b>

	Apr-03	May-04	Jun-05	Jul-06	Aug-07	Sep-08	Oct-09
R million	Outcome			Estimate	Medium-term-estimates		
Percentage of total revenue							
Property rates	22,8%	22,2%	22,1%	20,6%	20,9%	21,2%	25,2%
Service charges	53,3%	47,1%	46,3%	46,1%	42,9%	43,2%	51,8%
Regional Service Levies	7,7%	9,7%	9,8%	0,2%	0,0%	0,0%	0,0%
Investment revenue	2,5%	2,7%	2,8%	3,1%	3,8%	3,7%	4,6%
Government grants	5,4%	8,7%	7,3%	18,5%	17,6%	17,4%	1,9%
Public contributions and donations	0,1%	0,9%	0,9%	1,0%	0,0%	0,0%	0,0%
Other own revenue	8,3%	8,7%	8,9%	10,5%	14,8%	14,6%	16,5%
<b>Total revenue</b>	<b>100,0%</b>	<b>100,0%</b>	<b>98,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>	<b>100,0%</b>

Source: National Treasury, 2008

As Table 6.10 shows, in 2003/04 service charges (including refuse removal) contributed 53% of municipal operating revenue, but declined to 44% in 2009/10. Reasons for this drop can be attributed to the non-payment of water and electricity accounts, increasing consumer debt and the under-pricing of utility services (of which solid waste is one), coupled with non-collection of revenue on available sources including municipal solid waste.

Mobilising financial resources has always been a challenge for municipalities and hampers service delivery. Most budget allocations do not reflect waste management because it is seen as low priority. Furthermore, tariff structures are not uniform, as Table 6.11 shows. Compared to other metros, the City of Cape Town has a much more uniform tariff structure (R79.59/property/per month). The City of Johannesburg uses the property value to differentiate between consumers, ranging from R77.89 for properties worth R150,000–R300,000 to R189.93 for properties of R1.5 million and above. Both Nelson Mandela Bay and Johannesburg distinguish consumers who qualify for the free service. The Nelson Mandela Bay Metro also offers the service to non-domestic customers, such as trade and special waste. The lowest tariff for Nelson Mandela Bay is R14.02 for informal households, which is comparable to Tshwane's tariff of R14.48 for 85 litres of waste per week.

Like Ekurhuleni, the City of Tshwane has the most comprehensive tariff structure and pricing range for solid waste collection on a weekly or monthly basis. Unlike the other metros, Tshwane is able to deliver the service to households up to seven days a week, although at a higher rate of R1,312.08. In Tshwane and Ekurhuleni, the municipality is responsible for purchasing the correct size of the rubbish bin. The only difference between the two metros is that Ekurhuleni uses a range of volumes to be collected.

Comparing tariffs across metros is difficult, apart from the weekly 240 litre bin service, which is offered by the metros of Cape Town, Tshwane and Ekurhuleni. Using this service as a benchmark, Tshwane offers the cheapest rate (at R40.90), followed by Cape Town and Ekurhuleni at twice the rate, of R79.59 and R82.77 respectively.

Table 6.11. Tariff structures of the six metros (2011)

Rands millions	Level of service	Tariff structure & monthly rate
<b>Cape Town</b>	Weekly 1 X 240l bin	R 79,59
	Weekly 85l bin/bag: 1 X 85 l bin or 3 bags	Account to property owner. Basic bag service(weekly service is equivalent to a maximum of 3 bags/85L bin)

Rands millions	Level of service	Tariff structure & monthly rate
<b>Johannesburg</b>	R150,000 and less (including Indigent Households)	Free
	R150,001 to R300 000	R 77,89
	R300,001 to R500 000	R 90,70
	R500,001 to R700 000	R 103,50
	R700,001 to R1 500 000	R 136,58
	Greater than R1 500 000	R 189,93
<b>Tshwane</b>	85lx1 per week	R 14.48
	85lx2 per week	R 28.96
	240lx1 per week	R 40.9
	240lx5 per week	R 204.5
	240lx6 per week	R 245.5
	240lx7 per week	R 286.3
	1100lx1 per week	R 187.44
	1100x5 per week	R 937.2
	1100lx6 per week	R 1,124.64
	1100l x7 per week	R 1,312.08
<b>Nelson Mandela Bay</b>	Domestic waste collection charge per month in formal households	"R 55.23
	Domestic waste collection charge per month in informal households	"R 14.02
	Trade waste per tonne	"R 67.43
	Special waste per tonne	
	Domestic and general waste per tonne	
<b>eThekweni</b>	Data not available at the time	
<b>Ekurhuleni</b>	0 to 300m2	R 70.85
	301 to 600m2	R 82.77
	601 to 900m2	R 91.94
	901 to 1200m2	R 101.14
	1201 to 1500m2	R 116.46
	1501 to 2000m2	R 131.78
	2000m2 +	R 147.09
	240l bin	R 82.77
	1x per week Flat/town houses	R 77.94
	2 x per week	R 147.92

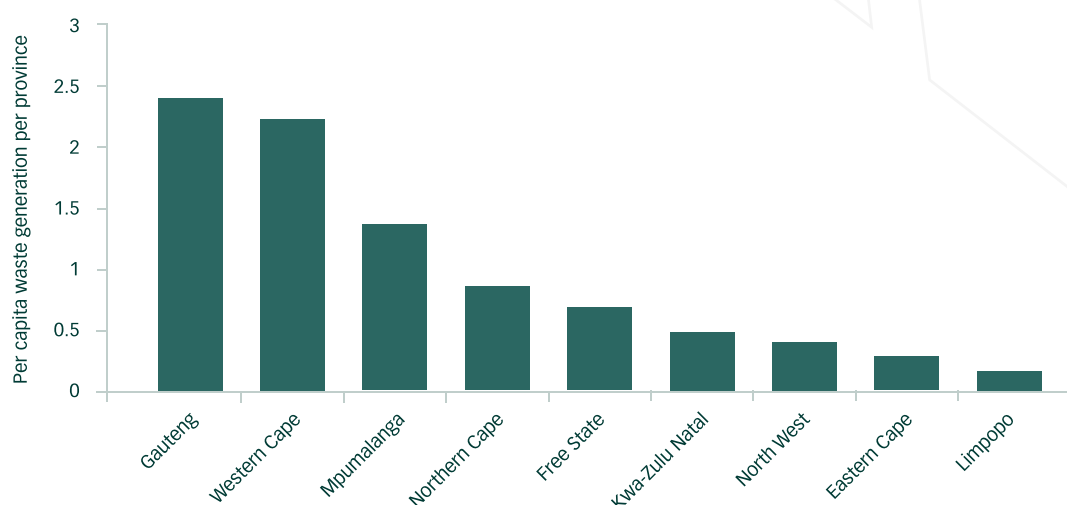
Source: Various municipalities, 2011

There is a lack of consistent data for waste management (National Treasury, 2011), which does not help with providing insight into solid waste management in South Africa.

#### 6.4.2 Extent of Solid Waste Management Provision in South Africa

Waste generation often reflects the economic status of society: the more affluent the society, the greater the waste (Bronberg Enviro Waste, 2012). The waste management baseline study (DEA, 2010) gave waste generation per province. As Figure 6.4 shows, waste generation is highest in Gauteng, at 2.44 tons per capita per annum, the result of high economic activities in the province. Gauteng is followed by Western Cape and Mpumalanga respectively.

Figure 6.4. Per capita waste generation in tonnes.



Source: DEA, 2010

Table 6.12 analyses the trends in refuse removal. In 2001 South Africa had 11.7 million households, of which 52% were provided with refuse removal services (StatsSA, 2003). By 2007, the number of households with refuse removal services had risen to 748 000, or a 6% improvement, given the 6% increase in number of households (to 12.5 million). Between 2001 and 2007, nearly a million more households (962 000) had access to refuse removal services (StatsSA, 2007).

Table 6.12. Trends in refuse removal (2001–2007)

Province	# of households 2001	# of households 2007	change in # of households	Access to refuse removal 2001	Access to refuse removal 2007	% of HH with access to refuse removal 2001	% of HH with access to refuse removal 2007	% improvement in access to refuse removal 2001-2007
Eastern Cape	1505029	1586742	5%	574035	587330	38%	37%	-1%
Free State	757244	802871	6%	442260	597254	58%	74%	16%
Gauteng	2887365	3175578	10%	2363932	2691367	82%	85%	3%
KwaZulu Natal	2231328	2234123	0%	1080769	1125311	48%	50%	2%
Limpopo	1193138	1215925	2%	187236	214602	16%	18%	2%
Mpumalanga	830254	940403	13%	298798	372576	36%	40%	4%
Northern Cape	259092	264653	2%	154700	185131	60%	70%	10%
North West	897806	911121	1%	364421	478840	41%	53%	12%
Western Cape	1209007	1369181	13%	1057292	1233166	87%	90%	3%
<b>Total</b>	<b>11770263</b>	<b>12500597</b>	<b>6%</b>	<b>6523443</b>	<b>7485577</b>	<b>52%</b>	<b>57%</b>	<b>6%</b>

Source: Stats SA, 2007

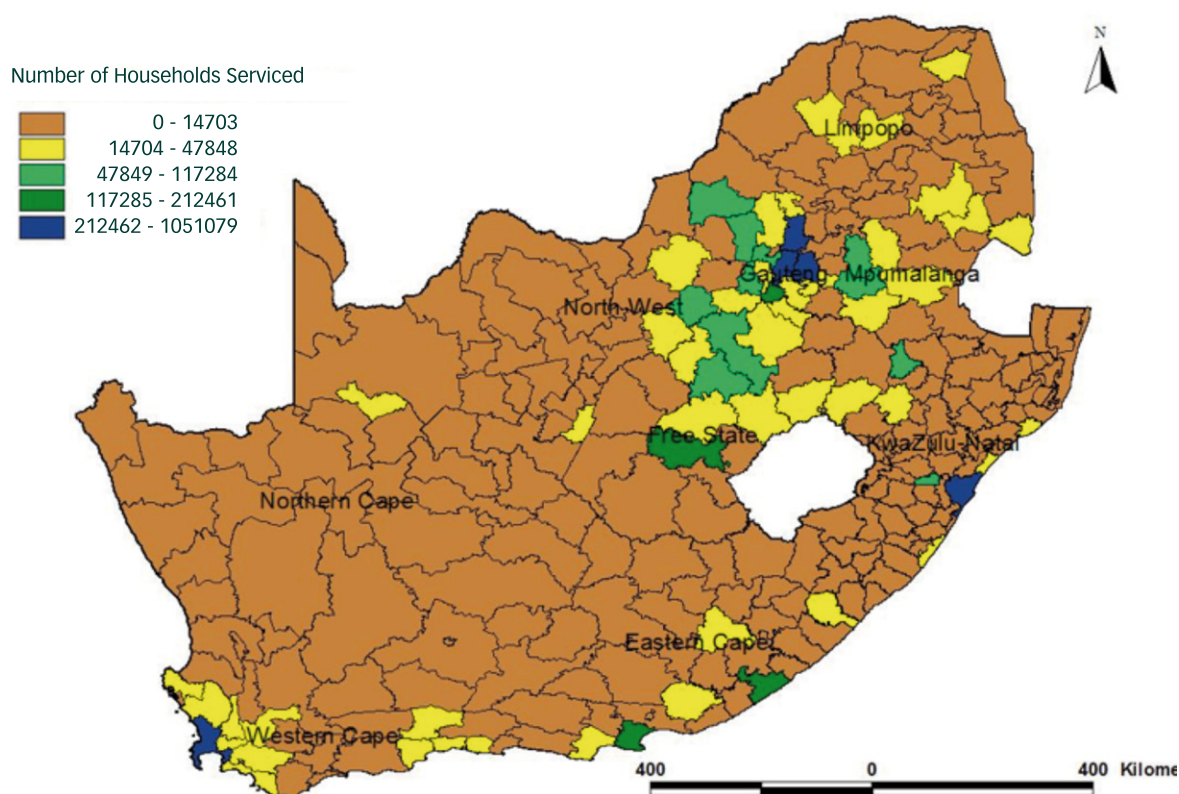
As Table 6.12 shows, refuse removal services are unevenly delivered across provinces. In 2007, the highest access to refuse removal was in the Western Cape (90%), Gauteng (85%) and the Northern Cape (70%). Between 2001 and 2007, the provinces that improved most the provision of these services were the Free State (by a significant 16%), followed by the North West (12%) and the Northern Cape (10%).

Limpopo has only 9.7% of all the households in South Africa, but only 18% of these have access to refuse removal, making it the least serviced province. Furthermore, the province has not improved significantly since 2001, as only 2% more households received the service in 2007. In Mpumalanga and Gauteng, where numbers of households increased considerably between 2001 and 2007, there has been no significant jump in access to the provision of these services. This trend is also a concern, especially for Mpumalanga which started on a low base of 40%, compared to 85% for Gauteng.

Between 2005 and 2009, the number of municipalities providing solid waste management services increased from 226 to 239, mainly in small towns and mostly rural municipalities. In the main metros, 92.5% of consumers receive this service compared to 16% in rural centres. The overall national picture shows that on average 64.5% of households in all municipalities were already accessing the service in 2009.

Given the current institutional arrangements, challenges to financing waste management remain. Solid waste management funds need to be ring-fenced in order to protect spending on the service. However, this is acknowledged to be impractical in much smaller municipalities. Organisational reforms are also needed, to allow revenue and expenditure authority and accountability to be combined (National Treasury, 2011).

Figure 6.5. Extent of refuse removal by municipality in 2007



Source: Data generated from Stats SA's Community Survey of 2007

Figure 6.5 reflects the extent of municipal refuse removal in 2007 and shows that the service differs widely, from zero collection to 1.5 million households per municipality. Most serviced households (between 212 462 and 1 051 079 households per metro) are found in five metros: Cape Town, Johannesburg, Ekurhuleni and Tshwane and eThekweni, followed by Buffalo City and Nelson Mandela, Mangaung and Emfuleni, where between 117 000 and 212 461 households per municipality are serviced. Other towns, such as Rustenburg, Moses Kotane, Newcastle and Mogale each provide refuse removal services to between 48 000 and 117 000 households. The next cluster are mainly township-based municipalities, servicing 14 000–48 000 households per municipality. The remaining municipalities are mostly poor and rural-based, providing refuse removal services to between zero and 14 000 households.

### 6.4.3 Case Studies of Waste Disposal in South Africa

#### **KwaZulu-Natal**

A 2004 study had difficulty finding municipal-level data on waste disposal sites in the province. In some instances municipalities were unable to determine the life expectancy of their disposal sites and thus plan appropriately for future demand. Ninety-five waste disposal sites were visited, of which 55% did not have permits because they were not registered. Over and above the compliance issue, some of the sites were found to be inappropriately located on high water tables and streams, posing a threat of run-off for informal communities located downstream. Other problems included locating of sites close to human settlements, improper disposal and poor management practices. Recycling initiatives were lacking and, where they existed, were illegal.

#### **eThekweni Metro Municipality waste-to energy projects**

eThekweni recorded a total of 4 784 tons of domestic waste and 1 191 tons of grade refuse per month. Commercial waste disposal is handled at landfill sites, where landscaping companies are contracted to provide the service. However, payment for the disposal of waste is reflected on electricity tariff accounts, making it almost impossible to detect.

The CDM viable projects include GHG mitigation strategies for landfills, such as capturing landfill gas for flaring and energy recovery, oxidising methane by using compost landfill cover, pretreating waste and aerobic landfilling. Funding for implementing these technologies at South African landfill sites is possible through the CDM. A good example to study is the eThekweni Municipality landfill gas-to-electricity CDM project at the Bisasar Road site and Mariannhill landfill, the only project of its kind in South Africa. The project produces 7.5 MW of electricity through a purpose-built one megawatt (MW) engine that generates 6.5 MW and a further one MW engine at the Mariannhill landfill site. The capital cost was approximately R100-million, and projected revenue is about R4.5-million per month, recovered from the sale of carbon credits and electricity. According to data from the UNFCCC (Cofie *et al.*, 2009) the eThekweni Municipality CDM projects offset approximately 68 833 metric tonnes of CO<sub>2</sub> e/year at Mariannhill and La Mercy landfill Sites and 342 705 tonnes CO<sub>2</sub> year at the Bisasar landfill site.

Table 6.13 compares the capital cost and estimated cost of generation per unit of energy from renewable sources. It shows that waste-to-energy sits below some of the other sources. However, the table does not take into account the environmental cost saving of waste-to-energy. In South Africa, the National Energy Regulator has encouraged the private sector to invest in independent power production through the REFIT programme, but most emphasis has been put on wind and solar energy. However, Table 6.13 suggests that waste-to-energy could provide a better opportunity than solar energy.

Table 6.13. Capital and estimated cost of power generation from renewable sources

Source	Capital cost ('000 \$/MW)	Estimated cost of generation per unit (\$/kWh)
generation per unit (\$/kWh)	890–1100	0.07–0.09
Small hydro (<25MW)	1100–1300	0.06–0.07
Bagasse cogeneration	665–775	0.04–0.07
Biomass	890	0.07–0.09
Biomass gasifier	555–665	0.07–0.17
Waste-to-energy	110–2225	0.09–0.17
Solar PV	5555–6665	0.33–0.44



## Gauteng

In the Gauteng province, the Mogale City local municipality is faced with solid waste management service delivery backlogs and has difficulty sustaining the operation. According to the Gauteng Department of Agriculture, Conservation, Environment and Land Affairs (GDACEL, 2004), the challenges are increased volumes of domestic growth because of rapid population growth; a lack of adequate refuse removal services in rural municipalities and informal settlements; fragmented waste management plan and delivery system; low priority afforded to waste management by municipalities and other spheres of government (national and provincial); a culture of non-payment for services by the communities and businesses; illegal dumping and littering in open spaces; unmanaged parks; increased costs of waste disposal because of stringent legislative requirements; and a lack of community awareness about prevention, minimisation, reuse and recycling of waste.

## Eastern Cape

The Nelson Mandela Bay Metro in the Eastern Cape generates about 300 000–350 000 tons of general domestic waste per annum. Using its contractors, the municipality collects daily this waste, which is dumped at landfill sites.

In general, waste generation lacks controls, as shown by households' generated waste being less than that from industrial and business sectors. The absence of laws allows manufacturers to package their goods in an uncontrolled manner, while the consumer pays for packaging and disposal. Currently only about 1% of the total waste in the metro is recycled. Legislation that introduces a 'producer pays policy' might encourage manufacturers to use recyclable materials. Alternatively, PPPs seem to work well in some cases.

As Table 6.14 shows, the amount of general waste generation in Nelson Mandela Bay is expected to increase in the coming years.

Table 6.14. Projected waste generation

Year	2004	2005	2006	2007	2010	2015	2020
<b>Economic growth</b>	3,7%	4,0%	4,3%	4,7%	5,0%	5,0%	5,0%
<b>Waste generation (tons per annum)</b>	325 000	337 025	350 506	365 578	421 993	538 582	687 382

Source: Nelson Mandela Bay Municipality, 2007

The Nelson Mandela Bay Metro has a waste management division that is responsible for waste management activities: awareness, collection and transport of waste, disposal of waste, development and recycling schemes. Management is financed from levies, surcharges, municipal budgets and external funding.

## 6.5 Conclusion

Broad policies relating to pollution and waste management are in place, and the government is committed to ensuring that the policies and legislative requirements are in line with international policies and agreements. However, the lack of enforcement of regulation and compliance means such policies not effectively implemented. In smaller and rural municipalities, the challenge is accessing the services and making sure services are expanded to previously unserved areas.

The functional responsibilities between district and local municipalities are unclear and create confusion. These unresolved issues are hampering the government's commitment to achieving the rights stated in the Constitution and other related legislation, including meeting international commitments to which South Africa is a signatory.

Furthermore, these findings suggest that implementing EIs for solid waste management is a complex issue. In municipalities and private companies across South Africa, almost all respondents felt that EIs should be used to reduce waste generation and increase the diversion of waste from landfill to recycling.



## 6.6 Recommendations

With respect to financing of waste management, the Commission recommends that:

- By the end of the 2015/2016 financial year, government should phase in full cost accounting (FCA) for solid waste management within municipalities. To achieve this goal:
  - Government should develop specific FCA guidelines for integrated municipal solid waste management that addresses the specific and inter-related environmental and service delivery needs of the sector, within the framework of activity-based costing that the National Treasury is introducing.
  - Government should develop a capacity-support programme to implement the guidelines that allows a phased introduction of FCA starting with high-capacity municipalities that face major solid waste management challenges.
- Government should take greater advantage of the opportunities for job creation in the solid waste sector, by incentivising municipalities to create 'green' jobs through labour-intensive service delivery. In particular:
  - The Department of Public Works should review the Expanded Public Works Programme (EPWP), which may negatively impact on the ability of municipalities to support job creation in the sector due to the comparatively higher capital costs associated with solid waste collection and recycling activities;
  - The Department of Cooperative Governance (DCoG) should review the funding conditions of the Municipal Infrastructure Grant (MIG) to ensure that local-level municipal waste management assets are eligible for financing.
  - A portion of resources from the recently established Green Fund should provide transitional financial support to municipalities that introduce innovative, labour-intensive waste collection, reduction and recycling mechanisms to areas where services are currently inadequate. These might include developing small waste collection and recycling contractors, or community cooperatives to manage waste buy-back centres and materials recovery facilities;
  - The DEA should develop municipal guidelines and regulations that support community involvement in waste management activities through community-based trusts and partnerships.
- The DEA should delay implementing the regionalisation of solid waste landfills policy until the fiscal risks and benefits for municipalities are better understood, and adequate decision-support measures for municipalities are in place. In particular:
  - The DEA should commission a full cost benefit analysis of regionalisation options, to ensure appropriately scaled projects within a fiscally sustainable licencing and service delivery framework;
  - The DEA should develop adequate decision-support tools to guide municipal choices on appropriate investments and the associated governance frameworks, including the use of multi-jurisdictional Municipal Service Districts where appropriate.
  - The Commission notes its availability to assist the DEA, on request, to explore further the policy options and risk mitigation tools associated with regionalisation proposals.
- Government should emphasise the expansion of access to solid waste services to poor communities, while strengthening the policy framework for the provision of refuse removal free basic services (FBS). In particular:
  - The DCoG should review the MIG guidelines to ensure that (i) adequate funding for solid waste assets is available to municipalities with weaker fiscal capacity; and (ii) expenditures on specialised vehicles and equipment required for solid waste management services are eligible for financing;
  - The DEA should prioritise support to municipalities seeking to expand services to poor communities using labour-intensive service delivery, including investigating potential fiscal instruments that might be incorporated with the EPWP or Green Fund;

- The DEA should commission a review of the refuse removal FBS policy, with a specific focus on its impacts on (i) expanding and sustaining services to poor households; (ii) the affordability and quality of service to poor households; (iii) environmental impacts, such as the extent of reduction in illegal dumping.

#### Appendix 6A. Government, Civil Society and Their Roles in Waste Management

Sector	Department	Roles & Functions
<b>National Government</b>	Environmental Affairs	Policy Development
	Traditional Affairs	Setting of National Standards and targets
	Health	Advisory
	Transport	Regulation and
	Trade & Industry	Inspection
	Water Affairs	
	Agriculture, Forestry & Fisheries	
	Mineral Resources	
	Energy	
<b>Provincial Government</b>	All Provincial departments dealing with Environmental Affairs	Standards and Targets
		Authorisations
		Advisory
		Regulation (permitting of all general waste sites)
<b>Local Government</b>	Metropolitan municipalities	Waste Service delivery
	District Municipalities	Planning and
	Local Municipalities	Waste Disposal
	South African Local Government Association (SALGA)	
<b>Associations and Organisations</b>	Institute of Waste Management of South Africa (IWMSA)	
	National Recycling Forum	
	Health Care Waste Forum	
	Packaging Council of South Africa	
	Recycling Actions Group	
	Plastics Federation	
	Paper Recycling Association of South Africa	
	Electronic Waste Association of South Africa	
	PET Plastic Recycling South Africa	
	Buy- e- Bag	
	The Glass Recycling Company	
	Collect a Can	
	SAPRO	
	Recycling Association of South Africa	
	Responsible Packaging Management in South Africa	
	Recycling Industry Body	
	Rose Foundation	
	Tyre Recycling Association	
	Scrap Metal Association	
<b>NGO's</b>	WESSA	
	WWF	
	Groundworx	
	Earthlife Africa	
<b>Waste Contractors</b>	Vary in size	Re-claimers
		Collectors
		Recyclers
		Operators of waste management facilities

Source: Department of Environmental Affairs, 2011

## References

- ABS. 2008. *Electricity, Gas, Water and Waste Services, Australia, 2006-07*. Australian Bureau of Statistics.
- ADB (Asian Development Bank). 1997. *Guidelines for the Economic Analysis of Projects*. Available online: <[http://www.adb.org/Documents/guidelines/Eco\\_Analysis/](http://www.adb.org/Documents/guidelines/Eco_Analysis/)>
- Appasamy, P and Nelliya, P. 2007. *Financing Solid Waste Management: Issues and Options*. Chennai: Madras School of Economics, p 600-625.
- Barrientos, C. 1989. Recycling of domestic waste in Guatemala City: a case study with neighbourhood participation. *GATE*, vol. 3, no. 10, pp. 11-14.
- Barton, J, Issaias, I and Stentiford, E. 2008. Carbon – making the right choice for waste management in developing countries. *Waste Management*, 28, 690-698.
- Bel, G., & Warner, M. (2008). Does privatization of solid waste and water services reduce costs? A review of empirical studies. *Resource, Conservation & Recycling*, 52 (12), 1337-1348.
- Bell, R. And Russell, C. 2002. Environmental policy for developing countries. Issues in *Science and Technology*, Spring.
- Bogner, JM. 2003. Global methane emissions from landfills: New methodology and annual estimates 1980–1996. *Global Biogeochemical Cycles*, 17, 1065-1083.
- Bogner, J, Pipatti, R, Hashimoto, R, Diaz, C, Mareckova, K, and Diaz, L. 2008. Mitigation of global GHG emissions from waste: conclusions and strategies from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report. Working Group III (Mitigation). *Waste Management Research*, 26, 11-13.
- Boldrin, A, Andersen, J, Christensen, T and Favoino, E. 2009. Composting and compost utilization: accounting for greenhouse gases and global warming contributions. *Waste Management and Research*, 27, 800-812.
- Bronberg Enviro Waste. 2012. Website of Bronberg Enviro Waste (Pty) Ltd. Available online: <http://www.bronbergenvirowaste.co.za/cp/8227/waste-defined>
- Christensen, T.H. 2009. Global warming factors modelled for 40 generic municipal waste management scenarios. *Waste Management and Research*, 27(9): 871-884.
- Christensen, T, Gentil, E, Boldrin, A, Weidema, B and Hauschild, M. 2009. C balance, carbon dioxide emissions and global warming potentials in LCA-modelling of waste management systems. *Waste Management and Research*, 27, 707–715.
- Cofie, O, Drechsel, P, Agbottah, S and van Veenhuizen, R. 2009. Resource recovery from urban waste: options and challenges for community-based composting in Sub-Saharan Africa. *Desalination*, 248, 256-261.
- Cointreau, S. 2006. *Occupational and Environmental Health Issues of Solid Waste Management: Special Emphasis on Middle and Lower-income Countries*. Washington D.C: World Bank. Available online: <http://documents.worldbank.org/curated/en/2006/07/7826263/occupational-environmental-health-issues-solid-waste-management-special-emphasis-middle-lower-income-countries> [Accessed 20 June 2012]
- Costanza, R, d'Arge, R, de Groot, R, Farber, S, Grasso, M, Hannon, B, Naeem, S, Limburg, K, Paruelo, J, O'Neill, RV, Raskin, RG, Sutton, P, van den Belt, M. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387, 253-260.
- Savage, D. 2009. Cooperative Governance, Local Government and the Waste Planning System. Paper prepared for Department of Environmental Affairs as part of NWMS process, August 2009
- DEA (Department of Environmental Affairs). 2011. *Draft Municipal Waste Sector Plan*. Pretoria: DEA.
- DEA. 2010. *State of the Environment Report*. Pretoria: DEA.
- DEAT (Department of Environmental Affairs and Tourism). 1999. *National Waste Management Strategy*. Pretoria: DEA.
- DEAT. 2000. *White Paper on Integrated Pollution and Waste Management for South Africa*. Pretoria: Government Printer.
- DEAT. 2001. *The Polokwane Declaration on Waste Management*. Polokwane. South Africa.
- DEAT. 2004. *National Cleaner Production Strategy*. Pretoria: DEAT.
- ECOTEC. 1997. *Environmental Protection Expenditure by UK Industry*. London: Department of the Environment, Transport and the Regions.

- FFC (Financial and Fiscal Commission). 2008. *Five Year Research Strategy*. Midrand: FFC.
- FFC. 2011/2012. *Research and Recommendations Program Work Plan*. Midrand: FFC.
- Friedrich, E and Trios, C. 2011. Quantification of greenhouse gas emissions from waste management processes for municipalities – a comparative review focusing on Africa. *Waste Management*, 31, 1585–1596.
- Friends of the Earth. 2010. *More Jobs Less Waste: Potential for job creation through higher rates of recycling in the UK and EU*. October 2010. Available online: <http://www.foe.co.uk/resource/reports/morejobslesswaste.pdf>
- GDACEL (Gauteng Department of Agriculture, Conservation, Environment and Land Affairs). 2004. *Gauteng State of the Environment Report*. Johannesburg: GDACEL.
- Goddard, H. 1995. The benefits and costs of alternative solid waste management policies. *Resource Conservation: Recycling*, 13 (3-4), 183-213.
- Greben, H and Oelofse, S. 2008. *Unlocking the Resource Potential of Organic Waste: a South African Perspective*. CSIR. South Africa, Pretoria.
- Haddix, G. 1975. Regional solid waste planning models, two cases. *Comput. Urban Soc.*, 1, 179-193.
- Halstead, J. 1994. *Waste Management and Job Creation*. University of Wisconsin-Madison and Community, Natural Resource and Economic Development Programme, University of Wisconsin Extension, Massachusetts.
- Hawkins, P. 1989. *Community-based solid waste systems in Olinda and Recife, Brazil*. Duebendorf, Switzerland: IRCWD.
- Higgins, G. 1999. *Basic Principles of Full Cost Accounting for the Business, Labor and Agriculture Interim Committee*. Helena, MT: State of Montana, Legislative Services Division
- Hogg, D. 2002. *Financing of Municipal Waste*. Bristol, UK: Eunomia Research and Consulting Ltd.
- Joynes, M and Dean, N. 2011. *Waste Core Strategy Background Document – Waste Freight by Rail*. Worcester, UK: Planning Environment and Economy Worcestershire County Council.
- Koller, H. 2010. *Financing of Waste Management – Different Approaches and Examples*. Vienna, Austria: International Solid Waste Association.
- Komilis, D, Harn, R and Stegmann, R. 1999. The effect of landfill design and operation practices on waste degradation behaviour: a review. *Waste Management and Research* 17, 20–26.
- Larsen, A, Vrgoc, M, Christensen, T and Lieberknecht, P. 2009. Diesel consumption in waste collection and transport and its environmental significance. *Waste Management and Research*, 27, 652-659.
- Miranda, M, Everett, J, Blume, D and Roy, B. 1994. Market-based incentives and residential solid waste. *Journal of Policy Analysis and Management*, 13(4), 681-697.
- Moutavtchi, V, Stenis, J, Hogland, W, Shepeleva, A and Andersson, H. 2008. Application of the WAMED model to landfilling. *Cycles of Waste Management*, 10(1), 62-70.
- Nahman, A. 2011. Pricing landfill externalities: Emissions and disamenity costs in Cape Town, South Africa. *Waste Management*, 31(9-10), 2046-2056.
- National Treasury. 2008. *Local Government Budgets and Expenditure Review*. Pretoria; National Treasury.
- National Treasury. 2009/2010. *Section 71 Reports*. Pretoria: National Treasury.
- National Treasury. 2011. *Local Government Budgets and Expenditure Review*. Pretoria; National Treasury.
- Nelson Mandela Bay Municipality. 2007. *Integrated Waste Management Plan 2005–2010*. Port Elizabeth: Nelson Mandela Municipality.
- OECD (Organisation for Economic Cooperation and Development). 1997. *Environmental Policies and Employment*. Paris, France: OECD.
- Panneer Selvam, L. 1993. *Community-based Solid Waste Management*. Project preparation: Panaji case study. New York: World Bank/UNDP.
- Pearce, D, Atkinson, G and Mourato, S. 2006. *Cost–Benefit Analysis and the Environment: Recent Developments*. Paris, France: OECD.

- Pearce, D. and Turner, R.K. 1994. Economics and solid waste management in the developing world. *CSERGE Working Paper WM 1994-05*. Available online: <http://www.uea.ac.uk>. Accessed 20 June 2012.
- PFSA (Plastics Federation of South Africa). 2011. Available online: <http://www.plasticsinfo.co.za/>
- PRASA (Paper Recycling Association of South Africa). 2011. Available online: [www.prasa.co.za](http://www.prasa.co.za).
- Purnell, G. 2009. *National Waste Quantification and Waste Information System*. Paper prepared by Munitech for Department of Environmental Affairs as part of NWMS process, August 2009.
- Russell, C. and Vaughan, W. 2003. The choice of pollution control policy instruments in developing countries: arguments, evidence and suggestions. In Henk Folmer and Tom Tietenberg (eds.). *The International Yearbook of Environmental and Resource Economics 2003/2004*. Cheltenham, UK: Edward Elgar.
- Salhofer, S, Schneider, F and Obersteiner, G. 2007. The ecological relevance of transport in waste disposal systems in Western Europe. *Waste Management*, 27, 547-557.
- SAPRO (South African Plastics Recycling Organisation). 2011. Available online: [www.sapro.biz](http://www.sapro.biz).
- Schübeler, P, Wehrle, P and Christen, J. 1996. Conceptual Framework for Municipal solid waste management in Low Income countries, *Urban Management and Infrastructure*. Swiss Centre for Development Co-operation in Technology and Management. Switzerland.
- Shimura, S, Yokota, I and Nitta, Y. 2001. Research for MSW flow analysis in developing nations. *Journal of Material Cycles and Waste Management*, 3, 48-59.
- Shore, M and Duchesne, M. 1997. *Analysis of the full cost of solid waste management for North Carolina local governments*. Department of Environment, Health, and Natural Resources. The North Carolina Division of Pollution Prevention and Environmental Assistance.
- Smith, A, Brown, K, Ogilvie, S, Rushton, K and Bates, J. 2001. *Waste Management Options and Climate Change*. Final Report to the European Commission., Available online: <[http://www.ec.europa.eu/environment/waste/studies/pdf/climate\\_change.pdf](http://www.ec.europa.eu/environment/waste/studies/pdf/climate_change.pdf)> (June 2010). Brussels: European Commission.
- South Africa. 1977. *Health Act* (No. 63 of 1977). Pretoria: Government Printer.
- South Africa. 1989. *Environment Conservation Act* (No. 73 of 1989). Pretoria: Government Printer.
- South Africa. 1996. *Constitution of the Republic of South Africa*. (No. 108 of 1996). Pretoria: Government Printer.
- South Africa. 1998a. *Municipal Structures Act* (No.117 of 1998). Pretoria: Government Printer.
- South Africa. 1998b. *National Environment Management Act* (No. 19519 of 1998). Pretoria: Government Printer.
- South Africa. 2000. *Amended Municipal Structures Act* (No. 33 of 2000). Pretoria: Government Printer.
- South Africa. 2001. *Free Basic Services Policy*. Pretoria: Government Printer.
- South Africa. 2003. *Municipal Finance Management Act* (No.56 of, 2003. Pretoria: Government Printer.
- South Africa. 2004. *Air Quality Act* (No. 39 of 2004). Pretoria: Government Printer.
- South Africa. 2008. *National Environment Management Act: Waste Act* (No. 59 of 2008). Pretoria: Government Printer.
- South Africa. 2011a. *National Domestic Waste Collection Standards*. Pretoria: Government Printer.
- South Africa. 2011b. *National Policy for the Provision of Basic Refuse Removal Services to Indigent Households*. Pretoria: Government Printer.
- StatsSA (Statistics South Africa). 2003. *Census 2001: Census in Brief*. Pretoria: StatsSA. Available online: <http://www.statssa.gov.za/> Accessed 20 June 2012]
- StatsSA (Statistics South Africa). 2007. *Community Survey data – 2007/8 Annual financial indicators of municipalities* (Release P9114). Pretoria: StatsSA
- TEEB (The Economics of Ecosystems and Biodiversity), 2010. *The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB*. Available online: <<http://www.teebweb.org/TEEBFinalReport/tabid/29410/Default.aspx>>.

- Thompson, S, Sawyer, J, Bonam, R and Valdivia, J. 2009. Building a better methane generation model: validating models with methane recovery rates from 35 Canadian Landfills. *Waste Management*, 29, 2085–2091.
- Troschinetz, A and Mihelcic, J. 2009. Sustainable recycling of municipal solid waste in developing countries. *Waste Management*, 29, 915–923.
- Uiterkamp, B, Azadi, H and Ho, P. 2011. Sustainable recycling model: a comparative analysis between India and Tanzania. *Resources. Conservation & Recycling*, 55, 344-355.
- UNEP (United Nations Environment Programme). [Sa]. *Municipal Solid Waste Management*. Nairobi, Kenya: UNEP.
- USEPA (United States Environmental Protection Agency). 1996. *Making Solid (Waste) Decisions With Full Cost Accounting*. Washington, DC: USEPA.
- Van Beukering, P and van den Bergh, J. 2006. Modelling and analysis of international recycling between developed and developing countries. *Resources Conservation & Recycling*, 46, 1-26.
- Von Blottnitz, H, Austin G, Nissing, C, Schmalbein, N, Liphoto, L, Ncwadi, N, Gets, A and Fedorsky, C. 2006. *Burn, Gasify, Pyrolyse or Ferment: Making Sense of the Many Possibilities for Energy from Waste in South Africa*. Weltevreden Park, South Africa: Institute of Waste Management.
- Weng, Y-C and Fujiwara, T. 2011. Examining the effectiveness of municipal solid waste management systems: An integrated cost-benefit analysis perspective with a financial cost modeling in Taiwan. *Waste Management*, 31, 1393-1406.
- WRAP (Waste and Resource Action Programme). 2010. *CO2 Impacts of Transporting the UK's Recovered Paper and Plastic Bottles to China*. Banbury, UK: WRAP.

## Part 3

# INSTITUTIONAL DEVELOPMENT FOR INCLUSIVE GROWTH AND INNOVATION



# Chapter 7

## THE IMPACT OF AGGREGATE REVENUE AND EXPENDITURE ASSIGNMENTS ON ECONOMIC GROWTH: THE CASE OF PROVINCES AND MUNICIPALITIES IN SOUTH AFRICA

M. Marinkov<sup>1</sup>

### 7.1 Introduction

The overriding question of this chapter is whether or not the distribution of competencies among the different spheres of government has an impact on economic growth. Different fiscal ‘arrangements’ determine conditions for economic growth, and so their relative advantages can be assessed based on their effect on economic growth. The assignment of decision-making competencies to different levels of government can influence national economic growth by shaping regional (i.e. provincial and local) growth-promoting policies. In this regard, the traditional public finance instruments (i.e. taxes and government expenditures) can enhance or dampen regional economic growth. The chief objective of the South African assignments’ system is to reduce interregional inequalities (through the provision of public services) and improve socio-economic indicators (Yemek, 2005). This system agrees with the broad public finance principles of expenditure assignment (which level of government does what and which level of government pays for what) and revenue assignment (which level of government should levy what taxes). In other words, there is a link between the geographic dimension of benefits from a specific service and the level of government that is responsible for its provision.

The empirical literature has not yet addressed the importance of the assignment of decision-making competencies for economic growth in South Africa. Hence, this chapter aims to fill this gap by answering the following: do South African provinces and district municipalities play a useful role in promoting economic growth and, if so, in what way (i.e. through revenue assignment, expenditure assignment or both)? Revenue and expenditure assignments are important pillars of the intergovernmental fiscal relations (IGFR<sup>2</sup>) system and for fiscal decentralisation<sup>3</sup>, both of which have many dimensions. This chapter focuses on the economic growth, an objective that the South African government is (and has for some time been<sup>4</sup>) strongly pursuing. The empirical analysis uses South African provincial-level and municipal-level data and several econometric techniques. The supply measures for building a knowledge-based economy are investigated, arguing that an enabling regime can be created through an understanding of the effects of IGFR on economic growth. In particular, the development disparities of the various regions in South Africa can be reduced through the creation of a knowledge economy.

1 Financial and Fiscal Commission, Macroeconomics and Public Finance Unit

2 The specific nature of IGFR in any given country depends on how sub-national government and administration are organised (UNDP, 2005). In South Africa, three distinctive, interrelated and interdependent spheres of government (national, provincial and local) each have revenue-raising powers and concurrent and exclusive functions. Municipal and provincial revenue comprises of equitable share, conditional grants and own revenue, although the composition for the two tiers of government is markedly different. For example, most provincial revenue comes from the equitable share and conditional grants, whereas own revenue is a major component of total municipal revenue. In addition, Schedules 4 and 5 of the Constitution outline the concurrent and exclusive functions of national, provincial and local government in South Africa. Lastly, Section 230 of the Constitution allows for sub-national borrowing (i.e. municipal and provincial borrowing) but only for capital purposes.

3 Fiscal decentralisation defines how expenditures and revenues are organised between and across different levels of government.

4 In January 2010, the South African government adopted 12 outcomes that now form the foundation of its long-term development strategy (The Presidency, 2010a). These outcomes guide the planning and resource allocation process in South Africa and all have delivery agreements, in most cases involving all three spheres of government. The fourth outcome (“Decent employment through inclusive economic growth”), in particular, focuses on fundamental outputs to promote employment creation and to stimulate inclusive growth. In addition to the 12 outcomes, the South African government has adopted a New Growth Path, whose central focus is employment creation, and hence higher and inclusive economic growth (The Presidency, 2010b). Furthermore, more recently, the National Planning Commission (NPC) published a report containing their vision for 2030 (NPC, 2011). Much like the New Growth Path document, the focus is on employment creation and sustained economic growth. Hence, it is clear that provinces and municipalities have a very big role to play in job creation and redistribution.

However, for this to happen, the South African government needs to put proper planning, economic and fiscal mechanisms in place, and the role of innovation should not be underestimated. Fiscal decentralisation arguments can also be used to formulate a strong case for the role of sub-national government in the economic growth process – these are discussed in more detail in section 7.2. Section 7.3 reports the findings of empirical studies, while section 7.4 contains the empirical analysis for South Africa, and section 7.5 concludes with some policy recommendations.

## 7.2 Theoretical Underpinnings

IGFR contains five aspects (Bird and Vaillancourt, 2006):

- (a) The assignment of expenditure responsibilities to different government levels (i.e. the expenditure assignment).
- (b) The assignment of tax and revenue sources to different government levels (i.e. the revenue assignment).
- (c) Intergovernmental fiscal transfers or grants to address vertical and horizontal imbalances.
- (d) Sub-national borrowing.
- (e) Institutional framework within which the national and sub-national government powers are exercised.

Each of these aspects must be addressed within the context of South African policy objectives, which may include not only efficiency (allocation), equity (distribution) and stabilisation, but also economic growth and achieving and preserving a regional balance. This chapter considers mainly aspects (a) and (b) (and to some extent aspect (c)), about which some more detail is provided below.

Expenditure assignment requires the functions and expenditure responsibilities for each sphere of government to be clearly specified (as they deal with which level of government will do what and which level of government will pay for what) and should follow certain principles:

- Sub-national government should focus on the allocation function (delivering goods and services, and how funds should be raised), whereas national government should focus on stabilisation and income distribution policies.
- Services should be delivered at the level of government closest to the citizen, for economic efficiency.
- Expenditure and revenue assignments should be balanced.
- Finance follows function.

In general, the assignment of expenditure functions should precede revenue sources because the prior informs the latter (Yemek, 2005). Revenue assignment requires a clear description of tasks to be performed by each sphere of government, i.e. it essentially deals with the question of which level of government should levy what taxes.

The aspects (a), (b) and (c) listed at the beginning of this section constitute important ‘pillars’ of fiscal decentralisation; hence, fiscal decentralisation is intricately linked to IGFR, though the two terms are not synonymous<sup>5</sup> (UNDP, 2005). Fiscal decentralisation can be defined as the devolution of fiscal power (revenue and expenditure assignments, and borrowing) from national to sub-national governments (Davoodi and Zou, 1998)<sup>6,7</sup>. The four arguments in favour of fiscal decentralisation are (Thießen, 2003; Elhiraika, 2007):

5 For example, papers like De Mello (2000) investigate the relationship between fiscal decentralisation and IGFR and conclude that decentralisation entails greater complexity in IGFR, so that coordination failures in IGFR are likely to have a bearing on fiscal positions, both nationally and sub-nationally.

6 Yemek (2005, p 3) defines fiscal decentralisation as the percentage of total government expenditure executed by sub-national governments, considering the size and characters of transfers, or the level of tax autonomy of sub-national governments or both. He further adds that the borrowing capacity of sub-national government also needs to be taken into account.

7 There are three dimensions of decentralisation (i.e. transfer of power from the central government towards provincial- and local government): administrative, political and fiscal (Wolman in Bennet, 1990). Administrative decentralisation focuses on how responsibilities and authority for policies and decisions are shared between the different levels of government and how these are turned into allocative outcomes. Political decentralisation focuses on how the voice of citizens is integrated into policy decisions and how civil society can hold authorities and officials at different levels of government accountable.

- 'Diversification hypothesis' ('decentralisation theorem'): uniform levels of public goods and services across the jurisdictions are generally inefficient, so fiscal decentralisation may result in greater allocative efficiency. Through allocative efficiency, fiscal decentralisation can influence macroeconomic governance, promote local growth and poverty alleviation directly and through spill-overs (De Mello, 2000).
- 'Leviathan restraint hypothesis': governments may maximise revenue to the detriment of the taxpayers, and horizontal and vertical competition among the different levels of government may prevent this behaviour.
- 'Productivity enhancement hypothesis': fiscal decentralisation, through the transfer of responsibility and accountability to the sub-national governments, may provide incentives for the sub-national governments to look for innovative ways to produce and supply public goods and services. This hypothesis forms a basis for building the knowledge economy through innovation.
- Political arguments, such as lowering concentration of fiscal power and promotion of democracy. Fiscal decentralisation can promote the streamlining of public sector activities and the development of local democratic traditions.

There are a number of arguments against fiscal decentralisation (ThieBen, 2003; Elhiraika, 2007):

- Fiscal decentralisation can contribute to regional inequalities because of competition between sub-national governments and, in particular, for redistributive reasons – i.e. poor regions cannot compete for mobile factors with the richer regions, and so poor regions get progressively poorer, while the rich regions get richer.
- Fiscal decentralisation may also result in lower quality government decisions, coordination failures, and greater corruption and influence of interest groups.
- Assignment of expenditure and financing responsibilities to sub-national governments can adversely affect service delivery for a number of reasons. These include a lack of capacity at sub-national level and misalignment of responsibilities because of incomplete decentralisation or political factors. However, country experiences indicate that the effect of fiscal decentralisation on service delivery is mixed.
- Fixed costs associated with fiscal decentralisation may negatively affect low-income/smaller countries (implying that fiscal decentralisation becomes attractive at a high threshold of economic development).
- Fiscal decentralisation may hinder long-term economic growth, when the fiscal adjustments needed to eliminate structural imbalances are considered (e.g. effective and timely coordination between the different levels of government is difficult to implement).

In brief, fiscal decentralisation can in principle improve the efficiency of the public sector, increase competition among sub-national governments in delivering public services, and stimulate economic growth (Davoodi and Zou, 1998). Given that fiscal decentralisation has many dimensions, this chapter focuses on economic growth, which is critical for South Africa. Fiscal decentralisation can contribute to economic growth<sup>8</sup> through three main channels: decreasing the size of the government, improving resource allocation within the public sector, and increasing competition among sub-national government (Martinez-Vasquez and McNab, 2001; Nguyen and Anwar, 2011). These channels are embodied in the diversification and the productivity enhancement hypotheses discussed earlier.

This chapter uses an endogenous growth model, developed by Zhang and Zou (1996) and Davoodi and Zou (1998), which provides micro-economic foundations to the relationship between fiscal decentralisation (i.e. revenue and expenditure assignments) and economic growth. The purpose is to treat the different levels of government (i.e. national, provincial and municipal) as factors of production. Fiscal decentralisation can take the form of either revenue decentralisation or expenditure decentralisation, both of which contribute positively to growth: revenue decentralisation through increased revenue collection and expenditure decentralisation through effective allocation of public spending (Bodman, Heaton and Hodge, 2009; Nguyen and Anwar, 2011)<sup>9</sup>. Proxies for both revenue and expenditure decentralisation (or revenue and expenditure assignments) are used in the empirical part of this chapter.

8 Theoretical examinations of the relationship between fiscal decentralisation and economic growth started with publications such as Tiebout (1956), Musgrave (1959) and Oates (1972).

9 The issue of causality between fiscal decentralisation and economic growth also needs to be considered – Osoro (2003) quotes a number of studies that show strong support for the view that fiscal decentralisation is a function of economic growth. However, empirical evidence for reverse causality is generally contradictory and beleaguered by measurement, analytical and specification problems.

Even given the above, no formalised theory exists for a relationship between fiscal decentralisation (expenditure and/or revenue assignments) and economic growth (Oates, 1999). In fact, the empirical literature regarding this relationship indicates an ambiguous and uncertain link between fiscal decentralisation and economic growth.

### 7.3 Empirical Evidence

Although a body of literature exists on fiscal decentralisation and economic growth, there is no consensus on the direction and the strength of the link between government structure and economic growth<sup>10</sup>. This section provides a brief summary of international empirical evidence to date<sup>11</sup>.

Using data covering the period 1970–1989 for 46 developed and developing countries, Davoodi and Zou (1998) find fiscal decentralisation has a negative effect on economic growth for the developing countries (although not statistically significant) and no clear relationship for the developed countries. For a panel of developing countries, Woller and Phillips (1998), who also include South Africa in their sample of less developed countries, find similar results to Davoodi and Zou (1998) – no significant and robust relationship. More recently, Thornton and Olumuyiwa (2010), using annual data for 11 emerging market economies (including South Africa), find that sub-national governments contribute towards successful fiscal consolidations by cutting capital spending and raising their revenues. Examining the practice of fiscal decentralisation in developing countries, Smoke (2001) finds that the macroeconomic effects of fiscal decentralisation are mixed and anecdotal. Further, Smoke (2001) argues that simply decentralising is not going to lead to growth and development and failing to decentralise is not necessarily going to undermine growth and development. The challenge is to develop a structured system that provides incentives for responsible sub-national fiscal behaviour.

Zhang and Zou (1998) find that fiscal decentralisation efforts in China since 1998 have not been successful in promoting economic growth. On the other hand, Lin and Liu (2000) found the 1980s fiscal decentralisation had a positive impact on Chinese GDP growth. A more recent study by Jin and Zou (2005) uses a panel dataset for 30 provinces in China to examine the relationship between fiscal decentralisation and economic growth over two sample periods. Their results are contrary to what the theory suggests – divergence (rather than convergence) between sub-national revenue and expenditure assignments is associated with higher rates of growth in China.

Using a sample of OECD countries, Thießen (2003) finds that the relationship between economic growth and fiscal decentralisation is non-linear – i.e. the relationship is positive when fiscal decentralisation is increasing from low levels then reaches a peak and turns negative. Similar results are found for the relationship between fiscal decentralisation and investment share, as well as total factor productivity (as the main determinants of economic growth). The Thießen (2003) study's important implication is that the optimal degree of fiscal decentralisation that maximises economic growth needs to be found. Bodman and Ford (2006) also investigate the relationship between fiscal decentralisation and economic growth for a sample of OECD countries (for the period 1981–1998). They find little evidence of a direct relationship between fiscal decentralisation and output growth. However, their analysis provides evidence that a medium degree of fiscal decentralisation (using hump-shaped indicators of fiscal decentralisation<sup>12</sup>) is positively related to growth in the capital stock and the level of human capital. A more recent study of OECD countries finds a negative and significant association between fiscal decentralisation and economic growth (Rodríguez-Pose and Ezcurra, 2010).

Rodríguez-Pose and Krøijer (2009) use a dynamic panel of 16 Central and Eastern European countries for the period 1990–2004. Their findings suggest a significant negative relationship between fiscal decentralisation and economic growth. Rodríguez-Pose and Krøijer extend their analysis to the use of different time lags and show that the long-term effects vary according to the type of decentralisation: expenditure and transfers to sub-national government is negatively correlated with economic growth, whereas taxes assigned at sub-national level have positive effects on long-term economic growth.

Martínez-Vasquez and Rider (2006) argue that the effect of fiscal decentralisation on economic growth is complex. However, they find some evidence (though not conclusive) that fiscal decentralisation can contribute to macroeconomic instability and corruption. In addition, they find that for China and India, the lack of fiscal discipline and poor service delivery has the

10 Breus and Eller (2004) provide a very useful summary of the literature up to 2004.

11 It should be noted that all of the studies reviewed in this section look at both the revenue and expenditure assignments (decentralisation) and hence use proxies to capture these. The exceptions are three studies: Davoodi and Zou (1998), Rodríguez-Pose and Ezcurra (2010) and Ismail and Hamzah (2006). Thus, with the exception of these three studies and unless otherwise stated in this section, the effect of fiscal decentralisation on economic growth is measured through both sides of the budget, i.e. revenue and expenditure.

12 This formulation is based on the notion that it is not necessarily true that the more decentralised a country's fiscal system becomes, the faster its economy will grow, but rather that an optimal degree of fiscal decentralisation exists (Osoro, 2003).

potential to affect adversely the sustainability of economic growth rates. Using panel data on 61 provinces in Vietnam, Nguyen and Anwar (2011) find that the effect of expenditure decentralisation on economic growth has been negative, but the effect of revenue decentralisation on economic growth has been positive. Bodman *et al.* (2009) find that, for Australia, the impact of fiscal decentralisation is not straightforward: a weak link between fiscal decentralisation and economic growth and some support for centralisation of taxation and decentralisation of expenditure patterns.

Ismail and Hamzah (2006) investigate the effect of fiscal decentralisation in Indonesia for the period 1992–2002. They find that the expenditure indicator of fiscal decentralisation is positively related to economic growth, whereas the revenue indicator of fiscal decentralisation is negatively related to economic growth. Carrion-i-Silvestre, Espasa and Mora (2006) estimate a panel using disaggregated Spanish data and find a positive relationship between the decentralisation process undertaken in Spain and overall as well as regional Spanish growth.

Akai and Sakata (2002) use cross-sectional data for the period 1992–1996 and find that fiscal decentralisation contributes to economic growth in the United States. The paper asserts that data with minimal differences in history, culture and the stage of economic development is more suited to determining the effects of fiscal decentralisation on economic growth.

Finally, analysis for South Africa is scant and quite limited.<sup>13</sup> Yemek (2005) examines fiscal decentralisation in the South African context with a particular focus on how fiscal decentralisation affects the delivery of social services. The findings include that benefits of social expenditure are eroded by low quality of services and the link is weak between the supply of and demand for services. In other words, there is no correlation between social expenditure by the various levels of government and a decline in poverty. The paper argues that fiscal empowerment of sub-national governments is important for deepening and broadening democracy, cautioning that this proposed transfer of responsibilities to the sub-national governments could slow down service delivery unless it is accompanied by capacity-building. Elhiraika (2007) investigates the effect of fiscal decentralisation on public service delivery, using provincial-level data to estimate cross-sectional expenditure functions for education and health, with a special focus on the effect of own revenue on these two types of expenditure. The author argues for increased fiscal decentralisation in South Africa, in particular revenue autonomy of sub-national governments, which can only enhance service delivery. Lastly, Turok (2010) investigates the role that provinces play in promoting economic prosperity in South Africa, citing poor provincial capacity and coordination across government as areas for improvement.

## 7.4 Empirical Analysis for South Africa

### 7.4.1 Empirical Specification and Estimation Strategy

The analysis in this chapter is based on a simple endogenous growth model, the theoretical framework of which is outlined in Appendix 7A. The general specification used for estimation is represented as:

$$y_{it} = \alpha_{i0} + \beta FD_{it} + \sum_{j=1}^k \gamma_j CONTROL_{jit} + \varepsilon_{it} \quad (1)$$

Where  $y$  is a measure of economic growth,  $\alpha$  is a constant,  $FD$  is a measure of fiscal decentralisation (or a measure of IGFR),  $CONTROL$  denotes a series of control variables, and  $\varepsilon$  is  $IID \sim (0, \sigma^2)$ . In addition, since the chapter looks at provinces as well as municipalities, the following definitions apply for  $i$  and  $t$ :

<sup>13</sup> The authors are aware of the work carried out by Prof. Estian Calitz and Hassan Essop (both of University of Stellenbosch) on fiscal centralisation in South Africa using financial and non-financial measures. However, this work was not publicly available at the time of publication.

Table 7.1. Sample and cross-section specification used in estimation

	Provinces	District Municipalities (Category C)	Metropolitan Municipalities (Category A)
<i>i</i>	1, 2, ..., 9	1, 2, ..., 46	1, 2, ..., 8
<i>t</i>	1999–2009	2006–2009	2006–2009

Notes: The selected time period in each case was governed by data availability. Strictly speaking, only six of the eight municipalities should be included in the analysis as Buffalo City Metropolitan Municipality and Mangaung Metropolitan Municipality only became metropolitan municipalities after the 2011 local government elections (and the analysis considers data prior to 2011). However, these two municipalities are treated as metropolitan municipalities together with the existing six metropolitan municipalities. It should also be noted that Category B (local) municipalities have been excluded from this round of estimation because of the lack of data for a number of these municipalities.

Hence, the model essentially relies on regression analysis that relates income levels or growth rates to fiscal decentralisation measures (i.e. revenue and expenditure assignment). The estimation carries out panel and pooled regression analyses, as these should capture relatively well the complicated short-run and long-run interactions between the different variables.<sup>14</sup> For the purposes of robustness, alternative estimation techniques and alternative variable specifications are experimented with.

#### 7.4.2 Variables and Data

Table 7.2 summarises the variables and specifications used in literature that was surveyed in section 7.3. Breuss and Eller (2004), and more recently Esteban-Laelona, de Frutos-Madrado and de Miguel-Bilbao (2011), have more comprehensive summaries of the empirical literature on the effect of fiscal decentralisation on economic growth. As Table 7.2 shows clearly, to avoid specification problems, control variables (such as general variables contributing to economic growth and dummy variables) should be included in the estimation of Equation (1). Furthermore, proper approximation of the fiscal decentralisation variable (using expenditure and/or revenue sides of the budget) warrants some consideration. For example, Smoke (2001) warns that the fiscal decentralisation variable proxy should not abstract from the political and institutional context. Hence, not only should alternative proxies be used, but the results also need to be carefully interpreted. Similarly, Dziobek, Mangas and Kufa (2011) argue that several indicators need to be used when looking at fiscal decentralisation. Their paper specifically looks at four measures of decentralisation: revenue, expenditure, tax effort and compensation of employees. Using the International Monetary Fund's Government Finance Statistics, Dziobek *et al.* (2011) show that the South African government can be considered decentralised if looking at the compensation of employees indicator but more centralised if looking at the tax effort measure. In this chapter, estimation includes expenditure and revenue indicators as measures of fiscal decentralisation. Table 7.3 contains detail on other variables used in estimating Equation (1) as well as the expected coefficient signs. Lastly, Appendix 7B includes a discussion on necessary data transformations.

<sup>14</sup> It should be noted that in estimation, district municipalities and metropolitan municipalities are grouped together in a panel or a pooled regression set-up.



Table 7.2. Summary of the empirical analyses

Conceptual Frameworks
<ul style="list-style-type: none"> <li>• Exogenous growth models (e.g. Solow, 1956)</li> <li>• Endogenous growth models (e.g. Barro, 1990; Mankiw, Romer and Weil, 1992)</li> <li>• Other (e.g. Davoodi and Zou, 1998)</li> </ul>
Dependent Variables
<ul style="list-style-type: none"> <li>• Average growth of real GDP per capita, average gross investment share of GDP, average growth rate of real gross fixed capital formation</li> <li>• Real per capita growth rate of provincial/state income</li> <li>• Total factor productivity growth</li> <li>• Economic volatility</li> <li>• Regional industrial output</li> </ul>
Measures of Fiscal Decentralisation
<ul style="list-style-type: none"> <li>• Share of provincial expenditure (revenue) in national expenditure (revenue), or average of these two</li> <li>• Measure of self-reliance of provincial governments (e.g. own revenue as a share of total revenue)</li> <li>• Tax revenue retention rate</li> </ul>
Control Variables
<ul style="list-style-type: none"> <li>• Openness</li> <li>• Inflation rate</li> <li>• Demographic variables (population, education, etc.)</li> <li>• Unemployment, employment</li> <li>• Investment</li> </ul>
Estimation Techniques
<ul style="list-style-type: none"> <li>• Pure and pooled cross-sectional growth regressions (e.g. Thießen, 2003)</li> <li>• Panel growth regressions (e.g. Woller and Phillips, 1998)</li> </ul>
Other Empirical Considerations
<ul style="list-style-type: none"> <li>• Testing for non-linearities, threshold effects, causality issues</li> </ul>



Table 7.3. Relation of independent variables to economic growth – Equation (1)

Variable	Proxy	Source	Coefficient (Equation (1))	Hypothesis (expected sign)
Degree of fiscal decentralisation (revenue or expenditure)	Ratio of total provincial / municipal revenue (expenditure) to total revenue (expenditure) of the general government	Various Provincial Budget Statements (National Treasury); National Treasury's local government database	$\beta$	+ (through the channels discussed in Section 7.2; i.e. decreasing the size of the government, improved resource allocation, increased competition)
Growth rate in provincial/municipal labour force	Log first difference of provincial / municipal GVA	Quantec EasyData	$\gamma_1$	+ (standard Cobb-Douglas production function arguments)
Provincial/municipal investment rate	Log first difference of provincial / municipal gross fixed capital formation	Quantec EasyData	$\gamma_2$	+ (standard Cobb-Douglas production function arguments)
Provincial/ municipal inflation rate	Deflator calculated using nominal and real GVA figures for each province / municipality; inflation rate is then calculated as the log first difference of the deflator	Quantec EasyData	$\gamma_3$	Ambiguous (+ because inflation impacts positively on economic growth through capital accumulation; - because uncertainty associated with high inflation can reduce the growth rate of productivity)
Degree of distortion in the provincial/ municipal economy	Ratio of provincial / municipal revenue collection (own revenue) to total provincial / municipal revenue	Various Provincial Budget Statements (National Treasury); National Treasury's local government database	$\gamma_4$	+ (this variable measures the aggregate distortion introduced by governments to finance their spending: the higher this variable, the higher government spending – assuming productive expenditure, higher degree of distortion would be expected to impact positively on economic growth)

## 7.5 Results

Section 7.5.1 first provides a preliminary analysis of the fiscal data for South African provinces and municipalities. Regression analysis is then carried out in section 7.5.2 followed by a discussion of the results.

### 7.5.1 Descriptive Analysis

#### South African provinces

Table 7.4 summarises the descriptive statistics for provincial revenue and expenditure assignments. The mean statistic represents the average of expenditure/revenue assignment over the sample period (1999–2009), whereas the standard deviation (std. dev.) figure measures the variation of expenditure/revenue assignment over the sample period. Therefore, the higher the std. dev. figure, the more erratic the expenditure/revenue assignment for a specific province. Some trends worth noting include:

- Revenue and expenditure assignments tend to mirror each other, irrespective of the province considered (i.e. the finance follows function principle).
  - The lowest revenue and expenditure assignments are recorded for the Northern Cape, followed by the Free State and Mpumalanga, whereas the highest revenue and expenditure assignments are recorded for KwaZulu-Natal, Gauteng and the Eastern Cape.
  - There is a wide disparity across the average revenue and expenditure assignments, with the lowest figures being around 1% of general government revenue expenditure and the highest figures being around 8%.

- Most volatile expenditure assignments (i.e. expenditure assignments that vary greatly over the sample period) belong to the Eastern Cape, KwaZulu-Natal and Gauteng.
- Most volatile revenue assignments are very similar, except for the North West province, which takes the place of the Gauteng province. Northern Cape is the province with the least volatile expenditure and revenue assignments.

Table 7.4. Descriptive statistics for the expenditure and revenue assignments (provinces; percentage of general government expenditure and revenue)

Assignment →	Expenditure assignment			Revenue assignment		
Province ↓	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
EC	6.16	5.92	0.94	6.39	6.12	1.13
FS	2.64	2.76	0.31	2.82	3.06	0.47
GP	6.87	6.91	0.59	7.14	7.36	0.71
KZN	7.89	8.01	0.69	8.16	8.57	1.01
LIM	4.68	4.45	0.42	4.83	4.76	0.61
MPU	2.74	2.71	0.23	2.86	2.91	0.32
NC	0.97	0.99	0.09	1.00	1.02	0.11
NW	3.03	2.88	0.39	3.30	3.44	0.79
WC	3.96	3.75	0.37	4.16	4.10	0.61

Table 7.5 summarises the average composition of provincial revenue (over the 1999–2009 sample). For all provinces, the majority of revenue comes from unconditional grants (equitable share). The top three own-revenue collectors are the Western Cape, Gauteng and KwaZulu-Natal, and the worst collectors are Limpopo, the Eastern Cape and the Northern Cape.

Table 7.5. Average composition of provincial revenue (1999–2009; percentage of total)

Province ↓	Own revenue	Conditional grants	Unconditional grants
EC	2.41	9.35	88.24
FS	3.75	19.89	76.36
GP	5.99	19.19	74.82
KZN	3.57	10.95	85.48
LIM	2.12	9.51	88.36
MPU	2.82	9.56	87.62
NC	2.91	14.63	82.46
NW	3.24	16.66	80.11
WC	8.01	17.04	74.95

Next, the interrelationship between GVA growth and expenditure and revenue assignment variables is examined in Figure 7.1.

Figure 7.1. Scatter diagrams for economic growth and revenue/expenditure assignments: provinces

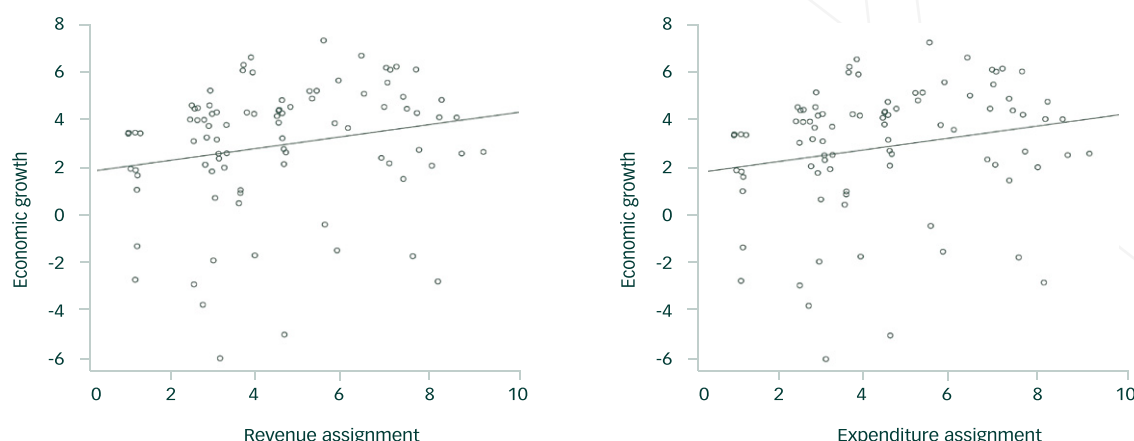


Figure 7.1 is a scatter plot of combined cross-sections (i.e. nine provinces) with a fitted regression line (upward-sloping denoting a positive relationship, whereas a downward-sloping line would represent a negative relationship between GVA growth and revenue (expenditure) assignment). What is evident from this figure is the apparently weak positive relationship between revenue (expenditure) assignment and GVA growth in provinces. By assumption, higher revenue (expenditure) assignment would lead to higher GVA growth for South African provinces on average and holding other variables constant – although this needs to be tested statistically in regression analysis.

### South African municipalities

Figure 7.2 presents the average values for district municipalities' expenditure and revenue assignments for 2006–2009. What is evident is the variation (or wide disparities) across municipalities in terms of their revenue and expenditure assignments. In addition, much like the provinces, the expenditure and revenue assignments mirror each other in most district municipalities.<sup>15</sup>

Figure 7.2. Average values for revenue and expenditure assignments (2006–2009; metropolitan and district municipalities)

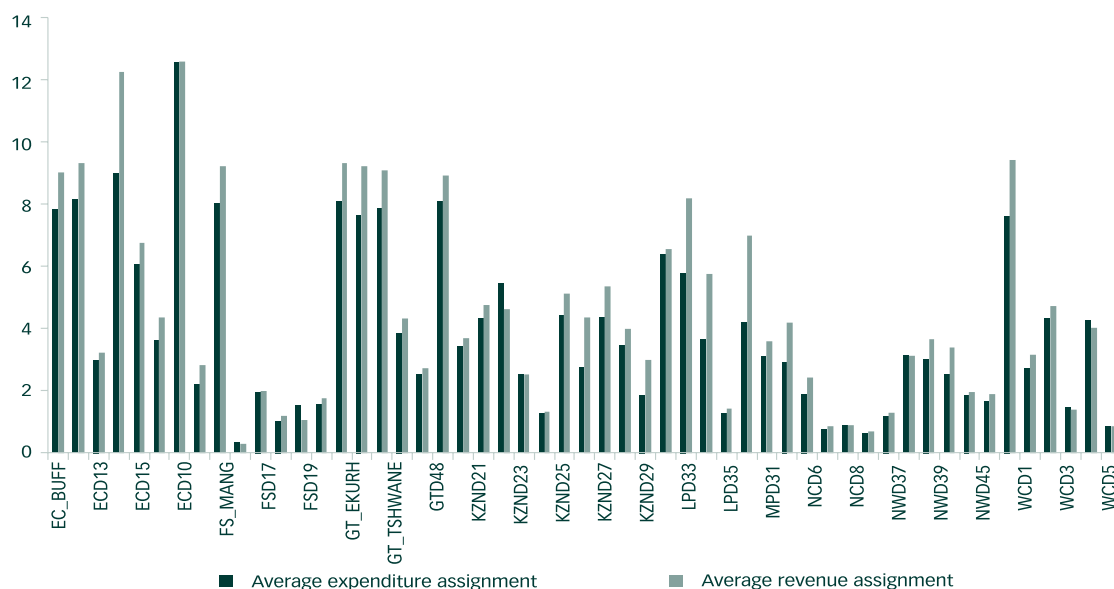
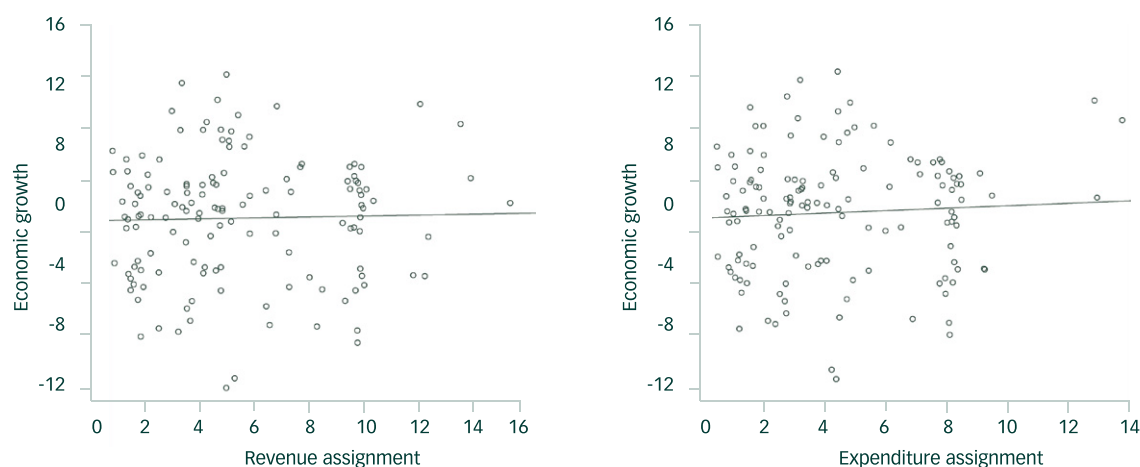


Figure 7.3 presents the scatter diagrams for municipalities (district and metropolitan) which provide an indication of the relationship between GVA growth and revenue (expenditure) assignment. The dots represent individual municipalities, and the line represents the regression line that is fitted to the stacked (collective) data of all municipalities. Both figures show clearly a weak positive relationship, indicating a lack of a relationship between GVA growth and revenue

<sup>15</sup> It should be noted that the variance (standard deviation) figures are also erratic across different municipalities. These results are not reported in this paper.

(expenditure) assignment for municipalities. Once again, before any conclusions are made, these hypotheses need to be tested statistically as part of regression analysis, which is done in the following section.

Figure 7.3. Scatter diagram of GVA growth and revenue/expenditure assignment: metropolitan and district municipalities



## 7.5.2 Regression Analysis

### South African provinces and municipalities

Please note that more detail on methodology is contained in Appendix 7B.

Table 7.6. Estimation results for provincial data

Dependent variable: real GDP growth	OLS Panel 1 (FE)	OLS Panel 2 (FE)	Dynamic Panel 1 (OD)	Dynamic Panel 2 (OD)	Dynamic Panel 1 (OD, W)	Dynamic Panel 2 (OD, W)	Pooled LS 1	Pooled LS 2	Pooled EGLS 1	Pooled EGLS 2
Lagged real GDP growth	-	-	0.195 (0.068)	0.304 (0.013)	-0.010 (0.912)	0.138 (0.358)	0.398 (0.003)	0.349 (0.000)	0.395 (0.000)	0.350 (0.000)
Growth rate in provincial labour force	0.243 (0.001)	0.204 (0.001)	0.027 (0.480)	0.033 (0.480)	0.349 (0.000)	0.295 (0.000)	0.128 (0.000)	0.146 (0.000)	0.119 (0.000)	0.139 (0.000)
Provincial investment rate	0.146 (0.000)	0.169 (0.000)	0.189 (0.000)	0.201 (0.000)	0.160 (0.000)	0.195 (0.000)	-0.103 (0.070)	-0.083 (0.171)	-0.061 (0.004)	-0.054 (0.003)
Provincial inflation rate	-0.048 (0.000)	-0.039 (0.000)	-0.062 (0.000)	-0.053 (0.000)	-0.064 (0.038)	-0.119 (0.000)	-1.020 (0.002)	-	-1.025 (0.000)	-
Degree of FD (revenue)	-1.688 (0.000)	-	-1.210 (0.000)	-	-0.930 (0.000)	-	-	-0.925 (0.029)	-	-0.895 (0.000)
Degree of FD (expenditure)	-	-1.562 (0.000)	-	-0.713 (0.000)	-	0.013 (0.968)	0.281 (0.369)	0.436 (0.172)	0.317 (0.000)	0.490 (0.000)
Degree of distortion in provincial economy	-0.311 (0.299)	0.000 (0.999)	0.652 (0.001)	1.171 (0.000)	1.206 (0.000)	1.443 (0.000)	7.034 (0.003)	5.475 (0.034)	6.661 (0.000)	4.973 (0.000)
Constant	16.001 (0.000)	12.797 (0.000)	-	-	-	-	0.475	0.439	0.977	0.951
Adjusted R2	0.582	0.518	-	-	-	-	0.398 (0.003)	0.349 (0.000)	0.395 (0.000)	0.350 (0.000)

Notes: p-values contained in parentheses. FE, OD and W, stand for fixed effects, orthogonal deviations, and white correction, respectively. LS, CS and EGLS stand for least squares, cross-section (specific coefficients) and estimated

generalised least squares, respectively. FD stands for fiscal decentralisation. The adjusted sample runs from 2000 to 2009, and the total number of cross sections is nine (i.e. nine provinces). Hence, the total balanced panel when using OLS (i.e. first two columns) has 90 observations. In the case of the last four columns, the adjusted sample runs from 2002 to 2009, resulting in a total number of 72 observations (balanced panel).

Table 7.7. Estimation results for district municipalities

Dependent Variable: real GDP growth	Pooled LS 1	Pooled LS 2	OLS Panel 1	OLS Panel 2	OLS Panel 1 (FE)	OLS Panel 2 (FE)	GLS Panel 1 (FE)	GLS Panel 2 (FE)
Growth rate in municipal labour force	0.155 (0.037)	0.144 (0.039)	-0.029 (0.277)	-0.031 (0.227)	0.394 (0.007)	0.345 (0.021)	0.487 (0.000)	0.412 (0.000)
Municipal investment rate	0.481 (0.000)	0.477 (0.000)	0.493 (0.000)	0.488 (0.000)	0.420 (0.000)	0.418 (0.000)	0.400 (0.000)	0.393 (0.000)
Municipal inflation rate	-0.336 (0.029)	-0.335 (0.025)	-0.303 (0.001)	-0.301 (0.001)	-0.236 (0.001)	-0.228 (0.001)	-0.213 (0.000)	-0.196 (0.000)
Degree of FD (revenue)	0.195 (0.000)	-	0.120 (0.191)	-	0.255 (0.383)	-	0.284 (0.000)	-
Degree of FD (expenditure)	-	0.214 (0.000)	-	0.140 (0.163)	-	-0.196 (0.612)	-	-0.122 (0.136)
Degree of distortion in municipal economy	-0.031 (0.337)	-0.031 (0.358)	-0.017 (0.417)	-0.016 (0.437)	-0.028 (0.260)	-0.023 (0.371)	-0.032 (0.000)	-0.010 (0.266)
Constant	1.279 (0.230)	1.309 (0.208)	1.803 (0.268)	1.916 (0.214)	-19.067 (0.007)	-15.041 (0.040)	-23.660 (0.000)	-18.714 (0.000)
Adjusted R2	0.607	0.624	0.582	0.604	0.825	0.823	0.987	0.987

Notes from Table 7.6 apply.

Summary of the results:

- A number of regressions have been estimated using various methods, for the sake of robustness and to control for possible endogeneity. The specification reported in Tables 7.6 and 7.7 is the benchmark specification that was derived in Appendix 7A.
- As mentioned earlier in the text, both revenue and expenditure measures are used in the analysis.
  - Revenue assignment (decentralisation) can contribute to economic growth by increasing the revenue collected, which can serve to reduce the government debt and hence its reliance on debt financing. In addition, increased government revenue reduces the incentives to increase tax rates.
  - Expenditure assignment (decentralisation) contributes to economic growth by ensuring efficient allocation of public spending.
- Results for provinces (Table 7.6):
  - The labour force participation rate and gross fixed capital formation have the expected positive signs and are robust across different specifications. Hence, provincial labour and capital contribute positively to provincial economic growth.
  - The sign on the inflation coefficient is negative, supporting the hypothesis that provincial inflation has a negative impact on provincial economic growth (uncertainty hypothesis – cf. Table 7.3).

- Irrespective of the proxy used (i.e. expenditure or revenue decentralisation), the sign on the fiscal decentralisation variable is negative. This indicates that decentralisation, or more specifically revenue and expenditure assignments at provincial level in South Africa, did not promote provincial economic growth – thus indicating an inappropriate level of decentralisation or too much decentralisation in government budgetary revenue and spending.
- The positive sign on the degree of distortion coefficient suggests that provinces are fairly good at collecting revenue from the public. It can be argued that provincial revenue collectors are able to take advantage of their superior knowledge concerning local affairs, which contributes towards a healthier fiscal position and also has a positive effect on economic growth.
- Results for district and metropolitan municipalities (Table 7.7):
  - Similar to the results for provinces, municipal labour and capital have a positive impact on municipal economic growth. The inflation variable also has a negative sign, implying that municipal inflation impacts negatively on municipal economic growth.
  - The results for the fiscal decentralisation variable are somewhat interesting, showing a positive effect on economic growth when the revenue measure is used and a negative effect on economic growth when the expenditure measure is used. An argument explaining this is that, in the early stages of economic development, the central government may be in a better position to undertake public investment with nationwide externalities. Also, it has been argued that expenditure decentralisation can contribute towards increased corruption, which can also explain the negative effect on economic growth.
  - The negative sign on the degree of distortion variable indicates that municipalities are not necessarily doing a good job at collecting revenue from the public.

## 7.6 Recommendations

With respect to alternative aggregate revenue and expenditure assignments for provinces and municipalities, it is recommended that:

- Key principles of national strategies such as the New Growth Path document and National Planning Commission's Vision for 2030 need to permeate provincial and local strategies. This can be achieved by translating these principles into complete sub-national strategies with full details on sustained implementation, followed by provincial and local governments' commitment to achieve the goals identified in the strategies.
  - Key components for sub-national government to consider are capital and labour inputs, and multifactor productivity. Provincial and municipal governments should continue to invest in physical and human capital, focusing specifically on issues such as lack of adequate skills and physical infrastructure needs (maintenance, better location, etc.). In addition, effective management and accountability mechanisms should be aimed at increasing multifactor productivity.
- The results reported in this chapter imply that economic development powers are well-placed at the provincial level, while economic growth powers could be better placed at the municipal level.
- Municipalities, and particularly non-metropolitan municipalities, should be encouraged to play a more direct role in economic growth. This can be achieved by:
  - National government assigning greater revenue and tax handles to the municipalities than is presently the case;
  - Reassessing all elements to support the growth-enhancing roles of municipalities, when reviewing the fiscal framework. These elements would include the local equitable share, local own-revenue sources (e.g. local business taxes) and conditional grants.
    - Such re-assessment should also ensure a better balance between equity and growth objectives in the local government fiscal framework.

- Municipalities are not necessarily doing a good job of collecting revenue from the public. Hence, municipalities need to improve their revenue-collection efforts, as these can contribute positively towards economic growth.<sup>16</sup>
  - It is well known that in South Africa some municipalities (for example, metropolitan municipalities) are raising substantial revenues, while other municipalities are still very dependent on transfers from national government.
  - Issues that need to be addressed include weak capacity within local administrations, small tax bases, delivery of free basic services requiring high municipal expenditures (that can only be financed through national transfers), and a lack of 'payment culture' for services.

## Appendix 7A. Theoretical Model

The theoretical model discussion in this section has been derived using Zhang and Zou (1996) and Davoodi and Zou (1998). The starting point is defining government spending per capita ( $g$ ) through the three spheres of government: national ( $f$ ), provincial ( $p$ ) and local ( $l$ ):

$$f+p+l=g \quad (i)$$

Next, define a Cobb-Douglas production function used to measure output:

$$y=k^{\alpha} f^{\beta} p^{\gamma} l^{\omega} \quad (ii)$$

where  $y$  is per capita output and  $k$  represents capital stock. The following conditions are imposed on the parameters in (2):

$$1 > \alpha > 0, 1 > \beta > 0, 1 > \gamma > 0, 1 > \omega > 0, \text{ and } \alpha + \beta + \gamma + \omega = 1.$$

The allocation of total government spending to the different spheres of government can be presented as follows:

$$f = \theta_f g, \quad p = \theta_p g, \quad l = \theta_l g$$

where  $\theta_f + \theta_p + \theta_l = 1$  and  $0 < \theta_i < 1$  for  $i = f, p$  and  $l$ . Also, total government spending  $g$  is financed a flat tax rate  $\tau_y$ .

The representative agent's preferences are given by:

$$U = \int_0^{\infty} \frac{c^{1-\sigma} - 1}{1-\sigma} e^{-\rho t} dt, \quad (iii)$$

where  $c$  is per capita private consumption and  $\rho$  is the positive time discount rate. Hence, the dynamic budget constraint of the representative agent is represented as follows:

$$\frac{dk}{dt} = (1 - \tau)y - c = (1 - \tau)k^{\alpha} f^{\beta} p^{\gamma} l^{\omega} - c \quad (iv)$$

The representative agent's choice of consumption is determined by maximising (iii) subject to (iv). Along the balanced growth path, the solution for the per capita growth rate for the economy is given by:

$$\frac{dy/dt}{y} = \frac{1}{\sigma} [(1 - \tau)\tau^{(1-\alpha)/\alpha} \alpha \theta_f^{\beta/\alpha} \theta_p^{\gamma/\alpha} \theta_l^{\omega/\alpha} - \rho] \quad (v)$$

Equation (v) shows that the long-run growth rate of the economy is a function of the tax rate and the shares of spending by the different spheres of government. Hence, equation (v) presents the basis for the empirical investigation of

16 In its 2012/13 Annual Submission, the Commission had made some recommendations aimed at improving revenue performance of municipalities in South Africa which are still relevant. These include (among others) regular updating and maintaining of data and information on indigents, outsourcing of functions, establishing municipal service districts and expanding the powers of municipalities to exercise more punitive recovery measures.



decentralisation and economic growth. The higher the budget shares (i.e.  $\theta_f$ ,  $\theta_p$  and  $\theta_l$ ), the higher the degree of fiscal decentralisation. If the existing allocation of government-spending shares is different from the growth-maximising shares, then decentralisation can lead to higher economic growth. The growth-maximising budget shares can be obtained by maximising (v) subject to  $\theta_f + \theta_p + \theta_l = 1$ , and are given as follows:

$$\theta_f^* = \frac{\beta}{\beta + \gamma + \omega}, \quad \theta_p^* = \frac{\gamma}{\beta + \gamma + \omega}, \quad \theta_l^* = \frac{\omega}{\beta + \gamma + \omega} \quad (\text{vi})$$

Thus, as long as the actual budget shares are different from growth-maximising shares, the growth rate can always be increased without altering the total budget's share in GDP.

## Appendix 7B. Data Transformations

All of the socio-economic indicators are measured in calendar year frequency. However, municipal and provincial data are collected in financial year frequencies specified as follows:

- For provinces, the financial year runs from 1 April to 31 March of the following year.<sup>17</sup>
- For municipalities, the financial year runs from 1 July to 30 June of the following year.

This has implications for estimation, as the different data sets are not strictly comparable. Thus, to obtain calendar year data for (say) 2009, a weighted average of the provincial/municipal data for the financial years 2008/09 and 2009/10 was calculated. The data was weighted in accordance with the proportion of the 2009 calendar year that fell within the two financial years, respectively (i.e.  $\frac{1}{4}$  for 2008/09 and  $\frac{3}{4}$  for 2009/10 in the instance of provincial data;  $\frac{1}{2}$  for 2008/09 and  $\frac{1}{2}$  for 2009/10 in the instance of municipal data)<sup>18</sup>.

### A small discussion on the methodology:

Panel regressions use data that has both a cross-sectional dimension (provinces or municipalities;  $i$  in Table 1) and a time series dimension ( $t$  in Table 1) – more specifically provinces and municipalities are observed over time. Panel estimation is different from a pooled estimation – the latter pools independent cross-sections across time and estimates are obtained with a simple extension of the ordinary least squares (OLS). Consider the following generic specification of a panel regression:

$$y_{it} = \beta_0 + \beta_t + \beta_1 x_{it1} + \beta_2 x_{it2} + a_i + u_{it} \quad (\text{vii})$$

The strict exogeneity assumption holds:  $\text{cov}(x_{it}, u_{is}) = 0$  for all  $t$  and  $s$ . Other variables are defined as follows:

$y_{it}$ : dependent variable

$x_{it1}, x_{it2}$ : independent variables

$a_i$ : contains the effects of time-constant independent variables – this intercept is called a fixed effect or unobserved heterogeneity.

$\beta_t$ : are the time-specific intercepts – these control for common shocks to all provinces (municipalities) at time  $t$ .

$u_{it}$ : is the idiosyncratic error.

It should be noted that if the  $\text{cov}(x_{it}, a_i)$  is not zero and the pooled OLS method is used, estimates of all parameters might be biased (heterogeneity bias). The key assumption of the random effects (RE) estimator is that  $\text{cov}(x_{it}, a_i)$  is zero. The difference between the fixed effects (FE) and the RE estimator is that in FE  $a_i$  is controlled using dummy variables, whereas in RE  $a_i$  is omitted and is part of the disturbance. RE estimator is generally more efficient (precise) if the RE

17 For provinces, fiscal data was sourced from various editions of provincial budgets, which can be found on the National Treasury's website ([www.treasury.gov.za](http://www.treasury.gov.za)). For each of the nine provinces, audited data was obtained for the period 1998/99 to 2009/10 (which was then converted to calendar year period 1999–2009 using the method explained in the section above). For municipalities, fiscal data was sourced from the local government database which can also be found on the National Treasury's website ([www.treasury.gov.za](http://www.treasury.gov.za)). For district municipalities, data was obtained for the period 2005/06 to 2009/10 (which was then converted to calendar year period 2006–2009 using the method explained above).

18 An alternative way of dealing with calendar and fiscal year data matching entails using the calendar year data for the beginning of the fiscal year. Thus, for provincial/municipal data for fiscal year 1998, calendar year data from 1997 is used. This reflects the fact that decisions about fiscal structure are set at the beginning of the fiscal year, which occurs in the previous calendar year.

assumption holds. The difference between RE and pooled OLS is that in the RE approach, the correlation over time<sup>19</sup> is eliminated using some generalised least square (GLS) method, whereas in pooled OLS, the GLS correction is not used.

## References

- Akai, N and Sakata, M. 2002. Fiscal decentralisation contributes to economic growth: evidence from state-level cross-section data for United States, *Journal of Urban Economics*, 52: 93-108.
- Barro, R. 1990. Government spending in a simple model of endogenous growth, *Journal of Political Economy*, 98: S103-S125.
- Bennet, RJ. 1990. *Decentralization: Local Governments and Markets*. London: Clarendon Press.
- Bird, RM and Vaillancourt, F (eds.). 2006. *Perspectives on Fiscal Federalism*, World Bank, Washington DC.
- Bodman, P and Ford, K. 2006. Fiscal decentralisation and economic growth on OECD. Macroeconomics Research Group at University of Queensland. Available online: [www.uq.edu.au](http://www.uq.edu.au).
- Bodman, P, Heaton, K and Hodge, A. 2009. Fiscal decentralisation and economic growth: a Bayesian model averaging approach. Macroeconomics Research Group at University of Queensland (Discussion Paper Series), paper number 26. Available online: [www.uq.edu.au](http://www.uq.edu.au).
- Breuss, F and Eller, M. 2004. Fiscal decentralisation and economic growth: is there really a link? *CESifo DICE Report, Journal of Institutional Comparisons*, 2(1): 3-9.
- Carrion-i-Silvestre, JL, Espasa, M and Mora, T. 2006. Fiscal decentralisation and economic growth in Spain, *Public Finance Review*, 36(2): 194-219.
- Davoodi, H and Zou, H. 1998. Fiscal decentralization and economic growth: a cross-country study, *Journal of Urban Economics*, 43: 244-257.
- De Mello, L Jr. 2000. Fiscal decentralization and intergovernmental fiscal relations: a cross-country analysis, *World Development*, 28(2): 365-380.
- Dziobek, C, Mangas, CG and Kufa, P. 2011. Measuring fiscal decentralisation – exploring the IMF's databases. International Monetary Fund (IMF) Working Paper Series, working paper number: WP/11/126. Available: [www.imf.org](http://www.imf.org).
- Elhiraika, AB. 2007. Fiscal decentralization and public service delivery in South Africa, African Trade Policy Centre (ATPC), Work in Progress, no. 58.
- Esteban-Laelona, S, de Frutos-Madrado, P and de Miguel-Bilbao, M. 2011. A review of the empirical literature about the relationship between fiscal decentralisation and economic growth, *Economía, Sociedad y Territorio*, 11(36): 349-381.
- Ismail, AGB and Hamzah, MZ. 2006. Fiscal decentralization and economic growth nexus: evidence from province-level cross-section data for Indonesia, *Review of Islamic Economics*, 10(2): 133-149.
- Jin, J and Zou, H. 2005. Fiscal decentralisation, revenue and expenditure assignments, and growth in China, *Journal of Asian Economics*, 16: 1047-1064.
- Lin, JY and Liu, Z. 2000. Fiscal decentralization and economic growth in China, *Economic Development and Cultural Change*, 49: 1-21.
- Mankiw, N.G., Romer, D. and Weil, D.N. 1992. A contribution to the empirics of economic growth, *The Quarterly Journal of Economics*, 107(2): 407-437.
- Martinez-Vasquez, J and McNab, RM. 2001. Fiscal decentralization and economic growth, Georgia State University International Studies Program, Working Paper 01-1.
- Martinez-Vasquez, J and Rider, M. 2006. Fiscal decentralization and economic growth: a comparative study of China and India, *Indian Journal of Economics and Business*, Special Issue China and India: 29-46.
- Musgrave, RA. 1959. *The Theory of Public Finance*. New York: McGraw-Hill.

19 Since  $a_i$  is in the error term, observations over time are correlated for the same individual  $i$ .

- NPC (National Planning Commission). 2011. *National Development Plan: Vision for 2030*. Available online: [www.npconline.co.za](http://www.npconline.co.za).
- Nguyen, LP and Anwar, S. 2011. Fiscal decentralization and economic growth in Vietnam, *Journal of Asia Pacific Economy*, 16(1): 3-14.
- Osoro, NE. 2003. *Institutions, Decentralisation and Growth*. Economic Commission for Africa.
- Oates, WE. 1972. *Fiscal Federalism*. New York: Harcourt, Brace, Jovanovich.
- Oates, WE. 1999. An essay on fiscal federalism, *Journal of Economic Literature*, Vol. XXXVII: 1120-1149.
- Rodriguez-Pose, A and Krøijer, A. 2009. Fiscal decentralisation and economic growth in Central and Eastern Europe, London School of Economics *Europe in Question* Discussion Paper Series.
- Rodriguez-Pose, A and Ezcurra, R. 2010. Is fiscal decentralisation harmful for economic growth? Evidence for OECD countries, *Journal of Economic Geography*, 10(5): 619-644.
- Smoke, P. 2001. Fiscal decentralization in developing countries: a review of current concepts and practice, *Democracy, Governance and Human Rights*, Programme Paper Number 2, United Nations Research Institute for Development.
- Solow, R.M. 1956. A contribution to the theory of economic growth, *The Quarterly Journal of Economics*, 70(1): 65-94.
- Thießen, U. 2003. Fiscal decentralisation and economic growth in high-income OECD countries, *Fiscal Studies*, 24(3): 237-274.
- Tiebout, CM. 1956. A pure theory of local expenditures, in W.E. Oates (ed.) 1998. *The Economics of Fiscal Federalism and Local Finance*, Cheltenham and Northampton.
- The Presidency. 2010a. *Delivery Agreement for Outcome 4: Decent Employment Through Inclusive Growth*. Available online: [www.gov.za](http://www.gov.za).
- The Presidency. 2010b. *The New Growth Path: The Framework*. Available online: [www.gov.za](http://www.gov.za).
- Thornton, J and Olumuyiwa, SA. 2010. Fiscal decentralisation and fiscal consolidations in emerging market economies, *Applied Economics Letters*, 17: 1043-1047.
- Turok, I. 2010. Towards a developmental state? Provincial economic policy in South Africa, *Development Southern Africa*, 27(4): 497-515.
- UNDP (United Nations Development Programme). 2005. *UNDP Primer: Fiscal Decentralisation and Poverty Reduction*. Available online: [http://asia-pacific.undp.org/practices/governance/documents/Primer\\_FDPR-200511.pdf](http://asia-pacific.undp.org/practices/governance/documents/Primer_FDPR-200511.pdf).
- Woller, GM and Phillips, K. 1998. Fiscal decentralization and LDC economic growth: an empirical investigation, *Journal of Development Studies*, 34(4): 139-148.
- Yemek, E. 2005. Understanding fiscal decentralisation in South Africa, Institute for Democratic Alternative for South Africa (IDASA) *Occasional Paper Series*. Available: [www.idasa.org.za](http://www.idasa.org.za).
- Zhang, T and Zou, H. 1996. Fiscal decentralization, public spending, and economic growth in China, *Journal of Public Economics*, 67(2): 221-240.

# Chapter 8

## ALTERNATIVE SERVICE DELIVERY ARRANGEMENTS: THE CASE OF MUNICIPAL AGENCIES

Sasha Peters

### 8.1 Introduction

In the last thirty years, the public sector's traditional role has shifted, away from financing, owning and managing projects to parcelling out of aspects of delivery through the use of alternative service delivery (ASD) arrangements. ASD arrangements vary from public-private partnerships (PPPs) to the use of agencies and are not new to South Africa. The most recent agency, the Municipal Infrastructure Support Agency (MISA), a national agency operating in the local sphere, was established in 2011 (MISA, 2011). Unlike government departments that have a portfolio of activities and responsibilities, a defining characteristic of an agency is its narrower, specialised purpose. In theory, this characteristic, coupled with significant operating independence, allows agencies to bypass many of the challenges that their bureaucratic counterparts experience, thus providing the potential for innovation.

#### 8.1.1 Problem Statement and Objectives of the Research

Agencies are established to assist government in improving service delivery and facilitating economic and social development. The rationale is that the organisational form of agencies allows them to innovate and improve performance. In South Africa, the majority of municipal agencies are active in development/planning activities related to local economic development (LED), the provision of water and social housing. However, the country cannot claim success simply because agencies (rather than government departments) are active in these sectors, for gaps in access to water and social housing persist and LED remains elusive in a number of municipalities.

This begs the question whether government is using agencies for the right activities, leveraging the potential benefits they can offer, or are other, intervening reasons inhibiting their success. The objectives of the research are:

- To assess whether agencies are appropriately used in municipalities
- To propose a diagnostic tool that policy-makers can use when deciding on the appropriate mode of delivering services at the local government level.

#### 8.1.2 Rationale of Study and Relationship to Research Strategy

Millions of tax-payers' rands are regularly allocated to government initiatives to improve service delivery performance. In 2007, it was estimated that 33% of the population (or 15 million people) do not have access to proper sanitation, 8% (or 3.5 million people) do not have access to safe, potable water, and 8% (or 3.5 million people) do not have access to electricity, (StatsSA, 2007). However, the traditional service delivery approach has limitations, and (if used properly) ASD arrangements present an opportunity to innovate and improve service delivery. In addition to using creative delivery mechanisms responsibly, explicit accountability measures need to be put in place to avoid fruitless expenditure and other types of mismanagement.

This research project is located under the theme of "Accountable Institutions" in the Financial and Fiscal Commission's (the Commission) Five-Year Research Strategy (FFC, 2008). This refers to accountability in service delivery, policy-making and planning, aspects that come into play when considering the use of ASD arrangements. The theme of the Commission's Submission for the Division of Revenue 2013/14, is "Moving People out of Poverty: Supporting Innovation

in Intergovernmental Financing". The study fits well into this theme, as ASD mechanisms, such as agencies, represent a shift away from bureaucratic, traditional models of service delivery and have the potential to aid innovation in public service delivery.

The chapter is divided into six sections. Section 8.2 sets out the methodology, which is followed by the literature review and theoretical underpinning of the study in section 8.3. Section 8.4 provides the South African context, outlining the sectors where municipal agencies are found and the regulatory environment guiding their use. Section 8.5 zones in on important areas of discussion regarding agencies in the South African local government sphere while Section 8.6 highlights key principles that should be considered when establishing an agency. Section 8.7 concludes and proposes recommendations.

## 8.2 Methodology

One of the objectives researched is to develop a diagnostic tool, or set of principles, that policy-makers can use when deciding on the appropriate mode of delivering basic services at the local government level. The idea is to get government spheres to ask the right questions and consider the right aspects prior to embarking on reforms. This is intended to assist in making the approach to reforming delivery mechanisms more systematic and thereby improve performance.

After establishing a thorough understanding of best practice methods based on international and national literature about ASD arrangements and agencies, the considerations pertinent to the South African context will be teased out.

The development of this diagnostic tool will be further strengthened by drawing on lessons learned from previous reform exercises, interviews with selected agencies and by assessing the performance of municipal agencies/entities to date. In this regard, key data sources will include StatsSA's Non-Financial Census, 2009/10, which provides information on municipalities that have commercialised or outsourced services, the number of consumer units that have access to basic services and audit outcomes published by the Auditor-General (StatsSA, 2011).

This methodological approach will allow for the development of a diagnostic tool, which is not only based on international best practice but also complemented by country-specific evidence of the agency experience in South Africa.

## 8.3 Literature Review

Alternative ways of structuring service delivery, which include but are not limited to outright marketisation, have gained prominence, as policy-makers realise the constraints of traditional bureaucratic government structures. This phenomenon of 'unbundling bureaucracy' is commonly referred to as ASD arrangements (Wilkins, 2003). Ford and Zussman (1997, p 6) provide a formal definition of ASD arrangements as, "a creative and dynamic process of public sector restructuring that improves the delivery of services to clients by sharing governance functions with individuals, community groups and other government entities". ASD arrangements can range from very basic reorganisation to more extreme options such as privatisation (Wilkins, 2003).

The wide array of structural arrangements associated with ASD arrangements can be clustered into four main categories (Good and Carin, 2003):

- Mainstream government (ministries, departments)
- Agencies (statutory and non-statutory)
- Partnerships (other organs of state, contracts)
- Private entities (not-for-profit, for-profit).

The focus of this research is statutory agencies. According to Schick (2002), agencies are diverse in nature: some are departments with operational freedom; some are free-standing, with no formal link to departments, while others are newly created entities, established to assist government with new responsibilities. Irrespective of the precise form of

an agency, the golden thread that distinguishes them from traditional government departments is that they are not “conglomerations of multiple activities. The typical agency has a single or relatively narrow purpose, and each has substantial operating independence, even if it is still housed within a department” (Schick, 2002, p 8). Internationally, the appetite for establishing agencies peaked during the 1980s and 1990s.<sup>1</sup> Where governments are concerned with maintaining policy coherence, agencies usually form part of ministries/departments. Alternatively, the emphasis is on administrative independence, agencies are established as free-standing entities, usually with management boards (Schick, 2002).

According to Laking (2005), agencies work well and even facilitate improvements in public performance within developed countries. The evidence is less conclusive with respect to developing countries or those in transition. In more developed countries, agencies are classified into three main types: departmental agencies (form part of ministries, staff are employed within the parameters of general public service rules and funding is through the state/national budget); public law administrations (partially or fully separate, personnel guidelines are subjected to the general framework for public servants); and private law bodies (quasi-corporations, staff are employed under general labour laws and budgets are separate to those of ministries). In developing and transition economies, examples of agencies include (Laking, 2005, p 12):

- Parastatals, which refer to government trading enterprises that will potentially be corporatised or privatised. They are generally run along corporate governance rules.
- Non-profit or non-governmental agencies, which are usually involved in public works.
- Social funds or organisations that focus on funding a wide range of projects aimed at poverty alleviation (also referred to as social investment funds).
- Extra-budgetary fund administrations, for example pension funds, health insurance funds, agricultural subsidy funds.
- Independent revenue authorities, which refer to agencies charged with tax collection and administration within general tax policy.

Laking (2005) highlights the risks of shifting to agencies. The risks occur when the foundational issues in setting up an agency are not thoroughly thought through and clarified. The first risk is setting up an agency without a clear public policy justification, or whether the reason driving the establishment of an agency is compatible with the principles of good governance. The second concerns the lack of rules and systems in place to ensure external direction and control of new organisations. To avoid this risk, governance rules guiding the operation of an agency should be clear upfront, and political control must be maintained to ensure that the agency stays compliant with the original reason for its establishment. A contingency plan needs to be in place for when agency performance goes awry. The failure to adequately supervise/oversee performance of agencies is not unique to developing countries. Government/parent ministries should strive for a good balance between providing support and micro-managing. The final risk for governments is to guard against creating an agency that is not capable of managing itself. Agencies are usually established to improve performance. Underlying this improved performance is that management is provided with autonomy, i.e. the discretion to allocate resources to achieve objectives. An agency that lacks quality management and requires micro-management from the parent ministry is effectively futile.

In 1988, Britain’s efforts at agency-building, known as the Next Steps Initiative, gained momentum. The Next Steps Initiative process of establishing agencies can be considered a good model for implementing the agency model (Schick, 2002). The process is based on eight steps, detailed in Table 8.1.

1 It should however be noted that agencies date as far back as the 16th and 17th centuries (Laking, 2005, p9).



Table 8.1. Phases in the Next Steps Initiative

Stage	Description
Candidate stage	The stage during which an activity is designated as a candidate to become an agency. The stage usually lasts for 3–9 months, during which time the appropriateness of the agency form is assessed
Prior options	A formal review, where the agency's mission and alternative ways of carrying out the mission are considered
Ministry-agency relationships	The relationship with the parent ministry is clarified, including decisions on aspects where the agency will be authorised to govern itself
Framework document	This document formally sets out the agency's objectives, operating conditions, responsibilities of the chief executive, relationship with the parent department and information related to financial and human resource arrangements
Chief executive	Filling of this critical position is based on the principle of open competition. The contract for the position is based on a specified working conditions and performance expectations
Performance targets	These targets are published annually and allow agencies to know exactly what their performance will be assessed against
Annual reports	These reports must contain information/comparisons of actual relative to targeted performance
Periodic reviews	Every five years, a review is carried out, to evaluate performance and to determine whether operating-type changes are necessary

Source: Schick, 2002, p16-17.

As the various stages in the Next Steps Initiative imply, what happens prior to the launching of an agency (the foundational phase) is critical in determining future performance.

Based on international literature, an overview of the key considerations that need to be factored in when governments decide to use agencies is given below<sup>2</sup>.

The decision to use ASD arrangements can be assessed through various lenses. While this paper draws heavily from transaction cost theory and broader new institutional economics, equally valuable advice is offered by the public values and rights approach (which argues that over and above efficiency and equity concerns, aspects such as equality, accountability and efficacy should also be factored into the decision on whether or not to use ASD arrangements).

Transaction costs exist for both in-house and outsourced service delivery. Transaction costs refer to the management costs involved in delivering a service that arise because of "limited information, uncertainty about the future, and the prospect that people or organisations behave opportunistically in their interactions with others" (Brown and Potoski, 2005). In deciding whether or not to outsource, governments need to find a balance regarding the transaction costs associated with in-house versus outsourced service delivery. Transaction cost theory, which centres on inter-firm contractual hazards, provides a useful lens for analysing contracting problems, such as the make-or-buy challenge confronting governments (Williamson, 1998). Service-specific characteristics, which affect the efficacy of contracting, are identified (Brown and Potoski, 2005), allowing government officials to devise safeguards to prevent *ex ante* and/or *ex post* contracting hazards. Some of the key hazards associated with contracting out include wastage, fraud and poor

<sup>2</sup> These considerations are not unique to agencies but are similar for the various types of alternative service delivery mechanisms.



service delivery. Three key service-specific characteristics that affect the efficacy of contracting relate to the ease of measurement, asset specificity and the frequency with which contracts recur (Brown and Potoski, 2001, p 2):

- Ease of measurement, or metering, refers to the ease with which service delivery can be monitored or anticipated outcomes measured. Where service delivery outcomes are difficult to monitor, transaction cost theory advises against outsourcing and vice versa.
- Asset specificity refers to the extent to which specialised investment is required to perform a function or deliver a service. Examples of specialised investment include using highly specialised human skills that cannot be used for other purposes, using specialised tools or a complex system designed for a single purpose. High asset specificity brings the risk of monopolistic bargaining, as the winner of the first contract has an advantage in subsequent rounds of contracting. In such cases, governments may opt for internal service provision.
- Frequency of contracting, can give rise to monopolistic situations, which is particularly likely for long-term contracts.

Table 8.2 categorises municipalities according to asset specificity and meterability.

Table 8.2. Examples of municipal services according to asset specificity and metering

	LOW ASSET SPECIFICITY	HIGH ASSET SPECIFICITY
<b>EASY METERING</b>	<p><i>Meterable Market Services</i></p> <ul style="list-style-type: none"> <li>• Residential/commercial solid waste</li> <li>• Traffic signs</li> <li>• Utility meter reading/billing</li> <li>• Street repair</li> </ul>	<p><i>Meterable Monopoly Services</i></p> <ul style="list-style-type: none"> <li>• Operation of bus service</li> <li>• Operation of airports</li> <li>• Tax collection</li> <li>• Electricity/water distribution</li> </ul>
<b>DIFFICULT METERING</b>	<p><i>Non-Meterable Market Services</i></p> <ul style="list-style-type: none"> <li>• Child welfare</li> <li>• Public health programmes</li> <li>• Ambulance services</li> <li>• Animal control</li> </ul>	<p><i>Non-Meterable Monopoly Services</i></p> <ul style="list-style-type: none"> <li>• Crime prevention</li> <li>• Traffic control</li> <li>• Prisons and jails</li> <li>• Fire prevention</li> </ul>

Source: Brown and Potoski, 2001.

The aspects described above give rise to transaction costs that, “make specifying, monitoring and enforcing contracts difficult and lead to incomplete contracts” (Brown and Potoski, 2001, p2). So, while ASD arrangements are popular because of their potential to facilitate greater efficiency, definite risks and costs are attached to their use.

In addition to the characteristics of the service in question, the organisational form (i.e. public, private or non-profit organisations) affects the suitability of the service provider. This argument is based on incentives power and authority types, and the belief that different organisational forms are subject to different incentives and authority types (Barbieri and Salvatore, 2010).

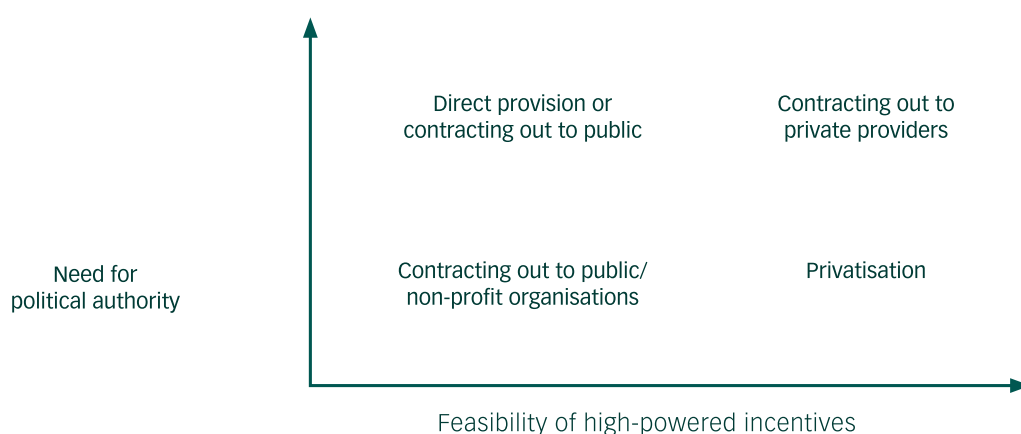
High-powered incentives revolve around “transactions in which efficiency gains flow directly to the individuals transacting and are typically offered by governance structures similar to ‘pure’ market” (Barbieri and Salvatore, 2010, p 352). In contrast, low-powered incentives are those provided by transactions “in which individuals involved are not able to personally lay claim to the gains from trade, except perhaps in terms of a pay rise or a promotion. A governance structure that typically provides low-powered incentives is the ‘pure’ hierarchy” (Barbieri and Salvatore, 2010, p 352).

Measurability is the key to deciding between the feasibility of low- versus high-powered incentives.

The rule of thumb for the incentive dimension of services is that low-powered incentives are preferable when a service provider's performance is hard to assess, or when a service provider is required to fulfil numerous objectives (for example equity and efficiency) and at least one of these objectives is difficult to measure. Within this framework, private organisations provide higher incentives than public and non-profit organisations. Public and non-profit organisations have a non-distribution constraint, which means that profits earned are not distributed to those individuals exercising control. Thus, there is no incentive to increase revenues or reduce costs. Of the two organisational types that have a non-distribution constraint, government or public institutions are in a better position to ensure that self-interested actions are minimal. For example, establish legal requirements for public organisations to return all unspent financial resources to national treasuries. In contrast, "private firms' shareholders have an incentive to devise high-powered compensation schemes, if feasible, because giving employees a part of the increased revenues or reduced costs may improve their overall residual profits" (Barbieri and Salvatore, 2010, p355).

Underlying the authority dimension of services is the question of scope and what governments should or should not be involved in. For example, the delivery of public goods is usually the domain of governments. According to Barbieri and Salvatore (2010), two aspects need to be considered when thinking about the authority dimension of services. The one relates to excludability: the more difficult or costly it is to exclude consumption or externalities, the more political authority is required. The second aspect is an ethical one and relates to instances where people, due to poverty, are unable to access certain services (for example health care); in this case delivery of the service requires more political authority and should not be contracted out. Figure 8.1 graphically depicts the above discussion.

Figure 8.1. Incentive power, authority type and service delivery choice



Source: Barbieri and Salvatore, 2010, p 358.

Institutional dynamics, specifically organisational capacity, are critical when considering the use of ASD arrangements. Financial resources, availability of adequately skilled and sufficient human capital and the existence of unions should be prioritised. Unions often present a political hindrance to shifts away from traditional service delivery forms because of the belief that such a shift will result (in the short term) in possible lay-offs and (in the longer term) fewer government employment opportunities (Brown and Potoski, [Sa]). Thus, tensions may arise when governments embrace the use of ASD arrangements such as agencies, which imply a more New Public Management (NPM) type approach underlined by a less active, leaner government bureaucracy focused on maximising efficiency and using the economic market as a model for political and administrative relationships. This is in opposition to the more developmental-type state preferred by unions.

The rise in the use of ASD arrangements, particularly agencies, has hollowed out, or eroded, the state, and this trend promotes institutional fragmentation, such that "service delivery will depend increasingly on linking sets of organisations" (Rhodes, 1994, p 146). Delivery will entail a plethora of organisations, which cut across the public, private and voluntary sector, cooperating. Such extreme organisational interdependence makes the provision of strategic direction difficult (Rhodes, 1994). Finally, drawing on the public values/rights approach, where public services/tasks are allocated to actors other than government, substantive (fundamental rights of citizens) and procedural (due process) public values need to be promoted and safeguarded (Auby, 2009).

The literature highlights that government and policy-makers need to factor in a variety of aspects when deciding how to arrange the delivery of a service. These aspects are diverse and are drawn from different theoretical perspectives in order to avoid a narrow focus. The nature of the service plays a role in determining the best delivery option and so does the type of organisation (public, private, non-government) tasked with delivery. Governments are increasingly driven by efficiency concerns, but institutional dynamics (such as existing capacity and the existence and strength of unions) need to be balanced against the need to improve performance. Finally, from human rights perspective, maintaining general public values and constitutional obligations to citizens cannot be ignored or dismissed.

## 8.4 South African Context

In South Africa, roles and responsibilities are allocated to different spheres of government under Sections 4 and 5 of the Constitution (South Africa, 1996). Section F of the 1998 White Paper on Local Government emphasises the need for creative service delivery arrangements to enhance service provision, especially given the backlogs created during the apartheid era (South Africa, 1998). Options listed for municipalities to consider include corporatisation, public-private partnerships, partnerships with community-based or non-government organisations (CBOs or NGOs), contracting out and privatisation. The White Paper stresses that, when selecting a delivery option, the key consideration should be achieving government policy objectives.

Chapter 8 of the *Municipal Systems Act* (South Africa, 2000) is dedicated to the provision of municipal services, including mechanisms for delivery. Section 76 of the Act defines internal and external delivery mechanisms. Internal mechanisms are defined as delivery by: a department or administrative unit, a business unit established by the municipality or any other component of the administration. External mechanisms include municipal entities, another municipality, an organ of state, CBOs or NGOs. Section 78 lists aspects that municipalities need to consider when deciding how services will be delivered. These include the costs and benefits of the delivery option, the municipality's existing and future capacity and skills, the impact on job creation and development within the municipality, and the views of organised labour.

Chapter 10 of the *Municipal Finance Management Act* (MFMA) speaks to the establishment and financial governance of municipal entities and PPPs (South Africa, 2004). Similar to the *Municipal Systems Act*, the MFMA explicitly emphasises that municipalities need to be aware of the impact on the municipality's staff and assets of shifting a function to an entity. When motivating for ASD arrangements, other principles to consider are affordability and value for money.

These local government policies and legislation entrench alternatives to traditional, government-led service delivery. These guiding documents do not simply mention the use of alternatives to traditional service delivery, but motivate for government and municipalities to make use of creative means to enhance the delivery of public services. However, policy and legislation are also emphatically clear on the processes to be followed and the aspects to be considered prior to adopting ASD arrangements. The question is whether policy and legislation stimulate practically the use of creative delivery arrangements and, equally important, if pre-establishment guidelines are being well adhered to; or whether it is a case compliance for the sake of compliance. Certain regulatory requirements may stifle the use of ASD arrangements. For example, Section 33 of the MFMA requires additional approvals to be obtained if a contract runs in excess of three years. These additions range from ensuring some form of public participation to obtaining views/recommendations from provincial and national treasuries, the national department responsible for local government and the relevant sector department (thus, the Department of Water Affairs if the ASD arrangement concerns water). This lengthy process can prolong the contracting stage and jeopardise service delivery.

As at 2009/10, the Auditor-General's report listed a total of 54 government agencies (Auditor-General, 2011). Most municipal agencies focus on promoting social and economic development, in particular local economic development, tourism, access to social housing and the provision of water, sewerage and solid waste management. Municipal agencies in South Africa take various forms, including (Auditor-General, 2011):

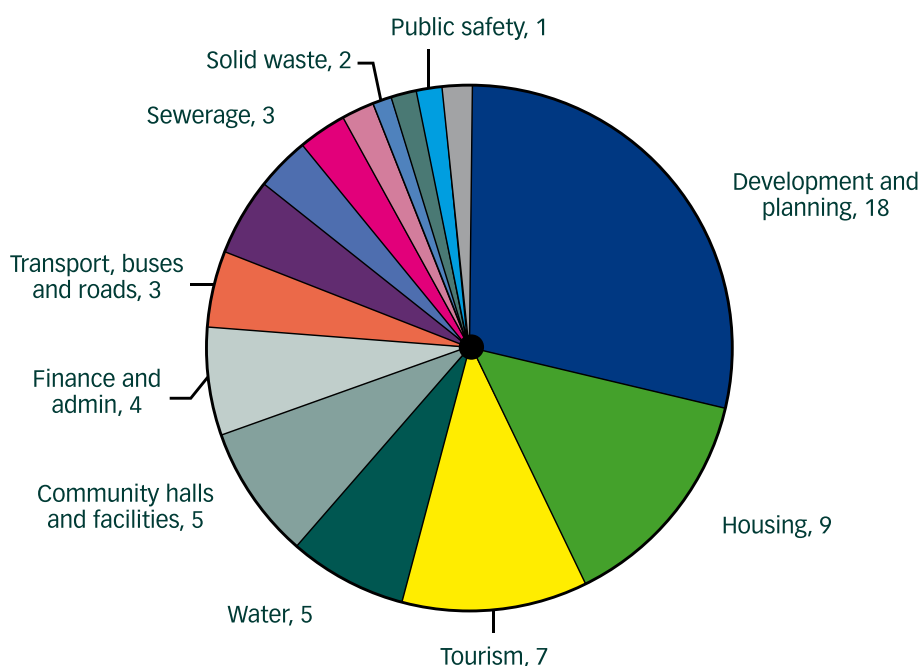
- Section 21 companies, for example, Blue Crane Development Agency in the Eastern Cape, Johannesburg Tourism Company in Gauteng or Hibiscus Coast Development Agency in KwaZulu-Natal.
- Private companies, such as Amathole Economic Development Agency in the Eastern Cape, City Power, Johannesburg Development Agency in Gauteng and Overstrand Local Economic Development Agency in the Western Cape.

- Trusts, for example the Rustenburg Water Services Trust in the North West Province or Khayelitsha Community Trust in the Western Cape.
- Service utilities, such as Johannesburg Social Housing Company or Pikitup both in Gauteng. Some service utilities are multijurisdictional in nature, for example, the Kouga Development Agency in the Eastern Cape.

Within local government, social funds (organisations that focus on aspects related to poverty alleviation) are particularly prevalent. Within national government, priority is attached to extra-budgetary fund administrations, such as the proposed National Health Insurance (NHI) and the South African Social Security Agency (SASSA).

Figure 8.2 illustrates the sectors where municipal agencies are used.

Figure 8.2. Number of municipal agencies per sector (30 June 2010)

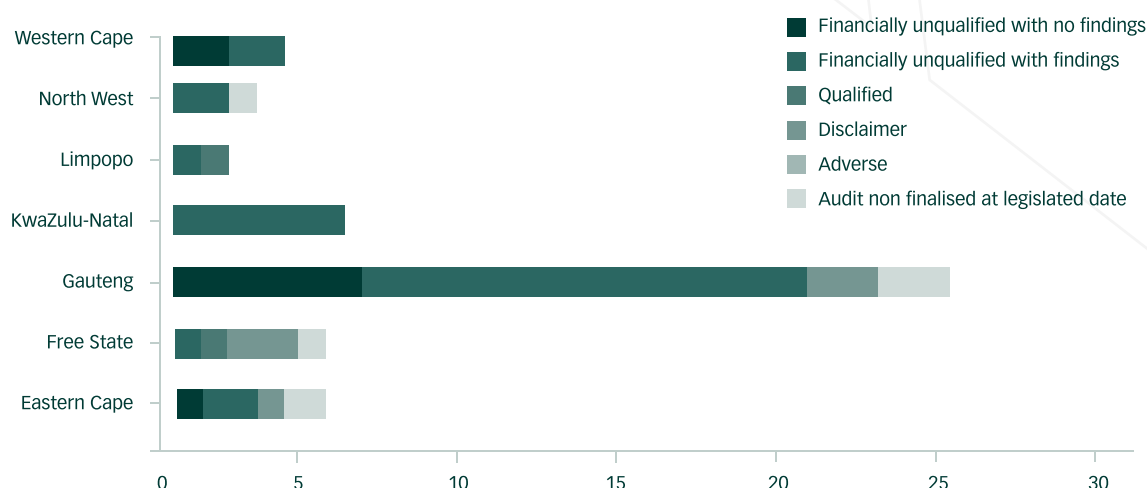


Source: National Treasury, 2010.

As is evident from Figure 8.2, most municipal agencies are involved in development and planning, an area where objectives are numerous and not easily measurable. As such, this function is appropriate to lie within government and with a government agency, based on the theory regarding whether services are good candidates for internal/government or external/private delivery. Good candidates for outsourcing to a private company are solid waste and certain financial and administration related functions (of which billing is part) because asset specificity is low and measurability is high. In such an instance, the innovative approach of the private sector reaps benefits. Poverty and ethical concerns and constitutional obligations around access to basic services, make water service particularly appropriate to be kept within the public sector/municipal agency domain.

Numerous municipal agencies have been established, and their performance outcomes, specifically audit opinions, are mixed. Figure 8.3 summarises the audit outcomes of these agencies from 2009/10. Gauteng has the largest number of agencies, while municipalities in the Northern Cape and Mpumalanga have no agencies. Over half of the agencies received financially unqualified audits with findings.

Figure 8.3. Number of municipal agencies per province with particular audit outcomes, 2009/10



Source: Auditor-General, 2011

The Auditor-General's report also cautioned against municipal agencies that rely heavily on grant funding and have weak own-revenue generating abilities. Specific highlights from the report include:

- R155 million categorised as unauthorised expenditure (mainly as a result of over-expenditure)
- R113 million attributed to irregular expenditure, which was related to irregular supply chain management practices
- R21 million, which was the result of fruitless and wasteful expenditure.

Despite enjoying significant operational autonomy, these agencies seem to produce similar audit outcomes to their bureaucratic counterparts. The concern is the apparent lack of success in engendering a culture of performance within municipal agencies, which raises the question of whether the agencies are able to manage themselves and be sustainable.

In accordance with Sections 74 and 178 of the MFMA, municipalities report to the National Treasury on any entities under their control. National Treasury provides an overview of the performance, and the Auditor-General provides information on the audit outcomes of municipal agencies. However, access to annual reports of agencies is not as easy to find. Most lesser-known municipal agencies do not have websites, while those that do have websites do not feature their annual reports. This implies that very little information is available in the public domain (visible reporting), which can be seen as a contravention of Section 127(5)(a)(i) of the MFMA that requires a municipal entity to make public its annual report immediately after being tabled in council (South Africa, 2004). The 2010 Afrec study on municipal entities raised the lack of a central portal of (financial and performance-related) information on municipal agencies (Afrec, 2010). Table 8.3 lists some of the agencies that either do not have websites or have websites but do not provide access to annual reports.

## 8.5 Discussion

The following areas are key considerations related to municipal agencies in South Africa.

### 8.5.1 New Public Management vs. the Developmental State

The use of ASD mechanisms, such as agencies, falls within the rubric of New Public Management, where the focus is on a less active, leaner government bureaucracy that maximises efficiency and uses the economic market as a model for political and administrative relationships. Contrary to this school of thought are proponents of the developmental state who advocate for a more interventionist approach. The state is seen as critical in effecting redistribution and plays a significantly more participative/active role. Within South Africa, unions resist strongly any type of reform that may result in the loss of jobs. The South Africa Government is a large employer, employing just over one million people, or 9.7% of total employment in 1999. As at March 2010, the number of public servants rose to 1.272 million or 10% of total employment (SAIRR, 2010, p 206). Labour usually treats ASD arrangements with caution, viewing them as a step closer to full privatisation, a shift away from traditional service delivery that threatens job security and conditions of service.

Given the power of labour unions in South Africa, this is a politically sensitive issue that government needs to manage. Furthermore, from a public rights perspective, the South African Constitution guarantees the progressive realisation of certain basic services. As a result, government needs to walk a fine line between achieving efficiency and the need for equity, accountability and protecting the broader values of the public service.

Table 8.3. Agencies without websites or not listing annual reports

Province	Municipality	Entity
<b>No website as at February 2012</b>		
Eastern Cape	Maletswai	Mthombo Sediba Development Agency
Free State	Maluti-A-Phofung	Maluti-A-Phofung Water (Pty) Ltd
Gauteng	Ekurhuleni	Lethabong Housing Institute
Gauteng	City of Tshwane	Civirelo Water
KwaZulu-Natal	Hibiscus Coast	Hibiscus Coast Development Agency
Limpopo	Polokwane	Polokwane Housing Association
Western Cape	Knysna	Knysna Economic Development Agency
Western Cape	Overstrand	Overstrand Local Economic Development Agency
<b>Website is available but no annual reports listed</b>		
Eastern Cape	Buffalo City	Buffalo City Development Agency
	Blue Crane	Blue Crane Development Agency
Free State	Mangaung	Centlec (Pty) Ltd
Gauteng	City of Joburg	Joburg Property Company
		Johannesburg Tourism Company
KwaZulu-Natal	Ekurhuleni	Ekurhuleni Development Company (Pty) Ltd
	Ilembe	Ilembe Management Development Enterprise (Pty) Ltd

### 8.5.2 ASD Arrangements Do Not Erase the Need for Adequately Skilled Human Capital

Government needs to be clear about its role in the public sector: will it directly deliver public services, or facilitate and oversee delivery by an external party, or use a combination of these strategies. Whichever course is chosen, adequate capacity will remain a challenge. Government would be remiss to view the use of ASD arrangements as a means of bypassing the need for skilled public servants. Where service delivery is outsourced, the ability of the public sector to oversee, monitor and evaluate the work of its agencies is critical to ensure the sound management of agencies and outsourced public service delivery. Government should avoid establishing a new agency and transferring the same inadequate skills from the parent department to staff at the new agency, which is almost certainly a recipe for continued poor performance.

### 8.5.3 Performance of the Parent Department/Municipality

In the 2009/10 audit, 53 municipalities received disclaimers and seven received adverse audit outcomes. In addition, 43 municipalities showed no result as the audit was not finalised by the legislated date. Poor performance is widespread across South African municipalities. The health of agencies is intricately linked to the performance of the parent department (Schick, 2002; Upton, 2001), and for municipal agencies, the parent department is the municipality. If the parent department has “not paid for their independence in ... the hard currency of performance through the prior imposition of proper accountability machinery, then all manner of things can go unchecked” (Upton, 2001). A municipality



that is barely capable of managing itself is likely to be incapable of effectively managing others. The question that arises is whether the activities/outcomes delivered by agencies are adequately monitored to ensure alignments with municipal/developmental objectives.

#### 8.5.4 Regulatory Environment to Facilitate Use of ASD Arrangements

South African legislation and policy are vocal about the use of ASD arrangements and provide reasonable instruction on the steps that should be followed when deciding to shift away from traditional bureaucratic-based service delivery. The legislation calls for affordability assessments, cost-benefit analyses and to ensure that the shift to an ASD arrangement is well thought out and based on likely sound benefits to the public and value for tax-payers money. While fulfilling these regulatory requirements cost significant time and financial resources, this cost needs to be incurred prior to setting up the preferred service delivery arrangement. Following these various affordability, cost-benefit assessments, municipalities should ideally be able to easily set up ASD arrangements and appropriate mechanisms to ensure effective oversight, monitoring and evaluation of agency operation. However, certain legislative requirements introduce prohibitive costs. For example, Section 33 of the MFMA prescribes additional onerous requirements (including soliciting views/recommendations from provincial/national treasuries) on a municipality where a contract is in excess of three years. Where a municipality has done the 'ground work', proving the benefits of moving towards an ASD arrangement, certain concessions should be allowed in terms of the period for which the municipality is allowed to contract for. External parties may be hesitant to make significant investment in a venture where a contract risks not being renewed after three years.

#### 8.5.5 Scope for Corruption

When implemented for the right type of service, ASD arrangements are likely to enhance performance. However, the use of these arrangements, including agencies, may not solve public sector corruption. Compared to business as a form of organisation, governments are unlikely to be effective in fighting corruption for various reasons, including (Banfield, 1975):

- Government's objectives are numerous, vague, often ambitious and sometimes contradictory. An objective may be as vague as 'improving the quality of life'. Such vagueness provides room for subjective decision making and makes monitoring such decisions difficult.
- Good and services delivered by governments are often not based on market prices and are regulated to ensure access. This process of regulation may often provide scope for breaking the law and/or bribery.

Municipalities need to ensure legislation related to reporting is strictly enforced, particularly the need for municipal agencies to make their annual reports public and easily accessible. A lack of transparency in this regard can foster an environment conducive to corrupt activity.

#### 8.5.6 National Agencies Operating in the Local Sphere

In addition to agencies operating within municipalities, national agencies also operate in the local government sphere. Examples of these are the Development Bank of Southern Africa (DBSA) and the newly established Municipal Infrastructure Support Agency (MISA). The operations of the DBSA and the anticipated activities of MISA focus on local capacity-building. These types of national agencies need to take care to avoid scope creep, that is becoming involved in much broader activities than originally envisioned.

Different spheres that focus on the same issue provide an opportunity for inter-agency collaboration. By sharing critical information and resources, such collaboration provides space for solving public problems in creative ways and enables governments to increase responsiveness to diverse circumstances and changing conditions (Page, 2004). Pooling expertise has an added benefit of increased value for money. However, effective collaboration requires the parties involved being clear about what they are accountable for, and guidelines/regulations should serve to facilitate such partnerships.



### 8.5.7 ASD Arrangements Are Reactive rather than Proactive

In many cases, agency establishment in South Africa is driven by poor or variable performance by government departments, or existing agencies (as in the case of MISA). A more proactive approach to improving performance can be taken by applying the theoretical underpinnings of when to use an agency or even outsource. For this to work requires addressing the territoriality of government officials. One example is billing: most municipalities (whether well-resourced or not) experience serious problems with billing, which is an activity that has low asset specificity and high measurability. Yet very few municipalities relinquish control of this function, and the result is worsening municipal consumer debt. Municipal billing is an area where definite gains can be achieved by using an ASD arrangement.

## 8.6 Towards a Set of Principles

The following guidelines are proposed for evaluating whether to establish an agency:

- The service in question is eligible for delivery by an entity other than government. As the literature highlights, key aspects are asset specificity and measurability.
- The establishment and use of agencies should be based on sound public policy reasoning and not on political interference or desire to garner political support.
- An agency's mandate should be precise and specialised, which will ensure agency activities are not duplicated by other organs and (importantly) better monitoring and oversight by parent departments/organs of state.
- The establishment of an agency should depend on the ability of a parent department/municipality to manage its own operations well, in order to ensure sound oversight and that social objectives are maintained at the core of public service delivery.

## 8.7 Recommendations

With respect to alternative service delivery arrangements (with a focus on municipal agencies), the Commission recommends that:

- Government's approach to regulating agency formulation should balance maximising the potential benefits of utilising an alternative service delivery (ASD) arrangement with minimising the attendant risks. In the quest to improve performance and efficiency, ASD arrangements may (in appropriate circumstances) provide a creative way for municipalities to deliver services, particularly against the backdrop of limited financial and human capital resources. Therefore, the regulatory framework for municipal entities should ensure that:
- The use of an ASD arrangement is contingent on a demonstrably sound business case for its establishment and sustainable operation;
- Unnecessary, costly and time-consuming regulations are avoided. To this end, government should review existing legislation, specifically Section 77 and Section 78 of the *Municipal Systems Act* and Section 33 of the MFMA, which places onerous demands on municipalities wanting to use an ASD arrangement.
- Establishment of municipal agencies, or any ASD arrangement, should be linked to the parent municipality having an adequate level of performance and effective oversight ability. Determining whether performance is adequate or not should be linked to the audit outcomes of the parent municipality. Government should discourage the creation of agencies where the parent municipality is manifestly weak; for example, if the municipality is found to have a severely qualified, adverse or disclaimed audit result.
- Legislation that requires municipal entities to make public details of their performance and plans (as required in terms of Section 127(5)(a)(i) of the MFMA) should be strictly enforced, and non-compliance reported to the Auditor-General. This is necessary not only for compliance but also for greater transparency of agency performance, thereby enabling better monitoring and oversight by parent municipalities and treasuries.

- Government should establish a central portal of financial and performance-related information on municipal agencies. Such a facility could also serve as a peer-learning mechanism through which success stories are shared. Municipalities and agencies could also use the information to benchmark their performance, while greater public availability of this information will improve oversight and transparency. National government should take a more proactive approach, perhaps through the National Treasury's PPP Unit, to advising municipalities, especially lesser resourced ones, on the applicability of using an ASD arrangements in different instances.
- Government (particularly the National Treasury's PPP Unit) should put together a list of criteria to assist municipalities in deciding whether a sound business case for the creation of entities exists. The criteria should:
  - Establish whether benefits exceed potential costs;
  - Ensure potential risks are mitigated;
  - Focus on aspects such as measurability and asset specificity of the service in question.

## Annexure 8A. Municipal Agencies 2009/10

The table below outlines municipal agencies listed in the 2009/10 audit report published by the Auditor-General, including whether the entity has a website and whether annual reports are reflected on the website.

*Appears in both the Auditor-General's Audit report for 2009/10 and the National Treasury Entities Report as at 30 June 2010*

Province	Municipality	Municipal Agency	Website	Regular Annual Reports Available
Eastern Cape	Amathole	Amathole Economic Development Agency (ASPIRE)	Yes	Yes
	Blue Crande Route	Blue Crane Route Development Agency	Yes	No (2007/08)
	Buffalo City	Buffalo City Development Agency	Yes	No
	Kouga	Kouga Development Agency	Yes	No (2007/08)
	Nelson Mandela Bay	Mandela Bay Development Agency	Yes	No
	Maletswai	Mthombo Sediba Development Agency	No	No
	O.R. Tambo	Ntinga O.R. Tambo Development Agency	Yes	No
Free State	Mangaung	Centlec (Pty) Ltd	Yes	No
	Lejweleputswa	Lejwe Le Putswa Development Agency (Pty) Ltd	No	No
	Maluti-A-Phofung	Maluti-A-Phofung Water (Pty) Ltd	No	No
	Metsimaholo	Metsimaholo Mayoral Trust	No	No

Province	Municipality	Municipal Agency	Website	Regular Annual Reports Available
Gauteng	City of Johannesburg	City Power	Yes	Yes
		Joburg Property Company	Yes	No
		Johannesburg City Parks	Yes	No
		Johannesburg Civic Theatre	Yes	Yes
		Johannesburg Development Agency	Yes	Yes
		Johannesburg Fresh Produce Market	Yes	No
		Johannesburg Metropolitan Bus Services	No	No
		Johannesburg Roads Agency	Yes	Yes
		Johannesburg Social Housing Company	Yes	Yes
		Johannesburg Tourism Company	Yes	No
		Johannesburg Water	Yes	No (2008/09)
		Johannesburg Zoo	No	No
		Pikitup Johannesburg	Yes	No
		Roodepoort Civic Theatre	No	No
		Metropolitan Trading Company	No	No
	City of Tshwane	Sandspruit Works	No	No
		Civirelo Water	No	No
		Housing Company Tshwane	Yes	No
	Ekurhuleni	Pharoe Park Housing Company (Pty) Ltd	No	No
		East Rand Water Care Company (Erwat)	Yes	Yes
		Brakpan Bus Company	No	No
		Germiston Phase 2 Housing Company (Pty) Ltd	No	No
		Ekurhuleni Development Company (Pty) Ltd	Yes	No
		Lethabong Housing Institute	No	No
KwaZulu-Natal	eThekweni	Durban Marine Theme Park (Pty) Ltd	Yes	No
		ICC, Durban (Pty) Ltd	Yes	Yes
	Hibiscus Coast	Hibiscus Coast Development Agency	No	No
	iLembe	Ilembe Management Development Enterprise (Pty) Ltd	Yes	No
	Ugu	Ugu South Coast Tourism	Yes	No
	Umkhanyakude	Umkhosinga Development Agency	Yes	No
Limpopo	Newcastle	Uthukela Water (Pty) Ltd	Yes	No
	Polokwane	Polokwane Housing Association	No	No
	Musina	Zelpy 1903 (Pty) Ltd Trading as Letsema	No	No
	Moses Kotane	Moses Kotane Development Agency	No	No
Western Cape	Rustenburg	Rustenburg Water Services Trust	No	No
	City of Cape Town	Cape Town International Convention Centre	Yes	No
		Khayalitsha Community Trust	Yes	Yes
	Overstrand	Overstrand Local Economic Development Agency	No	No

*Appears on the list of municipal entities audited by the Auditor General as part of the audit for 2009/10 but not on the National Treasury entities report as at 30 June 2010*

Free State	Fezile Dabi	Fezile Dabi District Municipality Trust	No	No
		Krynaauwlust Farming Trust (Pty) Ltd	No	No
North West	Dr. Kenneth Kaunda	Dr KKDM Economic Agency (Pty) Ltd	No	No
Western Cape	Knysna	Knysna Economic Development Agency	No	No

*Appears in the National Treasury entities report as at 30 June 2010 but not on the list of municipal entities audited by the Auditor General as part of the audit for 2009/10*

Eastern Cape	Inxuba Yethemba	Mmotlie Investments	No	No
	Kouga	Kouga Cultural Centre	No	No
	Nkonkobe	Nkonkobe Economic Development Agency	No	No
	Port St. Johns	Port St. Johns Development Agency	No	No
Gauteng	City of Tshwane	Temba Roodeplaat Water Service Trust	No	No
		Tshwane Centre for Business Information and Support	No	No
KwaZulu-Natal	Msunduzi	Safe City	Yes	No
	uThungulu	uThungulu Financing Partnership	No	No
Mpumalanga	Govan Mbeki	Govan Mbeki Housing Company	Yes	No
	Mbombela	Mbombela Development Trust	No	No
	Umjindi	Umjindi Local Economic Development Agency	No	No
	Nkangala	Munsoft Section 21 Company	Yes	No
Northern Cape	Kamiesberg	Namaqualand South Development Association	No	No
Western Cape	George	George Housing Association	No	No

## References

- Afrec. 2010. *Effectiveness and Efficiency of Municipal Entities as Service Delivery Mechanisms*.
- Auby, JB. 2009. Contracting Out and Public Values: A Theoretical and Comparative Approach. Workshop on Comparative Administrative Law, Yale Law School: May 7<sup>th</sup>–9<sup>th</sup> 2009. Available online: [http://www.law.yale.edu/documents/pdf/CompAdminLaw/Jean-Bernard\\_Auby\\_CompAdLaw.pdf](http://www.law.yale.edu/documents/pdf/CompAdminLaw/Jean-Bernard_Auby_CompAdLaw.pdf)
- Auditor-General. 2011. *General Report on the Local Government Audit Outcomes for 2009/10*. Available online: <http://www.agsa.co.za/audit-reports/MFMA.aspx>.
- Banfield, E.C. 1975. Corruption as a Feature of Governmental Organization. *Journal of Law and Economics*. 18(3): 587-605.
- Barbieri, D and Salvatore, D. 2010. Incentive Power and Authority Types: Towards a Model of Public Service Delivery. *International Review of Administrative Sciences*. 76(2):347-365.
- Brown, T and Potoski, M. 2005. Contracting for Management: Assessing Management Capacity Under Alternative Service Delivery Arrangements. *Journal of Policy Analysis and Management*. 25(2): 323-346.
- Brown, TL and Potoski, M. 2001. The Influence of Costs on Municipal and County Government Choices about Alternative Modes of Service Provision. Paper for Presentation at the 6<sup>th</sup> National Public Management Research Conference, Indiana University. [Online].
- FFC (Financial and Fiscal Commission). 2008. *Five Year Research Strategy 2009/2014*. Available online: <http://www.ffc.co.za>.
- Ford, R and Zussman, D. 1997. *Alternative Service Delivery: Sharing Governance in Canada*. Institute for Public Administration of Canada and KPMG Centre for Government Foundation.
- Good, DA and Carin, B. 2003. *Alternative Service Delivery*. Available online: [www.aucc.ca/\\_pdf/english/programs/cepra/ASDPaper.pdf](http://www.aucc.ca/_pdf/english/programs/cepra/ASDPaper.pdf)

- Laking, R. 2005. Agencies: Their Benefits and Risks. *OECD Journal on Budgeting*. 4(4)
- MISA (Municipal Infrastructure Support Agency). 2011. *SPV/MISA Institutional Framework for Municipal Infrastructure Capacity Support*.
- National Treasury. 2010. *Updated Municipal Entities Report*. Available online: [www.treasury.gov.za](http://www.treasury.gov.za)
- Page, S. 2004. Measuring Accountability for Results in Interagency Collaboratives. *Public Administration Review*. 64(5): 591-606
- Rhodes, R.A.W. 1994. *The Hollowing Out of the State: The Changing Nature of the Public Service in Britain*. The Political Quarterly Publishing Company Limited.
- South Africa. 1996. *Constitution of the Republic of South Africa (Act 108 of 1996)*. Pretoria: Government Printer.
- South Africa. 1998. *White Paper on Local Government*. Pretoria: Government Printer.
- South Africa. 2000. *Local Government: Municipal Systems Act, 2000*. Pretoria: Government Printer.
- South Africa. 2004. *Local Government: Municipal Finance Management Act, 2004*. Pretoria: Government Printer.
- Schick, A. 2002. Agencies in Search of Principles. *OECD Journal on Budgeting*. 2(1).
- SAIRR (South African Institute for Race Relations). 2010. *South Africa Survey, 2009/2010*. Johannesburg, SAIRR.
- StatsSA (Statistics South Africa). 2007. *Community Survey*. Available online: [www.statssa.org.za](http://www.statssa.org.za).
- StatsSA. 2011. *Non-Financial Census*. Available online: [www.statssa.org.za](http://www.statssa.org.za).
- Upton, S. 2001. Politicians and the Genesis of Public Agencies: A Response to a Paper by Professor Allan Schick. *Conference on the Governance of Public Agencies and Authorities*, 22-23 November 2001, Bratislava.
- Wilkins, JK. 2003. Conceptual and Practical Considerations in Alternative Service Delivery. *International Review of Administrative Sciences*. 69: 173-189.
- Williamson, O.E. 1998. Transaction Cost Economics: How it Works; Where it is Headed. *De Economist*. 146(1): 23-58.

# Chapter 9

## UNDERSTANDING THE DYNAMICS OF THE CAPACITY CHALLENGE AT LOCAL GOVERNMENT LEVEL

Sasha Peters<sup>1</sup> and Henlo van Nieuwenhuyzen<sup>2</sup>

### 9.1 Introduction

The South African government has budgeted significant amounts of money for capacity building in South Africa. Yet very little research exists on whether such budgets and expenditure have translated into increased capacity and performance, specifically at the local government level. The lack of a formal evaluation component in governmental capacity-building initiatives makes assessing their level of success difficult. Government departments have different and ad hoc approaches to capacity building, which exacerbates the local government capacity challenge.

The lack of a common definition of capacity building, its outcomes and its impact has led to an uncoordinated, directionless approach to capacity building in local government. This is illustrated by some departments focusing almost exclusively on the formal approach to capacity building, emphasising accredited training aligned to unit standards, which has had an impact on the type of capacity building favoured by local government. In this context, accredited training refers to a learning programme that has been certified by the South African Qualifications Authority (SAQA) against the National Qualification Framework (NQF) registered unit standards or qualifications (SAQA, 2001). Other initiatives have focused on providing technical advisory support in local government over a specific period of time. This has involved the deployment of technical advisors with particular technical skill sets in municipalities, as mentors or as facilitators of internship programmes. The apparent lack of capacity within local government has led to a number of interventions by a range of stakeholders. However, these interventions have treated only the symptoms and not the real cause of this shortcoming (FFC, 2009), while all manner of performance failures are often disguised under the label 'lack of capacity'.

Therefore, researching and evaluating the ability of capacity-building initiatives to achieve results is essential to provide input into governmental policy and decision-making processes and to ensure that interventions are relevant and efficient. For this research, an evaluation is a process of focusing on the relevant questions, collecting the appropriate data and information, and then analysing and interpreting the information. This study will not only help the Financial and Fiscal Commission (the Commission) to fulfil its constitutional mandate, but also provide other capacity-building stakeholders with invaluable insight into how to address the skills and capacity gaps in local government.

#### 9.1.2 Research Objectives

Four objectives guide this research:

- To quantify the amount of public funds dedicated to local government capacity building from 2000 onwards.
- To contribute to an improved understanding of what constitutes a lack of capacity at the local level.
- To assess whether the various spheres of government are playing their requisite roles in capacity building at local government level, as envisaged by the legislative framework.
- To assess critically government's approach to capacity building in light of Outcome 9, the delivery agreement for local government and, if necessary, to recommend alternative/complementary intergovernmental measures for building capacity.

Different departments and stakeholders subscribe to different approaches to capacity building, and so determining whether a common definition of capacity building exists is important. Also important is to establish what would

<sup>1</sup> Financial and Fiscal Commission, Cape Town, South Africa.

<sup>2</sup> Phetho Consulting, Cape Town, South Africa

constitute a lack of capacity at local government level. Furthermore, with the sustained emphasis on enhancing local government's capacity, it is important to determine the amount of funds that has been dedicated to local government and its capacity-building efforts and whether it has contributed to municipal performance.

Section 154(1) of the Constitution clearly requires both national and provincial government to support efforts that strengthen municipal performance (South Africa, 1996). The State of Local Government report (DCoG, 2009) demonstrates the failure of national and provincial government in this regard. The report finds that in municipalities where provincial government had to formally intervene in terms of Section 139 of the Constitution, few post-intervention measures for improvement were institutionalised, which resulted in continued performance challenges.

The stark differences between South Africa's 278 municipalities necessitate different approaches to capacity building, to reflect these varied capacities and contexts. For example, strengthening administrative and financial capacity might require changes to current organisational forms, such as reassigning particular functions and scarce skills to district municipalities (The Presidency, 2010). This would entail municipalities adopting organisational structures representative of the particular responsibilities and capacities of the municipality itself, rather than adopting a generic form, which is quite often the practice.

### 9.1.3 Research Challenges

The research presents a number of challenges and highlights some shortcomings. The lack of a formal evaluation of governmental capacity-building initiatives makes assessing their level of success difficult. A lack of baseline data at municipal level also makes it difficult to monitor and evaluate whether the capacity-building initiatives are achieving their intended outputs, outcomes and impact. Furthermore, high levels of mobility among municipal officials make it difficult to monitor the impact of capacity-building initiatives. Despite an increase in the availability of financial resources for capacity building, municipalities face challenges in accessing these services. These may include time, geographical location, information, grant restrictions, content relevancy and consultants or trainers who are unfamiliar with the local government sector. Capacity building needs to differ from municipality to municipality. It is an ongoing and incremental process, which requires a sustained, flexible and holistic approach to ensure success over time.

### 9.1.4 Relationship to the Research Strategy and Past Commission Work

The research project is located under the theme of "Accountable Institutions" within the Commission's *Five Year Research Strategy* (FFC, 2008). Legislation prescribes roles and responsibilities for all three spheres of government to ensure a viable and sustainable local government sphere and an adequately skilled public service. The Commission's theme for its *Submission for the Division of Revenue 2013/14* is "Moving People Out of Poverty: Supporting Innovation in Intergovernmental Financing". The project fits squarely within the human resources for advanced knowledge production category, one of the supply-side measures necessary to facilitate a shift towards a more innovation- and knowledge-based economy.<sup>3</sup> Within this context, local government capacity is critical for managing a changing environment, promoting inclusive growth (through local economic development) and providing support services.

This project delves deeper and extends the work done as part of the *Submission for the Division of Revenue 2010/11*, which included recommendations on capacity.

## 9.2 Methodology

A dual approach of collecting and analysing both primary and secondary data and research was followed because of the nature of this study and the costly process of data collection. The study investigated whether the capacity-building efforts translated into short-term performance behaviour changes at municipalities, and whether they had a longer-term impact on municipal performance. The study analysed the capacity-building efforts, expenditure and the audit outcomes of municipalities in South Africa. Primary and secondary data and research were collected and analysed. Primary data was collected through semi-structured interviews and questionnaires, while secondary research examined, among others, consolidated reports from National Treasury, the DCoG, the Auditor-General, the Commission and the Demarcation Board. Questionnaires on municipal capacity building were also submitted to municipalities in the

3 Other supply-side measures include (1) innovation, research and development financing and economic development; (2) economic networks; and (3) enabling policy and economic regime.



three provinces of the Eastern Cape, Free State and Western Cape, to provide a picture of how some municipalities are experiencing the challenges of capacity building.

In an increasingly knowledge-based economy, investment in local-government capacity is central to municipal performance. With the establishment of the Municipal Infrastructure Support Agency (MISA), it is important to learn from the last ten years, to ensure an approach to capacity building that considers the diverse and practical needs of an accountable, local government. Key methodological phases are described below.

### 9.2.1 Questionnaire Design and Interviewing

Although pertinent information is captured within various governmental reports, guidelines and regulations, interviews were conducted with specific key stakeholders to gain an understanding of their definition and approach to capacity building for local government. The questionnaire focused on issues relating (but not limited) to:

- Value for money in capacity building
- Trends of under-spending in capacity building
- Defining the capacity challenge and possible solutions
- Whether national and provincial capacity-building interventions deliver results
- The degree of municipal commitment to its own capacity building
- The success (or not) of the *Guidelines for Minimum Competency Levels* (National Treasury, 2007)
- The ability of municipalities to attract and retain capacity and skills
- Strategies for using existing capacity more efficiently
- Whether capacity-building interventions have led to sustained improvements in municipal performance.

The sampling method was non-random, and so the findings cannot be generalised statistically beyond the sample. Owing to cost and time considerations, the study was limited to municipalities within the Western Cape, Free State and Eastern Cape provinces. All municipalities in the selected provinces were targeted.

Provincial and national departments that have a direct impact on municipalities (as identified in Outcome 9) and other organised interests in the local government sector were identified and interviewed using semi-structured questionnaires.

#### **Electronic questionnaires**

Electronic questionnaires were e-mailed to all municipalities in the provinces of the Western Cape (30), Free State (25) and Eastern Cape (45), and to other departments and entities. The sample choice was influenced by cost, time and the Commission's prior research projects in particular provinces. It had been hoped that this would facilitate greater participation levels. The questionnaires were formulated in a user-friendly manner. Follow-up e-mails and offers of assistance were e-mailed to the municipalities, departments and entities in order to increase the chances of questionnaires being completed and sent back.

In addition to the municipalities, the questionnaires were also sent to the:

1. National Treasury
2. DCoG
3. Office of the Premier of the Western Cape
4. Western Cape Department of Local Government

5. Western Cape Provincial Treasury
6. Office of the Premier of the Free State
7. Free State DCoG
8. Free State Provincial Treasury
9. Office of the Premier of the Eastern Cape
10. Eastern Cape Department of Local Government and Housing
11. Eastern Cape Provincial Treasury
12. Development Bank of Southern Africa (DBSA)
13. South African Local Government Association (SALGA)
14. Institute of Municipal Finance Officers
15. Institute of Municipal Administration for Southern Africa
16. Local Government Sector Education Training Authority
17. MISA
18. Municipal Demarcation Board (MDB)
19. Auditor-General of South Africa

Table 9.1 reflects a municipal response rate of 26% for the electronic questionnaires.

Table 9.1. Municipal response rate for electronic questionnaires

Province	Total	Submitted	Did not Submit	Submission Rate
Eastern Cape	45	5	40	11%
Western Cape	30	12	18	40%
Fre State	25	9	16	36%
Totals	100	26	74	26%

### **Personal interviews**

Despite numerous attempts, most municipal officials were unavailable for personal interviews, and only one personal interview was held with a municipality. However, follow-up telephonic interviews were conducted on specific questions and issues, to gain a better understanding of municipal challenges in capacity building.

### **9.2.2 Analysis of Research Data**

The desktop research analysed secondary research sources to identify discernable trends in capacity building in local government. In particular, documentation from National Treasury, (consolidated municipal reports and consolidated budget expenditure reports), the Auditor-General (audit reports), DCoG (State of Local Government Report, Turnaround Strategy Reports) and other stakeholders were used to provide insight into capacity expenditure and municipal performance. Municipal expenditure on capacity building was tracked over the period 2000–2010. The study also endeavoured to analyse vacancy rates over a similar period of time.

Data from secondary and primary sources were analysed to identify any emerging trends in capacity building in local government.

## 9.3 Literature Review

### 9.3.1 Defining Capacity

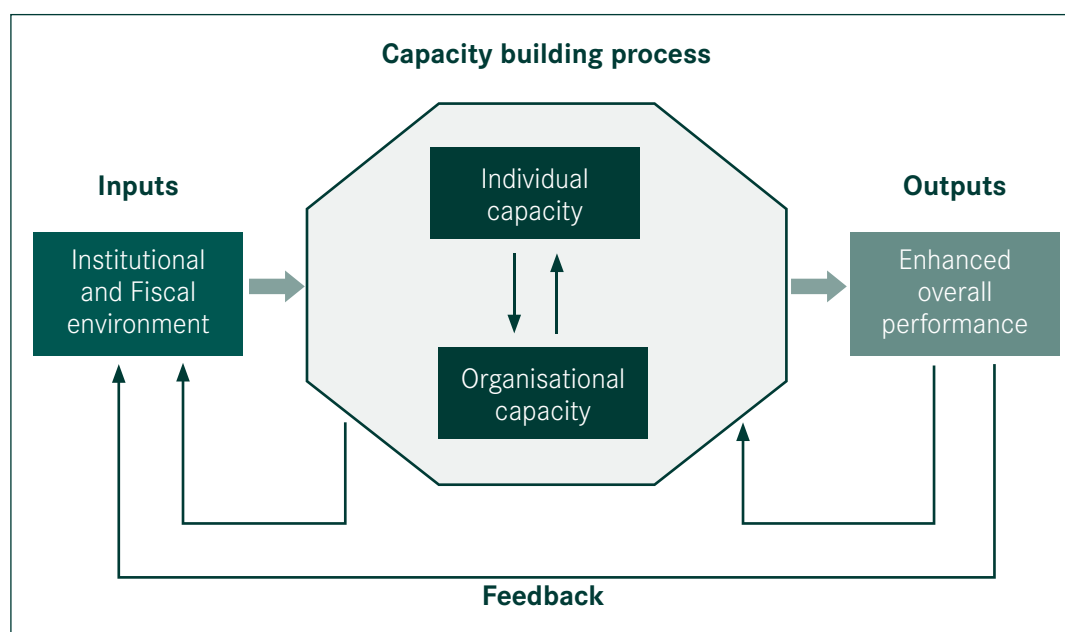
The concept of capacity is described by Morgan (2006) thus:

We see the concept and practice of capacity development as a part, but only a part, of the development puzzle. We do not see it as the 'missing link' in development or something that provides an overarching framework for all other interventions. Rather it contributes to and borrows from other ways of thinking such as governance, institutional development or organisational development. Indeed, it must borrow liberally from these other ways of thinking in order to generate real insights. Without the experience of public management, for example, the concept of capacity can tell us little about the structure of and behaviour of public agencies. Without political economy, capacity analyses have little to offer in terms of the effects of political power on organisational adaption. Without institutional economics, capacity cannot tell us much about the rules of the game that shape the effectiveness of many capacity development interventions. Without systems thinking and ideas such as 'emergence', capacity analyses are limited in explaining the dynamics of capacity development.

To understand the capacity challenges in local government, it is essential to develop a clear definition of capacity. The *National Capacity Building Framework for Local Government* (DCoG, 2008) defines capacity as "the potential for something to happen". The framework furthermore distinguishes three types of capacity: individual, institutional and environmental.

The difficulty in defining capacity is not just evident in the South African public sector, but also among a myriad of international organisations. The term 'capacity building' was introduced at least partially to improve on the practice of providing technical assistance. Public sector capacity is a multi-dimensional issue, consisting of human capacity, organisational capacity and institutional capacity (World Bank, 2005). This is further refined by Williams (2006) in his capacity model (Figure 1).

Figure 9.1. Components of capacity-building



Source: Williams, 2006

Individual capacity is the “potential and competency, or lack thereof, found within a person, normally reflected through his or her specific technical and generic skills, knowledge, attitudes and behaviour, accumulated through forms of education, training, experience, networks and values” (DCoG, 2011). In the local government context, this means appointing appropriate individuals to the post in which their specific capacity can be used to the maximum advantage of the community served. Individual capacity is built through training, mentoring and establishing learning networks.

In 2009, the DCoG reported that local government had an overall vacancy rate of 12% among senior management. In one example, a municipality in Limpopo had all senior management (also known as Section 57) posts vacant, except for the chief financial officer and the director of community service (DCoG, 2009). The Limpopo example highlights the difficulties that rural and poorer municipalities have in attracting and retaining scarce skills, which has a severe impact on service delivery. However, the manner in which capacity building is defined is a contentious issue. This is because capacity constraints or capacity challenges or a ‘lack of capacity’ are used continuously to excuse serious underlying pathologies, such as a lack of accountability, the practice of cadre deployment and the flouting of credible recruitment and selection processes.

Institutional capacity can be defined as “the potential or competency, or lack thereof, found within organisations. It includes human resource (collective individual capacities), strategic leadership, organisational purpose, orientation, institutional memory, internal confidence, partnerships, inter-governmental relations, powers and functions, resources and support systems, infrastructure and financial abilities, structures, processes, culture and by-laws” (DCoG, 2011). The municipal institutional capacity needs to “encompass a broad range of issues, such as policies and procedures, knowledge management and institutional memory, competency profiles of staff, background and experience and organisational ethics” (National Treasury, 2011). Municipalities should ensure that institutional capacity, which includes operational capacity, is maximised for the benefit of service delivery.

Environmental capacity is found outside municipalities’ formal structures, in areas that are beyond the control of the municipality. Examples include socio-economic and demographic composition; the political, legislative and social capital within communities; the ecological, geographic and non-municipal infrastructure; and the natural, mineral and environmental resources available. Environmental capacity can be enhanced by interventions that might improve the intergovernmental fiscal system and operating environment of a municipality, and changing national policies and legislation that affect the municipality (DCoG, 2009).

In 2009 the National Treasury’s discussion document *Strategy to Address Municipal Performance Failures* captured the issues underlying municipal performance failures and initiated a discussion on how to address the performance failures. The strategy builds on the *National Capacity Building Framework for Local Government* (DCoG, 2011) and suggests a structured approach to defining and addressing the challenges experienced by under-performing municipalities. The strategy defines well-functioning municipalities, or well-performing municipalities, as those municipalities that perform their functions (as defined in the Constitution), achieve their desired outcomes and where both political leadership and organisational capacity support sustainable performance levels.

The lack of success with previous capacity-building initiatives can be mainly attributed to (National Treasury, 2011):

- Uncertainty surrounding the roles and responsibilities of municipalities (changing powers and functions),
- The assumption that a lack of capacity is the root cause of all municipal performance failures,
- A lack of clear articulation of national, provincial and other role-players’ roles and responsibilities in local government,
- A lack of capacity in provinces and district municipalities to support local municipalities,
- A lack of performance incentives for municipalities to address performance failures,
- Perverse incentives inherent in the hands-on support approach,
- A lack of prioritisation of municipal needs,
- A lack of performance monitoring,
- The absence of a mechanism to manage the transition between support and intervention.

Some of the lessons that should inform future local government capacity-building initiatives are (National Treasury, 2011):

- Identifying and addressing the true root causes of local government performance failures,
- Ensuring a sustainable, long-term, dynamic process for performance improvement,
- Incentivising good performance,
- Getting the basics right,
- Sequencing initiatives correctly,
- Properly designing, developing, managing, implementing and evaluating capacity initiatives,
- Allowing for performance failure in extreme instances.

### 9.3.2 Lessons from Case Studies

#### *Defining capacity and capacity requirements*

The approach to capacity needs to be both broad and narrow (Morgan, 2006, p 18). Narrowing the concept of capacity is essential for developing a more grounded and operational way of assessing and managing capacity issues. However, the concept of capacity also needs to be broadened to encapsulate some of the inherent complexities. This would require any capacity-building programme to be broad – encompassing all three dimensions of capacity. However, the programme's implementation would have to be sufficiently flexible and broken down into specific, narrow and measurable interventions. At a macro level, incentives should therefore be created to identify and acquire appropriate capacity and to foster behaviour change. Defining minimum capacity requirements for key positions is a crucial condition for decentralisation policies to produce benefits in countries such as Brazil, Venezuela and Zambia (Vergara, 2003).

#### *The need for an integrated approach*

Coherent capacity-building efforts should take all three elements of capacity into consideration. A common example of a lack of integration of individual and organisational capacities is persistent efforts in training individuals to perform certain tasks prior to the organisation being ready to allow them to use such skills (Thomas, 2006). Theoretical frameworks for capacity building recognise the need to integrate individual, institutional and environmental capacity because they affect each other. Such a coherent approach to capacity building also demands a move away from a focus on short-term gains to a sustained, longer-term commitment to a capacity-building programme.

In Tanzania, lessons learnt about an integrated approach to capacity building in the public sector included the need for (Kiragu, 2005; Morgan and Baser, 2007):

- Securing political will and commitment,
- Strengthening key institutions involved in capacity building,
- Stabilising key positions and appointments,
- Championing innovation and technical assistance,
- Adopting a maintained, comprehensive support rather than a 'big bang' approach,
- Following a sector-wide approach,
- Restoring integrity and ethics.

The Tanzanian case study's lessons are, to a certain degree, mirrored in the Philippines–Canada Local Government Support Programme, which focused on the development of local government capacity in the Philippines. Here, the success of the programme was ascribed to (Agriteam Canada Consulting, 2006):

- The programme's scope and longevity,
- The use of appropriate and innovative delivery methodologies (peer-to-peer exchange and on-site coaching for context appropriate support),
- Local ownership.

There is a move to include systems thinking in capacity-development theory. The appeal of this approach lies in its coherence, whereby capacity building is considered an ongoing cyclical process that includes all parts of the system(s), in addition to the linkages between them (AusAid, 2009). A systems thinking approach recognises the complexity and interconnectedness of an organisational system, suggesting that precise measurement and impact evaluation based on 'gap analysis' (which assumes a static reality) may not always be an accurate reflection of reality. This has implications for defining capacity development in a way that can be measured and monitored.

Monitoring of training impacts should include not only the immediate benefits to the individual, but also the effects on organisational capacity (OECD, 2006). Existing systems and processes may have to be optimised in parallel to individual training, and the proper sequencing of initiatives would be critical. This is required in order to evaluate outcomes, understand impact, and determine accountability; and has implications for capacity-development design and reporting (Otoo *et al.*, 2009). An example of a lack of integration of capacity-building efforts may be found in the health sector in Mali, where much effort was put into fixing weaknesses in organisational capacity, when the main problem was in fact poor incentives for staff (Thomas, 2006).

### ***Long-term strategies for sustained capacity***

AusAid and its partners reflected on the role of technical assistance in capacity building, as a result of lessons learnt in deploying Australian civil servants in Papua New Guinea and the Solomon Islands. Although the civil servants were specialists, they had little experience in overseas development. AusAid began a more staged approach to capacity building, where technical advisors would move gradually – from direct implementation to indirect support for capacity development. As competencies were developed, systems and processes improved and other issues relating to a lack of capacity were addressed. However, despite this change in approach, the challenge remains to shift from the 'hands-on approach' to relying on context-specific understanding and interventions that recognise longer-term capacity-building methods are required in order to build and sustain capacity (AusAid, 2009). In Indonesia, the importance of external agencies as facilitators of capacity and change processes has been emphasised. The role that external agencies can play in providing innovation and learning to promote capacity within government is critical (Land, 2004).

Capacity-building interventions should not create dependency (Vergara, 2003). International and local experience shows that the impact and sustainability of capacity-building interventions are limited when they are consultant driven and not embedded through knowledge transfer in the daily operations of the municipality. This is because the municipality being capacitated is assumed to be able to draw upon sufficient capability, strategically align different instruments, build local networks and drive a coherent development agenda (Sibisi, 2009).

### ***Nurturing competitive, but fair market for service providers***

One of the lessons learnt from global municipal capacity-building experiences is the importance of promoting the role of other entities as producers of technical assistance (Vergara, 2003). No country has successfully established one capacity-building institution as the sole producer of technical assistance. Dynamism in the sector also needs to be fostered, and a diversity of capacity-building tools will allow for innovation. Uganda's use of local market forces to provide for local capacity-building needs was deemed successful because the government recognised that measures to stimulate supply and demand for capacity development at the local level would be required for sustainability. The Ugandan Ministry of Local Government played a leading role in setting minimum standards, developing capacity incentives, and monitoring progress in open, published reports. This market for capacity building was created by providing an annual "capacity-building grant" to local governments, which is used to procure training provider services on a competitive basis. The Ministry of Local Government assesses these service providers in terms of their competencies and past performance on an annual basis (Nelson, 2007).

### ***Accountability and auditing***

When analysing international case studies, each case (although specific to its own context) provides some guidelines for a future approach to capacity building. In Burkina Faso, a governmental health and nutrition project highlights

that maintaining the correct balance between autonomy and flexibility is important when using grant allocations and enhances accountability. In this project, districts were allowed greater freedom to use capacity-grant allocations to address their particular capacity needs, while the accountability element was strengthened by the signing of transparent management agreements. These management agreements addressed issues such as payment modalities, obligations of the recipients, financial management and auditing requirements, and issues of termination (World Bank, 2005). The introduction of audits with predetermined objectives could facilitate the collection of more reliable and relevant data on capacity-building efforts in municipalities, thereby contributing to more independent and objective assessments of the success of capacity-building initiatives.

### **Professionalisation of human resource management**

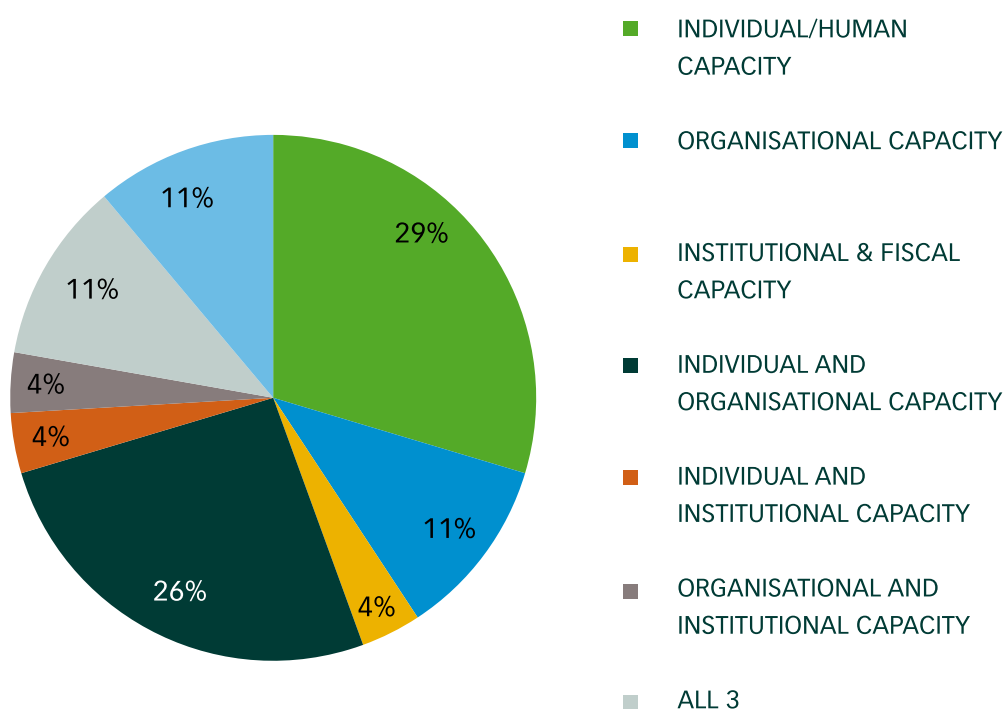
A study conducted in Ghana into the human resource development challenges facing local government found a need to professionalise the human resource development practitioners appointed in these local government roles. The importance of building the capacity of those responsible for capacity building within local government therefore becomes of cardinal importance (Antwi, Analoui and Cusworth, 2007). This calls for a professional and responsive human resource development department in municipalities, with clear and innovative strategies to respond to capacity building, recruitment, staffing, career development and retention.

## **9.4 South African Context**

### **9.4.1 Capacity Challenges at Local Government Level**

Despite undergoing the biggest transformation process in South African history, municipalities in South Africa still have a long way to go before they can claim to be sustainable and functional. The municipal transformation process itself has been a process beset by capacity constraints and performance failures. Questions have been raised about the viability of such a large number of municipalities in South Africa, the changing powers and functions of various municipalities, political leadership problems, the scarcity of skills, the lack of clarity on roles and responsibilities, and the service delivery protests. As Figure 9.2 illustrates, municipalities also differ in their definition of capacity building.

Figure 9.2. Municipalities' definition of capacity-building



Source: FFC, 2011

Of the 27 municipalities interviewed for this study, 29% defined capacity building as the training or capacitating of individual officials, while 11% emphasised the importance of organisational capacity. However, 26% defined capacity



building as focusing on increasing the capacity of both the individual and the organisation. Although 66% of all municipal respondents highlighted the individual and organisational dimensions of capacity building, only 12% regarded the institutional dimension of capacity as important. This institutional (or environmental capacity) dimension is found outside the formal structures of the municipality (DCoG, 2008), and these external factors should be addressed by improving the intergovernmental fiscal system and operational environment of municipalities. Therefore, municipal officials seem to equate capacity building with the elements that they have direct control over, i.e. individual and organisational capacity.

The lack of a commonly agreed-upon definition for capacity is an international problem (DFID, 2008). Monitoring and evaluating progress made in capacity building becomes challenging without a clear definition and common understanding among all stakeholders involved in designing, planning, implementing local government capacity building. Successful capacity building requires all three components (individual, organisational and institutional) to be addressed in a coordinated and sequenced manner. For example, capacity would be difficult to build if vacancies are not filled. Furthermore, low fiscal capacity (environmental capacity) in a municipality can lead to low levels of own revenue, which makes recruitment and retention of competent personnel very difficult, – especially at senior levels (individual capacity), and can result in poor systems and processes (institutional capacity). Therefore, simply attempting to address the visible symptoms of the vacancies at senior level would not address the underlying capacity challenges. Long-term, sustainable solutions should be designed that address the particular needs of municipalities within the macro-environment.

It is also essential to acknowledge that not all municipal performance failures are because of a 'lack of capacity'. There is a tendency to attribute all performance challenges to a 'lack of capacity', which is incorrect and leads to a situation where mismanagement, self-interest, lack of competence and corruption are justified through claims of a 'lack of capacity' (National Treasury, 2009). It is important to be aware of this and to ensure that the actual root cause of performance failure is being addressed.

The DCoG (2011) has conducted various studies on municipal performance and has highlighted various challenges faced by municipalities, including:

- The decline in municipalities providing basic services
- Static staffing levels despite an increase in responsibilities and capital and operational budgets
- Significant gaps in relevant qualifications, skills and experience of staff
- Weak performance management
- Councillor capacity.

When assessing capacity challenges as a cause for municipal performance problems, adequate municipal performance must be defined and norms and standards for capacity specified (MDB, 2010). It is also important to recognise that capacity constraints are often used to mask the real causes of municipal non-performance. The unevenness of local government performance is not solely because of capacity constraints, but may perhaps (more importantly) be because of tensions in intergovernmental roles and responsibilities, political-administrative interface, high vacancy rates and instabilities in administrative leadership, skills deficits, poor organisational design, inappropriate staffing and low staff morale (NPC, 2011).

Central to a functional, well-performing municipality is sound political leadership at national, provincial and local government. The political leadership needs to illustrate a strong commitment to the principles of good governance. Too much political interference is allowed in the reporting and recruitment processes and in selecting and managing senior staff. Continued weak managerial capacity and a lack of leadership in all spheres of government are preventing this lack of municipal performance from being addressed (National Treasury, 2009). The growing recognition of this fact is illustrated by promulgation of the *Municipal Systems Amendment Act* (No. 7 of 2011), which prohibits senior managers from reporting to the municipal manager and municipal managers from holding political office.

#### 9.4.2 Skills Challenges

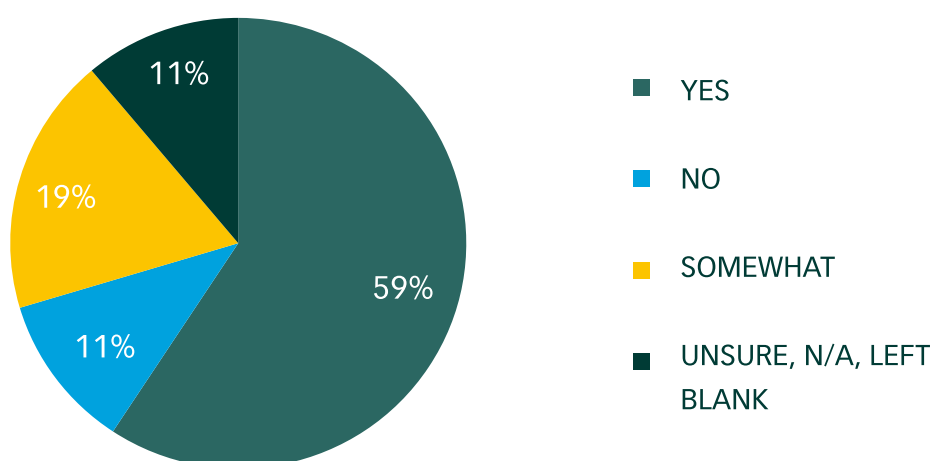
The skills challenges at municipal level are by no means new. In its submission to the Policy Review Process on Provincial and Local Government, SALGA identified a number of challenges. These included the under-investment in people, particularly where technical, management and leadership skills are required, and assumptions about short

cuts to acquiring specialist skills rather than obtaining the required education and work experience (DCoG, 2009). Municipalities do not appear to have the required skills base for optimal operational results. Between 2006 and 2009, municipal employment in the financial administration and technical sectors declined because of, among other reasons, skills shortages (National Treasury, 2011). The high level of staff mobility has also led to dependency on the services of consultants. The real need is to stabilise the senior management teams of municipalities in order to improve service delivery outcomes.

The *2011 Development Report* suggests that the appointments of senior personnel should be subject to relevant and rigorous tests in both key competencies and management expertise (DBSA, 2011). The need for appropriate technical skills to be in place in order to improve municipal capacity was the motivation behind the Municipal Regulations on Minimum Competency Levels, which was introduced on 1 July 2007 (National Treasury, 2007). Also introduced was the Municipal Finance Management Programme (MFMP), which is a training programme consisting of unit standards at NQF level 5 and 6 certificates in municipal finance management. Service providers are required to apply for accreditation with the Local Government Sector Education and Training Association (LGSETA) to provide the training. However, many private sector service providers have become disillusioned with the overly rigid, prescriptive and bureaucratic processes for applying for accreditation and implementing the programme. The training materials are also generic in nature and do not address some of the very real financial management challenges facing municipalities.

Even though the Municipal Regulations prescribe general competency levels required of select officials and senior managers, municipalities tend to ignore them (National Treasury, 2011). When municipalities have had the opportunity to appoint new staff, specifically to Budget and Treasury Offices, they have appointed people with inappropriate qualifications and experience. Therefore, incumbents with inappropriate experience and qualifications are still being appointed for positions. Despite this evidence, municipal respondents interviewed indicated that they believe municipal regulations are proving successful in guiding municipalities to build the needed competencies. The 30% of municipalities that felt the regulations and their guidelines are either unsuccessful or only somewhat successful were all local municipalities. Some of the municipalities interviewed also expressed some confusion over whether the Finance Management Grant, which supports the MFMP, was available to finance only interns at municipalities, or all participants in the programme (FFC, 2011). One significant problem with the implementation process has also been in the 'train all' approach adopted by municipalities, which fails to consider officials' current qualifications and work-related experience, even though this information is available in the municipal human resource (HR) system (FFC, 2012). One respondent indicated that a great deal of uncertainty still exists among municipalities about the interpretation and implementation of the regulations.

Figure 9.3. Perception of the success of the minimum competency levels guidelines



Source: FFC, 2011

#### 9.4.3 Vacancies and Capacity

Vacancy rates are an important component of institutional capacity. Service delivery suffers as a result of vacancy rates, which were 12% in 2009 among senior managers in local government, and the lack of regulations on competency levels for all critical posts.

Table 9.2. Vacancies in key sectors

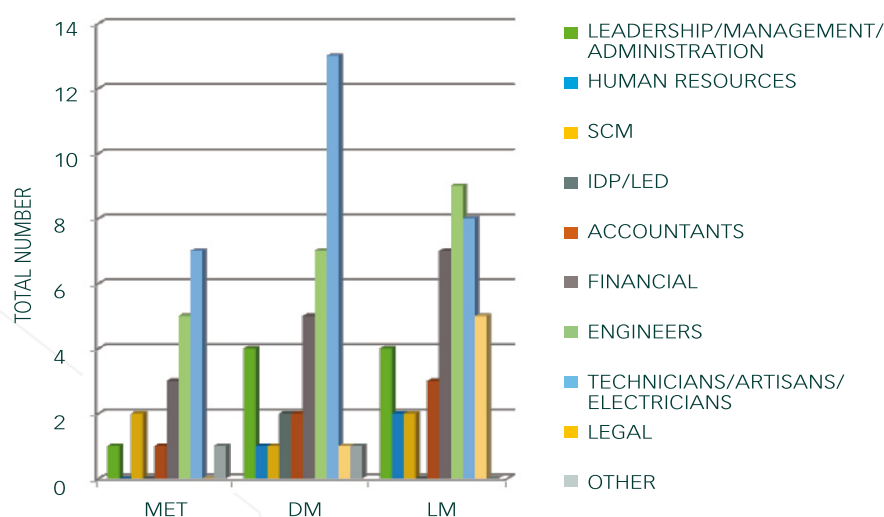
	2005	2006	2008	2009
	% positions vacant	% positions vacant	% positions vacant	% positions vacant
<b>Category A (Metros)</b>	23.50%	25.70%	24.50%	24.20%
Financial administration	13.10%	16.20%	15.50%	22.30%
Electricity	17.40%	28.70%	32.40%	33.10%
Water	27.50%	34.80%	30.40%	27.80%
Waste water management			43.50%	46.70%
Waste management			28.30%	26.50%
Sewerage/Sanitation	5.40%	10.70%		
Refuse removal	14.60%	17.00%		
Other	27.10%	26.80%	22.50%	21.20%
<b>Category B + C</b>	15.70%	17.70%	14.10%	15.40%
Financial administration	15.30%	13.90%	16.40%	16.60%
Electricity	15.70%	18.00%	19.80%	19.70%
Water	16.60%	16.60%	13.80%	13.90%
Waste water management			17.80%	23.80%
Waste management			11.10%	11.20%
Sewerage/Sanitation	15.70%	17.40%		
Refuse removal	10.40%	12.20%		
Other	16.70%	20.10%	12.90%	14.50%
<b>Total</b>	<b>19.70%</b>	<b>21.90%</b>	<b>19.30%</b>	<b>19.60%</b>

Source: StatsSA, 2009

As Table 9.2 illustrates, employment in the financial administration sector declined from 2006–09, and employment in the technical sectors fell from 29% to 23.4%. During this time municipalities were losing these critical skills, but employment increased in the “Other” sector that is mainly municipal support functions.

These vacancies and the inability to attract scarce skills are not only found at senior management level, as municipalities reported high vacancy rates for artisans, technicians and electricians. Of the 27 sampled municipalities, 29% indicated difficulties in attracting and retaining artisans, technicians and electricians.

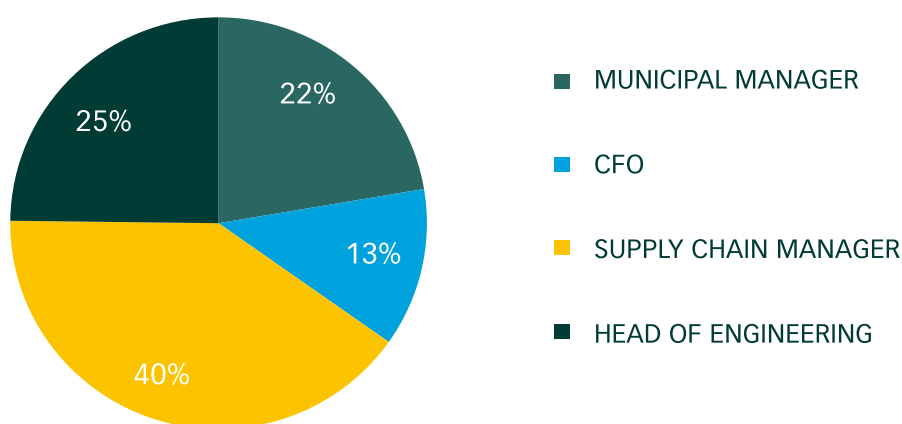
Figure 9.4. Municipal skills challenges



Source: FFC, 2011

The study found that 22% of the sampled municipalities also reported difficulties in attracting and retaining engineering skills. The need for financial skills is particularly evident in local and district municipalities, with 16% of municipal respondents reporting on its scarcity. The approach to improving skilled resources should, however, focus on both acquiring and retaining and using skills (Nair, 2003).

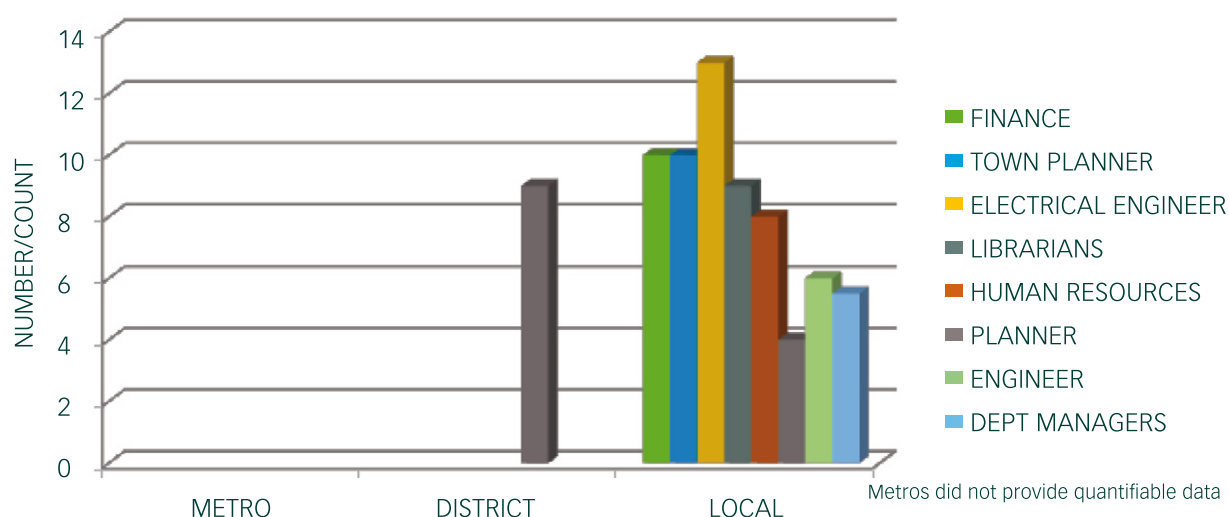
Figure 9.5. Municipal senior management vacancies



Source: FFC, 2011

The municipalities also reported difficulties in filling vacancies for most senior management positions. The challenges faced in acquiring and retaining skills undermine continuity in municipal management, which ultimately has a negative impact on service delivery (The Presidency, 2010).

Figure 9.6. Average period that positions remain vacant



Source: FFC, 2011

The inability of municipalities outside of urban areas to attract experienced technical and professional skills is exacerbated by the decreased opportunities for further skills development because of weak linkages with tertiary educational facilities and poorly organised professional bodies (DCoG, 2009).

Skills retention is a challenge for all the municipalities interviewed, and some of the main hurdles are:

- A fear that performance contracts will not be renewed, which propels officials to find alternative employment.
- Smaller municipalities being unable to compete with larger municipalities in retaining officials.

- Political interference in administration, which leads to officials seeking other employment opportunities.
- A lack of coordinated effort to retain existing skills.

#### **Quote from Respondent**

*Retention is challenging, because the Section 57 managers, when their contract expire they don't have a guarantee that their contract will be renewed after lot of money have been used to capacitate them, because of that they decided to leave the institution before their contract expired.*

To encourage greater stability, the new *Municipal Systems Amendment Act* provides for a number of strategies to attempt to fill vacancies and to retain senior managers, including (South Africa, 2011):

- Appointing managers, who are accountable to the municipal manager, to permanent rather than fixed-term posts.
- Regulating the minimum skills, expertise, competencies and qualifications for the appointment of senior municipal managers.
- Reducing incidences of nepotism and encouraging the appointment of suitably qualified people, by advertising posts nationally.

Obviously, this legislative amendment is not enough. Municipal councils have crucial roles to play in contributing to the stability and productivity of senior municipal managers. Some of the municipalities reported successes in retaining certain skills, particularly in the middle and lower management levels. However, senior management levels still appear to be particularly affected by the above-mentioned hurdles.

Individual capacity is developed within an institutional context, which may have positive or negative effects. Organisational factors – such as supply-chain management complexities that hamper the appointment of service providers; cumbersome HR practices that seldom yield the correct results; poor practices; the complexities of the skills development process; and the amount of paperwork required for training programmes – all compromise the human capacity of municipalities (The Presidency, 2010). The evidence of a high incidence of irregular or inappropriate appointments is concerning (DCoG, 2009). Although vacancy rates are often used as an indicator of organisational capacity, appointments are commonly made to positions that do not exist on approved organisational structures (National Treasury, 2011). Organised labour has complained that “nepotism and favouritism result in erratic appointments and promotions. Cases have been cited where posts are filled without being advertised; people are appointed for posts in technical positions where job evaluations and descriptions are not in place” (DCoG, 2009). This is despite the fact that the Institute for Local Government Management of South Africa has stipulated that appropriate recruitment and selection processes should be used, and that all employee appointments should be separated from political office bearers.

The Institute of Municipal Administration for Southern Africa has proposed that the senior management structure of a municipality should consist of officials who are obligated by their profession's code of conduct. These professionals should be on contracts for longer than five years, to ensure security of tenure (DCoG, 2009).

Furthermore, HR management in municipalities have been beset by poor recruitment practices, rigid enforcement of the employment equity principle, the inability to attract and retain suitably qualified staff, high vacancy rates, a lack of performance management systems and political interference in the appointment and dismissal of staff. Political interference in the recruitment process, disparities in salaries, and deteriorating relations between workers and employers all contribute to an environment that is unattractive to professionals. A poor municipal work environment with vague job descriptions, limited incentives, limited career paths and little scope or encouragement or initiative is not conducive to attracting and retaining talented professionals (DCoG, 2009).

Given the poor outcomes of HR management's recruitment and selection processes, the independent interview panels should be integrated into the process (DBSA, 2011). However, this alone is unlikely to be enough to counter the strong environmental capacity challenges. Another challenge is that the average cost of employment has increased at rates well above inflation (National Treasury, 2011). As an increasingly cost-effective method of delivering services, many municipalities are outsourcing activities. This is as a result of the financial pressures, which have constrained municipalities' ability to increase employment. The skills shortages and employment equity requirements make it even more difficult for towns and rural municipalities to recruit staff who are suitably qualified (National Treasury, 2011). Municipalities' rigid interpretation of the *Employment Equity Act* (No. 55 of 1998) has meant that the balance between

the need to fill vacancies with competent employees and the objectives of the Act has not been maintained (South Africa, 1998). This has resulted in positions not being filled (particularly in areas of distinct skills shortages) because a suitable affirmative action candidate could not be found, which has had a negative impact on service delivery.

#### 9.4.4 Capacity Gaps

Capacity gaps are defined as the difference between that which exists and that which is needed in order to comply with legislation, service delivery, the particular mode of service delivery and developmental challenges (DCoG, 2011). Theoretically, these capacity gaps should be clearly defined prior to designing any interventions. For example, an integrated perspective of capacity is needed (including individual, institutional and environmental elements), and so a skills gap should not be considered in isolation. In evaluating an environment in which capacity building may take place, understanding existing capacity is important: what works and how do things work in the current environment, how stakeholders perceive the key operational problems, and the distortive effects of the prospects of funding. A common problem in capacity-development interventions is the lack of a rigorous needs assessment and poorly articulated results in terms of change process logic (Otoo *et al.*, 2009).

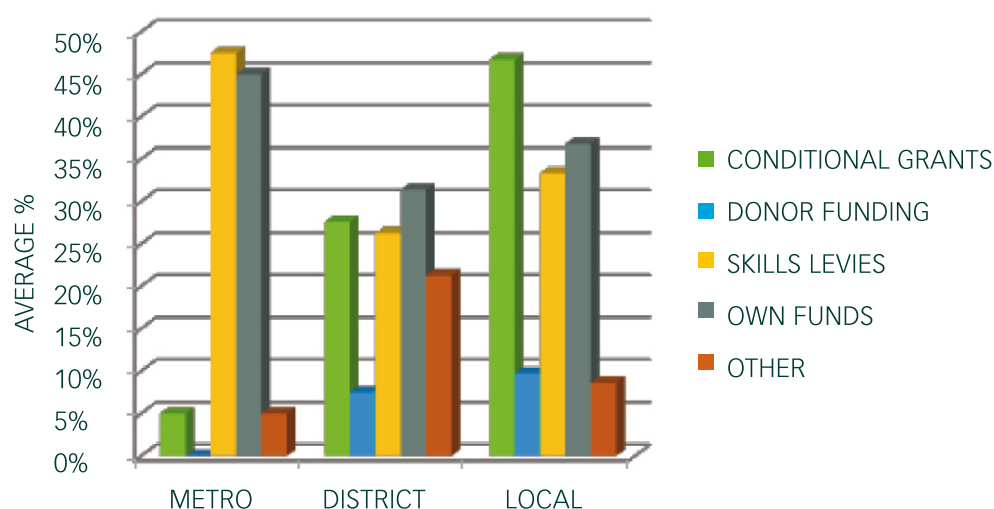
Further, capacity-building initiatives have to date been applied on a 'one-size-fits-all' basis. However, the consensus is growing for a differentiated approach when supporting municipalities (The Presidency, 2010). The *Outcome 9 Delivery Agreement* proposes an audit of the quality and quantity of existing capacity at municipalities in order to establish patterns and identify where the greatest needs are.

The DBSA introduces a municipal differentiation model (DBSA, 2011) that acknowledges the tendency for capacity-development initiatives to follow a one-size-fits-all approach. Instead, the model places municipalities on a continuum, based on how they use their endowments (local space, economy, financial reserves and ability to perform) to achieve their goals and objectives in a sustainable manner. Thus, the DBSA is able to distinguish between municipalities that are functional, structurally dysfunctional or systemically dysfunctional. Functional municipalities perform sustainably with the endowments they possess. Structurally dysfunctional municipalities are considered to be under-performing, while systemically dysfunctional municipalities are those that are unable to sustain service delivery without intervention because of their extremely low base of resources (DBSA, 2011). For example, municipalities in remote areas have the added challenge of access to skills and little understanding of their spatial and economic realities. They generally lack the financial and human resources to deliver on their constitutional and legal mandate and on citizen expectations (DCoG, 2009) and would be considered systemically dysfunctional. By categorising municipalities, interventions will hopefully be more targeted and appropriate (DBSA, 2011). Insufficient attention has been paid to systemically dysfunctional municipalities and to differentiating them from structurally dysfunctional municipalities. Yet analysing the capacity challenge and type of dysfunction should inform the design of the intervention. However, in practice the uncoordinated interventions by multiple departments and agencies and uniform treatment of municipalities regardless of capacity and socio-economic context are reasons for the limited success in improving local government performance to date (The Presidency, 2010).

#### 9.4.5 Budgeting for Capacity

Municipalities indicated four main sources of funding for capacity. As Figure 9.7 shows, local municipalities and, to a large degree, district municipalities across all three provinces are greatly dependent on conditional grants to fund their capacity-building efforts. This is in stark contrast to metropolitan municipalities, which access skill levels to fund capacity-building initiatives. This could indicate that the conditionality of grants can be used to provide incentives for specific changes in municipal performance – the conditional grants can be designed to require the municipalities to undertake particular actions. Examples include the filling of vacancies, implementing a performance management system or even monitoring and evaluating the outcomes and impact of the particular capacity-building initiative.

Figure 9.7. Capacity-building funding mechanisms



Source: FFC, 2011

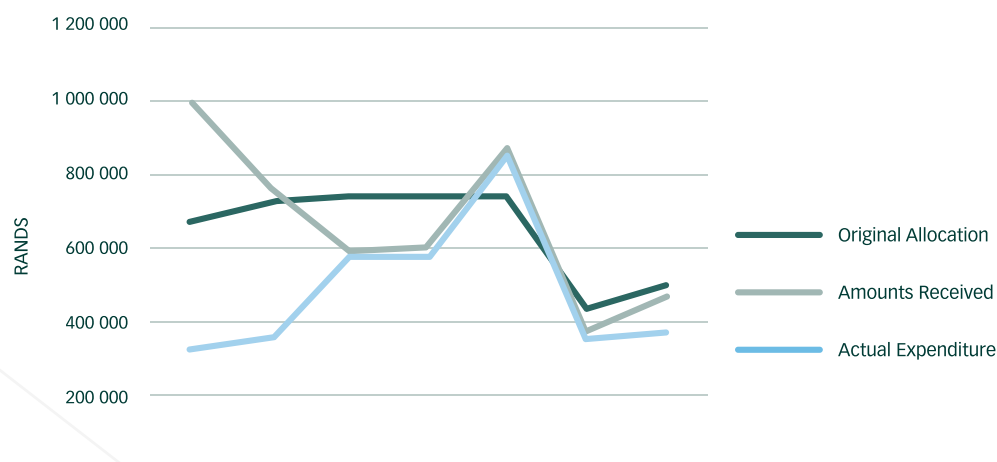
Municipalities find that, despite the urgent need, gaining access to funds for capacity building can be a difficult process. This delay, coupled with the time it takes to gain approval for particular capacity-building projects, affects municipalities' ability to fulfil this function.

Some municipalities indicated a disconnection between the available funds and the market-related costs, particularly of training. Furthermore, supply-chain management processes contribute to delays in securing capacity-building service providers. Municipalities raised concerns that the current percentage growth of capacity grants is not in line with the inflation rates, which makes the funding of future capacity-building programmes even more difficult. Municipalities also highlighted the lack of alignment between the capacity programmes offered by the various spheres of government and the lack of consultation with local government officials regarding their capacity constraints. Internally, municipalities often do not plan properly for capacity building and have poorly aligned planning and budgeting processes (DCoG, 2011).

### **The linkage between expenditure and performance**

Figure 9.8 shows the government expenditure and allocations for capacity-building conditional grants to local government from 2003–2010, with projections over the medium-term period.

Figure 9.8. Capacity-building national allocations and expenditure



Source: DCoG, 2011



The *Local Government Budget and Expenditure Review* revealed that from 2003–2010 municipalities spent on average 77.99% of received conditional capacity grants. The Financial Management Grant alone allocated over R2 billion (R2,161,220,000,000) to municipal capacity building for 2001–2012 (National Treasury, 2012).

According to the interviewed municipalities, such under-expenditure is attributable primarily to:

- Budgetary constraints (withholding training because of fears of funding shortfalls that do not materialise)
- Funds being diverted from capacity building to other functions
- A lack of proper planning.

Municipalities indicated that the under-expenditure is also attributable to a lack of communication both within the municipality and among the various stakeholders involved in capacity building. A lack of internal communication between the HR development officials and finance officials leads to situations where HR development officials are not aware of the available capacity grants and their related conditions.

Limited resources and budgetary constraints mean that training programmes are selected based on costs rather than applicability, practicality and quality – the pursuit of cost savings compromises quality. This overemphasis of quantitative targets, such as the number of officials trained, has led to a perverse incentive to train as many officials as possible, without any regard to the qualitative aspect. Quality and applicability is therefore often sacrificed in the pursuit of numbers. Furthermore adding to the problem is the absence of any independent evaluation of the outcomes and impact of such training or capacity-building initiatives at municipal level. Although municipalities do monitor capacity-building efforts through monthly and quarterly reports, no evaluations are done to assess the impact of the capacity-building spending on the municipal performance.

**Quote from Respondent:**

*The money that was budgeted for training was rather very limited for the whole institution, now we need to check for price when checking training, meaning we compromise the quality.*

Table 9.3. Municipal audit outcomes

Audit Opinion	2002/ 2003	2003/ 2004	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010
Unqualified opinion	39.00%	62.00%	52.00%	1.00%	0.00%	0.00%	1.00%	3.00%
Emphasis of matter	0.00%	21.00%	34.00%	16.00%	21.00%	37.00%	40.00%	51.00%
Qualified opinion	27.00%	0.00%	0.00%	25.00%	29.00%	23.00%	18.00%	21.00%
Disclaimer	27.00%	10.00%	14.00%	48.00%	42.00%	36.00%	37.00%	22.00%
Adverse	7.00%	7.00%	0.00%	10.00%	8.00%	4.00%	4.00%	3.00%

Source: Auditor-General, 2003–2010

Since 2006, municipal performance has shown some improvement, but the improvement has not been sustained, according to the *Consolidated General Report on Local Government Audit Outcomes 2009–2010* (Auditor-General, 2011). This slight improvement appears to correlate roughly with increased expenditure in capacity building in municipalities, as indicated in Figure 9.8.

**Quote from Respondent:**

*The current municipal audit outcomes are consistently not improving and this is a clear indicator that capacity initiatives implemented are not making required difference or impact.*

The Auditor-General has pointed out that the lack of capacity and skills to comply with legislative and accounting frameworks will continue to lead to audit qualifications, and provincial assistance is needed to address these capacity constraints (Auditor-General, 2009). To improve their audit outcomes, municipalities employ consultants to address

deficiencies in the municipality (Auditor-General, 2011). However, unless the necessary skills and knowledge are transferred to the municipality, this method will only result in a short-term improvement.

Despite the glaring skills and capacity constraints, since 2006 municipal employment levels have remained relatively static and can be partially explained by (National Treasury, 2011):

- The prohibitively high (and rising) costs associated with employing personnel directly: municipalities are outsourcing activities as a more cost-effective alternative method of service delivery.
- Municipal financial pressure because of revenue-management problems: over-ambitious capital expenditure, high wage increases and non-priority spending have placed severe pressure on municipal budgets, leading to vacancies remaining unfilled;
- A shortage of skills and rigid employment equity standards that have further exacerbated the ability of municipalities to attract skills.

However, capacity is not static but changes over time and is influenced by both internal and external factors. As such, the high level of mobility among municipal officials, changing or new systems and processes, the introduction of new legislation or regulations, and many other factors can have an impact on municipal capacity (Simister and Smith, 2010).

### **Funding capacity through grants**

Technical and management capacity needs building so that local government can perform its functions and fight poverty (National Treasury, 2011). Municipalities' inability to comply with the systems and processes prescribed by the *Municipal Finance Management Act* (No. 56 of 2003) has resulted in extensive local government management failures and poor audit reports (South Africa, 2003). Attempts to address these problems through capacity-building efforts have been complicated by national and provincial government's departmental and programmatic approach to municipal challenges, which is often cross-cutting and complex in nature (The Presidency, 2010). Therefore, national and provincial capacity support to municipalities remains fragmented, which is a challenge further intensified by the inability of some provinces to provide the required oversight on their delegated municipalities (FFC, 2012). This has led to duplication and often contradictory efforts in capacitating local government.

**Table 9.4. Local government restructuring grant (rands millions)**

	03/04	04/05	05/06	06/07	07/08
Original allocation	315,000	342,900	350,000	350,000	350,000
Amounts received	539,000	387,900	256,000	265,000	530,000
Actual expenditure	225,625	170,518	208,980	203,257	530,000

Source: National Treasury, 2008, 2011

Capacity-building efforts are funded mainly through grants (such as the Financial Management Grant and the Municipal Systems Improvement Programme Grant), skills levies and donor funds. The Local Government Restructuring Grant was established to assist municipalities in their restructuring processes. Transfers of the grant were dependent on reaching specific benchmarks and targets. The prevalently low levels of expenditure were in some instances because municipalities only partially complied with the grant conditions, but also because the onerous application process made municipalities reluctant to apply for the grant (Idasa, 2004; PMG, 2006).

**Table 9.5. Municipal systems improvement programme grant (rands million)**

	04-Mar	04/05	05/06	06/07	07/08	08/09	09/10
Original allocation	150,418	182,243	200,000	200,000	200,000	200,000	200,000
Amounts received	150,293	182,243	200,000	200,000	200,000	200,000	200,000
Actual expenditure	9,767	71,286	54,158	116,215	193,079	188,128	159,078

Source: National Treasury, 2008, 2011

The Municipal Systems Improvement Programme Grant focuses on local and economic development, financial viability, institutional development and good governance. In the past, some funds were withheld because of non-compliance with the grant requirements and a lack of reporting. The grant aims to assist municipalities build in-house capacity to perform their functions and stabilise institutional and governance systems. However, the degree of under-expenditure, municipalities' continued dependence on consultants and municipal audit outcomes (Table 9.3) indicate that these outcomes are not being achieved.

Table 9.6. Financial Management Grant (rands millions)

	03/04	04/05	05/06	06/07	07/08	08/09	09/10
Original allocation	151,000	137,000	132,500	145,250	145,250	180,000	299,990
Amounts received	279,910	137,000	132,354	145,250	144,750	180,000	269,490
Actual expenditure	68,325	58,622	78,427	87,473	140,105	170,031	219,387

Source: National Treasury, 2008. 2011

The Financial Management Grant aims to support sustainable management of the fiscal and financial affairs of municipalities. Again, municipal audit outcomes (Table 9.3) appear to question the effectiveness of the grant in achieving its outcomes. Considerable ambiguity among municipalities about who can and who cannot access the grant has contributed to the under-spending of this grant. The grant is often primarily perceived as an instrument to use for employing and training financial interns (FFC, 2012).

Municipalities are confused about the functioning of grants, as communications about the various grants have not been optimal. Some municipalities are unsure which officials would be eligible to attend capacity initiatives for particular grants (FFC, 2012). Such confusion needs to be addressed by streamlining the management, monitoring and reporting of such grants and improving communication and engagement with municipalities.

In its comments on the Division of Revenue Bill in 2010, SALGA reported that capacity-building grants have grown by only 1% over the Medium Term Expenditure Framework period, and therefore the local government turnaround strategy is condemned to failure. Some of the main concerns highlighted by SALGA included (SALGA, 2010):

- No coordination between grants
- No account of the impact of the grants
- Local government is not central to setting the agenda for capacity building
- Reporting burden and duplication
- Provincial allocations are not gazetted and transferred timeously.

Monitoring and evaluating the actual performance, successes and failures of capacity-building initiatives have proven problematic, and accountability is murky (FFC, 2010). No reliable, comprehensive data is available for the amounts municipalities spend on staff training or the number of staff who benefit from such programmes. Indeed, information is lacking about whether such capacity-building programmes have achieved their outcomes and impact. Therefore, capacity-building grants should include monitoring and evaluation conditions. Without effective data collection and management, the question of whether capacity building is achieving its desired outcomes and impact will never be answered satisfactorily.

#### **Quote from Respondent**

*The lack of monitoring is a major weakness and this result in perpetual assessment or assessment paralysis of capacity-building challenges. One evident area is that of same capacity-building programmes and outcomes recycled all the time.*

#### **Remuneration and capacity**

Significant increases in remuneration levels affect municipalities' ability to fill vacant positions and to address capacity concerns, and thereby undermine service delivery. From 2006 to 2010, total remuneration increased by 52.3%, but

employment levels increased only by 4% (National Treasury, 2011). However, this increase is not due to the salaries of senior managers, who account for just 3.4% of the total municipal wage bill.

### Outside influences

Narrow definitions of capacity building – referring to accredited training opportunities – undermine municipalities' ability to find creative and practical solutions to skills shortages. Such accredited training opportunities require investing time and costs, which poor municipalities cannot afford. The high degree of bureaucracy associated with accredited training provision also makes it prohibitive for private sector institutions to become involved in this market. This overemphasis on individual capacity building leads to other dimensions of capacity building being neglected.

#### *Quote from Respondent:*

*In finance, government focuses too much on accredited training instead of capacitating officials in specific problem areas. Government is losing sight of how different municipalities are from one another. Changes are forced through without real consulting or actually having effective workshops, instead, changes are just published for comment.*

However, it should be acknowledged that the *Minimum Competency Framework* will have assisted municipalities tremendously in acquiring the necessary skills to implement municipal finance reforms (National Treasury, 2009). The National Treasury database shows that 1 532 officials are registered in 2012 for the unit standards associated with the Financial and Supply Chain Management competency programme. This excludes learners from the University of the Witwatersrand Business School (National Treasury, 2012).

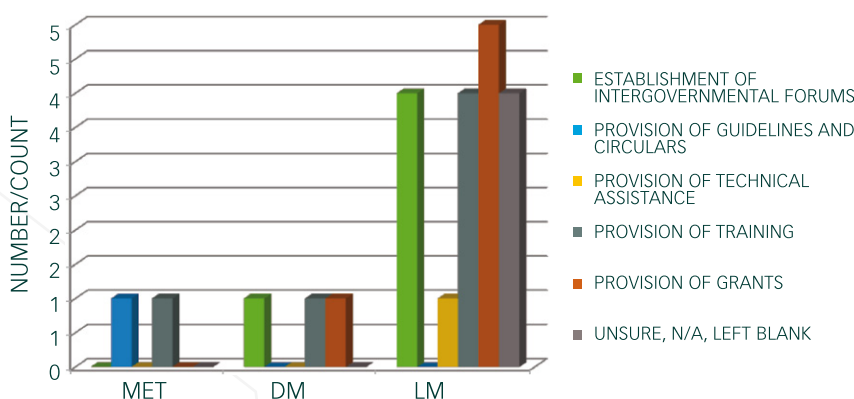
In municipalities, the lines of authority and accountability have become blurred, with contests for authority between unions and administrations. These dual and contradictory structures of authority have created an environment where institutional collapse and lack of performance are ignored and often vehemently denied, despite overwhelming evidence. These structures contribute directly to municipal performance failures and are covered up with references to a 'lack of capacity'. Municipalities must take the necessary action to deal with bad behaviour and bad performance in a decisive manner. Comprehensive, functional performance management systems are central to such a process. Therefore, it is critical that roles and responsibilities and lines of authority be clearly delineated and enforced (DBSA, 2011).

## 9.5 Capacity Roles and Responsibilities

In terms of Section 154 of the Constitution, both national and provincial government are required to support and strengthen the capacity of municipalities to manage their own affairs, exercise their powers and perform their functions. However, the degree of success of national and provincial government in fulfilling this role is questionable. Municipalities interviewed indicated that national and government fulfil this role primarily through providing funding, with little practical, hands-on support. The study found that 67% of the municipalities interviewed believed that national government should:

- Provide increased financial and human resources to municipalities;
- Be actively involved in job coaching and skills transfer to municipalities.

Figure 9.9. National government capacity support

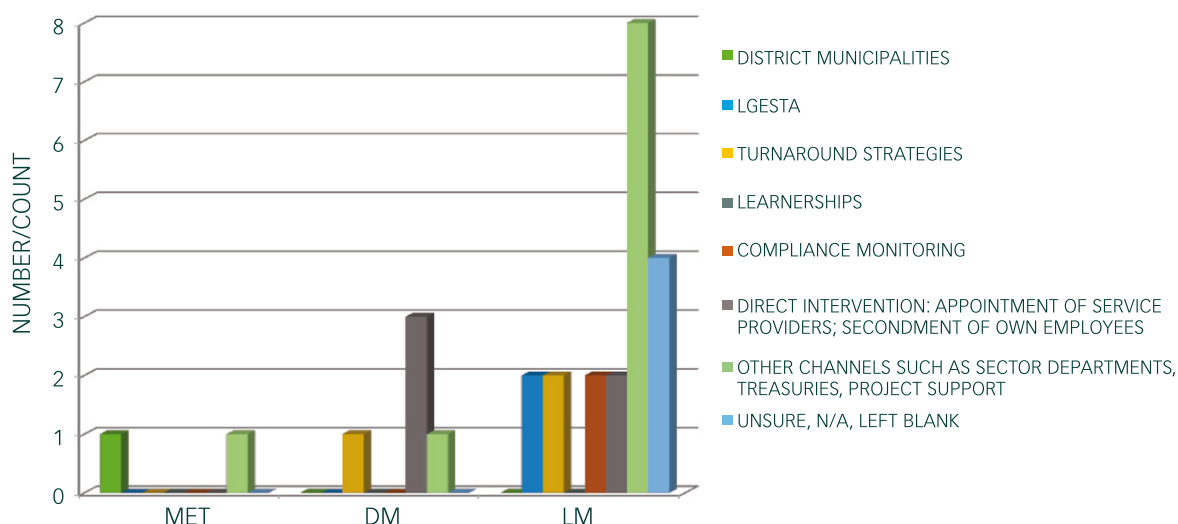


Source: FFC, 2011

In contrast, provincial government support is directed through various provincial sector departments, provincial treasuries and some direct project support. Half the municipalities interviewed said they would like provinces to increase their capacity support to municipalities and that such support should focus on:

- More direct hands-on involvement through on-site visits, mentoring and training,
- More available resources for capacity efforts,
- An equal and coordinated relationship with all relevant stakeholders.

Figure 9.10. Provincial government capacity support



Source: FFC, 2011

Municipalities also questioned the degree to which national and provincial government is able to respond to the challenges faced by local government. With initiatives such as the Special Purpose Vehicle (SPV), MISA, still very much in its infancy, capacity support is often uncoordinated and competing in nature. National and provincial government need to agree on the capacity needs to be prioritised per province and compile a coordinated strategy to address these capacity needs. For capacity-building initiatives to be successful, considerable work will have to be done in clarifying the roles and responsibilities of all stakeholders involved in providing support to municipalities. The current lack of clarity, failure of departments and entities to cooperate and continued turf battles contribute substantially to the poor outcomes of government's capacity initiatives and the duplication of effort (National Treasury, 2009). Clarification is needed specifically on the roles of (DCoG, 2008):

- DCoG and National Treasury
- Provincial departments, specifically provincial departments of local government, provincial treasuries and Offices of the Premier
- Sector departments
- District municipalities
- LGSETA
- Public Administration Leadership and Management Academy (PALAMA)
- MDB
- Local Government Data Coordination Forum

- DBSA
- Capacity-building service providers.

Provinces play an important regulatory and oversight role for local government. Provincial departments responsible for local government were established to give effect to Sections 154(1) and 155(6) and (7) of the Constitution. However, these departments (along with offices of the premier), which are tasked with oversight and support, are often under-resourced and poorly capacitated and structured. Their low capacity and systemic weaknesses result in poor responsiveness to local government. Consequently, the monitoring, intergovernmental checks and balances, and oversight are insufficient from the main support departments of DCoG and National Treasury, National Council of Provinces and provincial legislatures. To support local government more effectively, organisational structures at a provincial level should be suited to execute their mandate and be adequately funded and skilled for monitoring and Section 139 interventions, with defined intergovernmental fiscal relations and communication channels (DCoG, 2011). Unless addressed adequately, the continued low levels of capacity, especially in provincial departments, will continue to have a negative impact on municipal capacity and therefore also on municipal performance.

Section 139 of the Constitution allows national government departments to intervene in provincial matters where provincial government has failed, while Section 100 of the Constitution allows provincial governments to intervene in local government where a municipality has failed. Such interventions should be invoked as a last resort. Clarity is needed concerning the responsibility of national versus provincial government with respect to local government. For example, it is important to determine the degree to which national government can intervene directly in municipalities, and how inclusive provincial interventions should be of national government. In this regard, it is proposed that regulations be developed in terms of Section 154 of the Constitution (The Presidency, 2010).

Section 125(3) of the Constitution stipulates that “the national government, by legislative and other measures, must assist provinces to develop the administrative capacity required for the effective exercise of their powers and functions.” National government has an important role to play in helping provinces improve their capacity to (among others) support local government. Unfortunately, in most instances the effectiveness and impact of hands-on support interventions have not been measured by national and provincial government (The Presidency, 2010). A further complication is the fact that the Constitution does not define the support to be rendered to municipalities or the scale and monitoring that should be provided in general and before an intervention is staged. The most common failures that have triggered Section 139 provincial interventions are those related to governance, financial management and service delivery (DCoG, 2009). However, most municipal interventions have been reactive rather than part of ongoing cooperation and support. Therefore, to minimise recurrences, building municipal capacity needs to be emphasised during such interventions.

To succeed, monitoring and support require cooperation from municipalities. Effective intergovernmental relationships are required for both support and intervention measures, and so the legislative framework needs to provide clarity in this regard (The Presidency, 2010). The differing roles and responsibilities of other stakeholders involved in supervising municipalities also need clarifying. The failure to define clearly the roles of various stakeholders in capacity building is a weakness (DCoG, 2011). Although municipalities have autonomy according to the Constitution, this can contradict the principle of ‘interrelatedness’, which is expressed through the sharing of services and responsibilities.

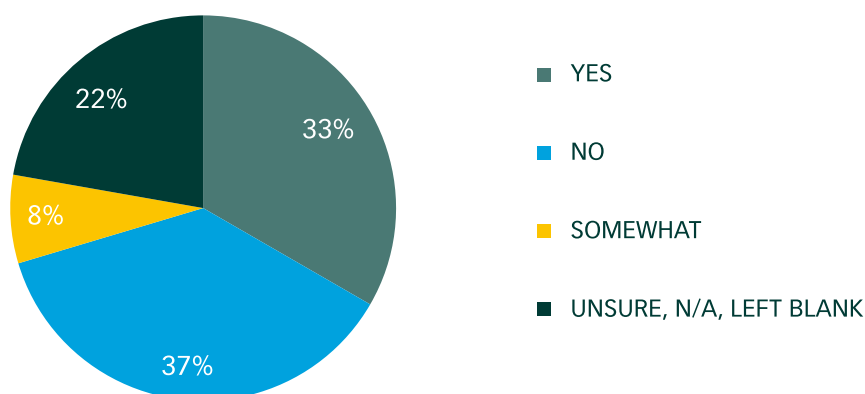
The main national departments that, together with DCoG, have a direct impact on municipalities are National Treasury, Water Affairs, Human Settlements, Energy, Rural Development and Land Reform, and Environment. Operating on a departmental level can make national government departments less sensitive to the often inter-sectoral needs of local government (The Presidency, 2010). The *Outcome 9 Delivery Agreement* proposes a single window of coordination, as a concept and organisational form that will bring about greater cohesion by reducing fragmentation within the cooperative governance arrangements affecting local government. Its practical expression would be that of a cross-departmental committee comprising the above-mentioned departments, which would enable better oversight and coordinated capacity-building support from provinces (The Presidency, 2010). One of the reasons interventions are ineffective is this lack of coordination, which inhibits national government’s ability to assess accurately the relevance, value for money and impact of support programmes. A more hands-on role is proposed for sector departments, such as Human Settlements and Water Affairs, which currently monitor compliance with regulations but are not structured sufficiently to support municipalities in delivering basic services. Such support will assist in closing the gap between the policy and regulatory environment and execution at the municipal level, which is often hampered by technical capacity (The Presidency, 2010).

Both national and provincial government have a duty to support and contribute to the building of capacity in local government (National Treasury, 2011). According to the *Municipal Systems Act* (No. 32 of 2000), national and provincial



government must ensure that sufficient funding and capacity-building initiatives are available to enable municipalities to carry out their functions (South Africa, 2000). Municipalities interviewed perceived national and provincial government as lacking the necessary skills and capacity to provide municipalities with required support. However, this failure of national and provincial government to fulfil their capacity-building role should be viewed in the light of national and provincial governmental capacity constraints. Inappropriate staffing, poor resourcing and unclear mandates contribute to the weak capacity – of the Presidency, national and provincial departments engaged in cooperative governance, offices of the premier and national and provincial treasuries – to provide municipal capacity-building support (DCoG, 2009). Municipalities also stated that national and provincial departments do not understand the implementation challenges that officials face “on the ground” and provide municipalities with conflicting interpretations of policies and regulations. The weak capacity of national and provincial departments means that they are unable to analyse and provide useful performance feedback to municipalities. National and provincial governments need to be asked the National Treasury question: are all municipal performance failures because of a lack of capacity or are they evidence of laziness, mismanagement, incompetence and political interference. This situation should be addressed urgently to ensure proper support is provided to local government in capacity building.

Figure 9.11. Do national and provincial departments have sufficient capacity to address the challenges experienced by municipalities?



Source: FFC, 2011

The *Municipal Structures Act* (No. 117 of 1998) allows municipal functions to be allocated differently, according to the municipal capacity (South Africa, 1998). The MDB attempted to differentiate “high, medium and low” capacities. However, this classification system has proven problematic and incapable of providing an accurate picture of municipal capacity. As municipalities continue to experience capacity challenges, the effectiveness of this classification is increasingly being questioned. The DBSA has developed an alternative model, which (as discussed) places municipalities on a continuum based on their endowments in terms of their local space and economy and financial reserves, as well as their ability to use these endowments to achieve their goals and objectives in a sustainable manner. This allows the DBSA to distinguish between municipalities that are functional, structurally dysfunctional or systemically dysfunctional. The advantage of this model is that it allows municipalities to move along this continuum, as they will not necessarily remain within one specific category for an extended period of time.

Municipalities would like provincial and national government to be more focused and coordinated in their approach and support of capacity building in local government. Current capacity-building efforts are based on ‘one-size-fits-all’ and are not differentiated to the particular municipality’s context. As emphasised in the *Submission for Division of Revenue 2010/2011* (FFC, 2009), local government capacity-building needs must be taken into consideration when formulating capacity programmes, as local government needs are central in agenda setting.

### 9.5.1 The Outcomes-Based Approach

#### Technical assistance

Over the years, national government has allocated significant funds to municipal capacity building over the years, but results remain poor. Unresolved problems identified in previous local government assessments should be acknowledged when evaluating these outcomes, (DCoG, 2009). The *Five Year Local Government Strategic Agenda (2006–2011)* focused



on, among others, mainstreaming hands-on support to local government to improve municipal governance, performance and accountability (DCoG, 2005). The *National Capacity Building Framework* recognised how this direct, institutionalised, hands-on approach is favoured, as it provides capacity building more closely linked to workplace needs and the state of the municipality (DCoG, 2008). As a result, many technical advisors have been deployed to municipalities.

The Siyenza Manje is probably the best example of such a hand-on approach to capacity building in South Africa. By June 2009, the programme had 210 experts and 165 interns deployed to 175 municipalities (National Treasury, 2009). However, of great concern is that the programme evaluation found that municipalities felt they would be unable to maintain the improvement levels once the technical experts were withdrawn. Thus, the programme provided short-term solutions, which did not translate into long-term sustainable improvement, indicating that the programme did not succeed in its objective to increase capacity at municipal level. The programme evaluation correctly highlights the dangers inherent in placing technical experts in municipalities where there are no counterpart officials to whom knowledge and skills can be transferred (Genesis, 2010). Such exercises are not sustainable, as they reinforce dependencies and do not build capacity. Furthermore, the evaluation points out the importance of establishing clear implementation timelines and clear entry and exit strategies when designing capacity initiatives. Clear entry and exit strategies are essential in preparing municipalities to continue initiatives under their own power. Therefore, and in line with the requirements of the *National Evaluation Policy Framework* evaluations must be planned and budgeted for appropriately, to ensure that the necessary data is collected, outputs are monitored and outcomes and impact of the programmes are evaluated (The Presidency, 2011).

Although there is little independent evaluation of their effectiveness and sustainability, such technical assistance approaches are resulting in perverse outcomes (National Treasury, 2011):

- 'Experts' earn more than people working in municipalities, resulting in an exodus of skilled employees from municipalities of these programmes.
- In practice, most experts are gap filling rather than capacity building because there is (a) no one to train, (b) no time to train, as the focus is on quick-wins in service delivery, and (c) experts who do not have an aptitude for training.
- Individuals and organisations have developed vested interests in the current hands-on-approach and therefore want the programmes to continue because the programmes are their livelihood or they like the power that comes with allocating assistance.
- Programmes that simply provide additional support to failing municipalities most often treat the immediate symptoms of failure rather than the underlying causes.

Unfortunately, there is no evidence that these technical assistance interventions have resulted in knowledge transfer or strengthened institutional memory.

### Outcome 9

The *Outcome 9 Delivery Agreement* proposes establishing a SPV to provide the necessary financial and technical support to municipalities for infrastructure delivery. The aim is to provide better technical assistance to municipalities with weak capabilities and to extend financial freedoms and flexibilities to competent municipalities in order to speed up the provision of services (DCoG, 2009). Technical assistance for weak municipalities would include "supporting the municipality to structure capital funding and mobilise operational funding to strengthen service provision and the delivery of new infrastructure to eradicate backlogs, rehabilitate existing infrastructure and the effective operation and maintenance of infrastructure" (The Presidency, 2010). However, the proposed SPV (MISA) and its implementation modality are unclear.

This presents at least two challenges. The first is how 'strong' and 'weak' municipalities are defined. The DBSA distinguishes between two kinds of dysfunctional municipalities that would be considered 'weak': structurally dysfunctional and systemically dysfunctional municipalities (DBSA, 2011). Structurally dysfunctional municipalities may exhibit poor financial health because the poor revenue collection systems result in poor fiscal effort. Systemically dysfunctional municipalities may also exhibit poor financial health, but, even with full fiscal effort, would not raise sufficient revenue to cover expenditure. Unless the cause of poor financial performance is clear, an intervention may be misdirected. This is significant because Section 139 interventions are aimed at structurally dysfunctional municipalities. Yet if a municipality

is performing poorly because it is systemically dysfunctional, the Section 139 interventions (as seen to date) are not going to solve the underlying problems. A consensus is needed on how to differentiate municipalities, and data to support this will need to be collected (if not already done). Problematic is the lack of a relationship between a system of national indicators, which enables government to assess the comparative performance of different municipalities, and the planning-related powers and functions assigned to municipalities (DCoG, 2009).

The second challenge relates to the institutions in South Africa created to drive change that are insufficiently resourced, which results in their own capacity constraints. Therefore, caution needs to be exercised when proposing new capacity-development institutional mechanisms for capacity development, such as the SPV, as using existing capabilities to support targeted interventions is likely to be more effective (DBSA, 2011). National government's capacity-building efforts could be strengthened by: improving the DCoG's capacity to deliver its mandate, strengthening national and government-wide monitoring and evaluation mechanisms to track the status and assess the impact of capacity-building programmes, and using this to inform planning of future interventions in a manner that encourages positive alignment with initiatives in municipalities (DCoG, 2011).

No accountability framework exists for technical support provided to municipalities, except for accredited training. Furthermore, in South Africa, the tendency is to procure training providers based on the cost of training, rather than obtaining the desired impact from training. For government departments to complain about the quality of capacity building provided by service providers, when they continuously focus on procuring service providers based on cost criteria, is disingenuous. Unless the correct incentives are in place, the approach to training and technical assistance, including its unintended consequences, is unlikely to change. In order to shift behaviour, organisations need to be incentivised to focus on outcomes and longer-term results rather than on outputs and short-term indicators (Nelson, 2006). However, when organisations do not have to pay for the training they receive, training is rarely owned and, as a result, reduces the incentives for the organisation to ensure that impact is achieved (Nelson, 2006). Often the prospect of funded training leads to organisations going ahead with capacity-building plans without considering whether the intervention has been properly designed and locally owned (Otoo *et al.*, 2009). In addition, if the goal of capacity development is to equip public managers with the competencies required to deal with complex problems faced in public management today, many of the rule-based management processes currently taught should not be in demand (DBSA, 2011).

### ***Causes of under-performance***

Municipalities need to invest in effective training and development initiatives, which could be seen as one of the softer, capacity-building interventions described above. However, these isolated interventions are not going to have a significant or sustainable impact on capacity and therefore on municipal performance. This is because of the tendency to select training initiatives based on cost (in order to increase the number of people being trained) rather than assessing the course content and value to the municipality. The impact of future municipal capacity building can be improved by preparing the 'capacity-building environment' and better integrating the different initiatives within each programme area (DCoG, 2011). However, the broader organisational and environmental factors will also need to be considered.

The lack of capacity at municipal level is often cited as a reason for poor service delivery. Under-performance is presumed to be because of a lack of capacity, but also evidence of laziness, mismanagement, incompetence and political interference. For example, although the number of people employed at municipalities has grown little, expenditure on personnel has been increasing strongly, with no discernible impact on services. Serious questions should therefore be asked about the state of performance management in municipalities. By reducing all municipal performance problems to a lack of capacity, institutions and government officials are able to focus on the softer, capacity-building interventions rather than on the complex process of dealing with poor performance and on aligning municipal systems and incentives to ensure sound administration (National Treasury, 2011). International experience has shown that transparency and accountability in local government need to be confronted (Vergara, 2003).

Municipal performance failures can be attributed to internal or external factors. Internal factors can include:

- Lack of community oversight and accountability
- Weak political leadership
- Organisational capacity

- Economies of scale issues
- Choice of technology.

The external factors concern the political environment and its impact on roles and responsibilities in local government. The focus here is specifically on the tensions and challenges caused by insufficiently clarified roles and responsibilities. It also emphasises the need for effective and efficient oversight and accountability by councils, but also specifically by provincial executives.

### ***Greater creativity needed***

As discussed, Morgan (2006) highlights the need both to narrow the concept of capacity (to have a more grounded and operational way of assessing and managing capacity) and to broaden the issue in order to encapsulate some of the inherent complexities. This would mean that any capacity-building programme should be broad enough to encompass all three dimensions of capacity, but its implementation should be sufficiently flexible, adaptable to municipalities' specific conditions and challenges, and broken down into specific narrow and measurable complementary interventions. At this narrow level, support should focus on the strategically prioritised needs as identified by municipalities themselves. At a macro level, incentives should therefore be created to identify and acquire appropriate capacity and foster behaviour change.

To be successful, such a differentiated approach should address all three dimensions of capacity building in a sustained manner. For example, from an institutional dimension, this would entail greater differentiation and flexibility in the design of the local government fiscal framework and a differentiated approach to assigning functions to municipalities, based on their capacity to manage them effectively. This should also be seen as a continuum along which municipalities can move freely. Based on this institutional capacity assessment, national and provincial government should compile an organisational support programme for the municipality. To improve the capacity of municipalities to perform their functions, the medium and senior management cadre of municipalities must be stabilised. Furthermore, the appropriate technical skills should be put in place, and minimum competencies should be enforced when recruiting and employing people. This means employing skilled individuals in vacant positions for which affirmative action candidates could not be found. Inputs from national government are also required. The following technical functions require particular attention:

- Sewerage and water treatment plant operators
- Road maintenance supervisors
- Health inspectors
- Planning and project managers.

The stakeholders interviewed indicated further strategies for using existing capacity more creatively, including:

- Initiating and maintaining a National Capacity-Building Coordination Committee as a single window of coordination
- Reviewing the division of powers and functions between municipalities
- Consolidating all the capacity-building interventions into one comprehensive programme and using provincial departments as implementing agents.

## **9.6 Recommendations**

With respect to the dynamics of capacity challenges at local government level, it is recommended that:

- Capacity-building efforts should be comprehensive and sustainable, instead of quick fix, short-term solutions. To this end, it is necessary to:
  - Establish a single capacity-support agreement per municipality. This agreement should stipulate all actions to be undertaken by national and provincial government and other relevant role-players.

Measurable objectives for capacity development programmes should be clearly defined (relative to credible baselines) and independent exit evaluations should be compulsory.

- Environmental constraints, specifically with respect to the allocation of powers and functions and the formulation of conditional grants, may need to be simultaneously adjusted.
- With respect to capacity-related conditional grants:
  - The grants' conditionality must commit municipalities to specific, independently verifiable capacity and performance improvements.
  - Grants should be redesigned to consider the quality of capacity-building interventions, instead of having a narrow quantitative focus.
  - An external, objective evaluation dimension should also be included in capacity grant requirements.
- Capacity-building interventions should holistically coordinate individual, organisational and institutional-level dimensions of capacity building in a particular municipality over the medium term. Instead of focusing disproportionately on training, support programmes should include technical support for new systems, business process redesign and change management, based on an assessment of the relevant municipality:
  - Individual: officials must have the necessary technical skills, knowledge, experience and competencies to fulfil their particular functions. This means appointing the correct person to the correct post (adherence to recruitment, selection and any minimum competency requirements) and ensuring that officials then receive training (both accredited and non-accredited) relevant to their areas of responsibilities to ensure continued workplace effectiveness.
  - Organisational: municipalities should be supported in compiling realistic IDPs, implementing functional and effective performance management systems, and knowledge management policies, to enhance organisational memory and data management and to ensure accurate and relevant reporting. Critical vacancies must also be filled and workable strategies for staff retention be implemented. Skilled individuals must be appointed to vacant positions for which affirmative action candidates cannot be found, and audits should be conducted of municipal positions that fall outside the approved organisational structures.
  - Institutional: greater differentiation and flexibility is required in the design of the local government fiscal framework. A differentiated approach is needed for the assignment of functions to municipalities, based on their capacity to effectively manage them. Once a municipality has proved its ability to provide a specific basket of services, decisions can be made regarding expanding the range of services provided by such a municipality. Where service delivery failures persist, such services should be removed from municipalities. Furthermore, the establishment of a coordinated capacity-building function across all local government departments is recommended. These actions must be complemented by simplified, streamlined and coordinated reporting requirements for local government and clearly defined roles and responsibilities for national and provincial departments. To assist rural municipalities, the value and practicality of an assistance programme should be explored, aimed at attracting and retaining scarce skills in these areas (similar to the scarce skills payments made to doctors in rural areas).
- To improve municipal capacity, the medium and senior management of municipalities need to be stabilised urgently, through greater insulation from political interference in the retention of skills and in the recruitment process. The link between actual performance of managers and the renewal (or not) of performance contracts should be strengthened. The human resource function within municipalities needs to be proactive in identifying possible incentives for retaining scarce skills and ensuring that roles and responsibilities are clearly defined within municipal job descriptions. This challenge will only be solved through increasing the pool of available people to fill vacant positions.
- Minimum competencies as entrenched in the MFMA should be enforced so as to ensure that appropriate technical skills are in place. Based on field work conducted by the Commission, the following functions require particular

attention: revenue management, supply chain management, sewerage and water treatment plant operators, road maintenance supervisors, health inspectors and planning and project managers.

## References

- Agriteam Canada Consulting. 2006. *The Philippines-Canada Local Government Support Programme: A Case Study of Local Government Capacity Development in the Philippines*. Maastricht: European Centre for Development Policy Management.
- Antwi, KB, Analoui, F and Cusworth, JW. 2007. *Human Resource Development Challenges Facing Decentralised Local Governments in Africa: Empirical Evidence from Ghana. Leadership, Learning, Institutes and Public Service*. Accra: Leadership, Learning, Institutes and Public Service.
- Auditor-General. 2009. *General Report of the Auditor-General on Audit Outcomes of the Limpopo Local Government for the Financial Year 2007–08*. Pretoria: Auditor-General.
- Auditor-General. 2011. *Consolidated General Report on the Local Government Audit Outcomes 2009–2010*. Pretoria: Auditor-General.
- AusAid. 2009. *Donor Capacity Development Innovation*. Australia: OECD.
- DBSA (Development Bank of Southern Africa). 2011. *Development Report 2011*. Pretoria: DBSA.
- DCoG (Formerly DPLG – Department of Provincial and Local Government). 2005. *Five Local Government Strategic Agenda*. Pretoria: DCoG.
- DCoG (Department of Cooperative Governance). 2008. *National CapacityBuilding Framework for Local Government*. Available online: <http://www.pmg.org.za/files/policy/090701capacitybuildingframework.pdf>. Accessed on 25 August 2011.
- DCoG. 2009. *State of Local Government in South Africa*. Pretoria: DCoG.
- DCoG. 2011. *National Capacity Building Framework for Local Government*. Retrieved August 25, 2011, from Parliamentary Monitoring Group: <http://www.pmg.org.za/files/policy/090701capacitybuildingframework.pdf>
- DFID (Department for International Development). 2008. *DFID Research strategy: 2008–2013*. London: DFID.
- FFC (Financial and Fiscal Commission). 2008. *Five Year Research Strategy*. Midrand: FFC.
- FFC. 2009. *Technical Report: Annual Submission on the Division of Revenue 2010/2011*. Available online: [http://www.ffc.co.za/docs/submissions/technical\\_report/2009/FFC%20Tehchnical%20Report%202009.pdf](http://www.ffc.co.za/docs/submissions/technical_report/2009/FFC%20Tehchnical%20Report%202009.pdf). Accessed on 14 September 2011.
- FFC. 2011. Municipal capacity questionnaires and interviews conducted with municipalities in the Eastern Cape, Free State and Western Cape.
- FFC. 2012. Departmental capacity questionnaires and interviews conducted with key government departments and stakeholders in South Africa.
- Genesis. 2010. *Final Report: Evaluation of the Siyenza Manje Programme: Lessons from the First Three Years of Operation*. Pretoria: Genesis
- Idasa. 2004. Local Government Grant System in South Africa, *Budget Brief No. 138*, January 2004. Available online: <http://www.idasa.org/media/uploads/outputs/files/Local%20Government%20Grant%20System%20in%20SA%20Jan%202004.pdf>. Accessed 26 September 2011.
- Kiragu, K. 2005. Tanzania: A Case Study in Comprehensive and Programmatic Approaches to CapacityBuilding. Available online: [http://siteresources.worldbank.org/AFRICAEXT/Resources/TZ\\_June.pdf](http://siteresources.worldbank.org/AFRICAEXT/Resources/TZ_June.pdf). Accessed on 26 September 2011.
- Land, A. 2004. *Developing Capacity for Participatory Development in the Context of Decentralisation*. Maastricht: European Centre for Development Policy Management.
- MDB (Municipal Demarcation Board). 2010. *Municipal Demarcation Board Review of Capacity Assessment Model*. Pretoria: MDB.



- Morgan, P. 2006. *The Concept of Capacity*. The Netherlands: ECDPM (European Centre for Development Policy Management).
- Morgan, P and Baser, H. 2007. *Building the Capacity for Managing Public Service Reform: The Tanzania Experience*. Maastricht: ECDPM.
- Nair, GG. 2003. *Nurturing Capacity in Developing Countries*. Washington: World Bank Institute.
- National Treasury. 2007. *Municipal Regulations on Minimum Competency Levels*, Gazette Number 29967, June 2007. Available: <http://mfma.treasury.gov.za>
- National Treasury. 2009. *Discussion Document: A Strategy to Address Municipal Performance Failures*. Pretoria: National Treasury.
- National Treasury. 2011. *2011 Local Government Budget and Expenditure Review*. Pretoria: National Treasury .
- National Treasury. 2012. *Local Government Budget and Expenditure Review: 2006/07–2012/13*. Pretoria: National Treasury.
- Nelson, M. 2006. *Does Training Work? Re-examining Donor-sponsored Training Programs in Developing Countries*. Washington: World Bank Institute.
- Nelson, M. 2007. *A Market-based Approach to Capacity Development: How Uganda's Local Governments are Breaking New Ground*. Washington: World Bank Institute.
- NPC (National Planning Commission). 2011. *National Development Plan: Vision 2030*. Available online: <http://www.npconline.co.za/medialib/downloads/home/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf>. Accessed 21 January 2012.
- OECD (**Organisation for Economic Cooperation and Development**). 2006. *The Challenge of Capacity Development: Working Towards Good Practice*. Paris: OECD.
- Otoo, S, Agapitova, N, Gold, Jand Fisher, S. 2009. *The Need for a Conceptual and Results-orientated Framework in Capacity Development: Discussion of a New Approach*. Washington: World Bank Institute.
- PMG (Parliamentary Monitoring Group). 2006. Select Finance Committee: Local Government Financial Management Grant; Local Government Restructuring Grant; Neighbourhood Development Partnership Grant. Available online: <http://www.pmg.org.za/minutes/20061009-local-government-financial-management-grant-local-government-restructuring-grant-ne>. Accessed on 25 January 2012.
- SAQA (South African Qualifications Authority). 2001. *National Qualifications Framework and Curriculum Development*. Available online: [http://www.saqa.org.za/structure/nqf/docs/curriculum\\_dev.pdf](http://www.saqa.org.za/structure/nqf/docs/curriculum_dev.pdf) Accessed on 26 September 2011.
- Sibisi, S. 2009. *Brushing Against the Grains of History: Making Local Economic Development Work in South Africa. Working Paper Series No. 5*. Pretoria: DBSA, Development Planning Division.
- Simister, N and Smith, R. 2010. *Monitoring & Evaluating Capacity Building: Is it Really that Difficult?* Oxford: International NGO Training and Research Centre (INTRAC).
- South Africa. 1996. *Constitution of the Republic of South Africa, No. 108 of 1996*. Pretoria: Government Printer.
- South Africa. 1998. *Employment Equity Act No. 55 of 1998*. Pretoria: Government Printer.
- South Africa. 1998. *Local Government: Municipal Structures Act, No. 117 of 1998*. Pretoria: Government Printer.
- South Africa. 2000. *Local Government: Municipal Systems Act, No. 32 of 2000*. Pretoria: Government Printer.
- South Africa. 2003. *Local Government: Municipal Finance Management Act No. 56 of 2003*. Pretoria: Government Printer.
- South Africa. 2011. *Local Government: Municipal Systems Amendment Act, No. 7 of 2011*. Pretoria: Government Printer.
- SALGA (South African Local Government Association). 2010. *Input on 2010 Division of Revenue Bill*. Pretoria: Salga
- StatsSA (Statistics South Africa). 2009. *Non-Financial Census of Municipalities for the year ended 30 June 2009*. Pretoria: StatsSA

- StatsSA. 2011. *Consolidated General Report on the Local Government Audit Outcomes, 2009–10*. Pretoria: StatsSA
- The Presidency. 2010. *Outcome 9: Delivery Agreement*. Available online: <http://www.thepresidency.gov.za/MediaLib/Downloads/Home/Ministries/DepartmentofPerformanceMonitoringandEvaluation3/TheOutcomesApproach/Delivery%20Agreement%20-%20Outcome%209.pdf>. Accessed on 3 September 2011.
- The Presidency. 2011. *National Evaluation Policy Framework*. Available online: [www.thepresidency.gov.za](http://www.thepresidency.gov.za). Accessed on 21 November 2011.
- Thomas, V. 2006. *Linking Individual, Organisational and Institutional Capacity Building to Results*. Washington: World Bank Institute.
- Vergara, V. 2003. *A Global Perspective on Urban and Municipal Capacity Building: General Lessons From Experience*. Available online : <http://info.worldbank.org/etools/docs/library/115318/ethiopia/paperethiopia.htm>. Accessed on 21 November 2011.
- Williams, Q. 2006. *Implementing Performance Management at Local Government Level in South Africa: A Case Study on the Impact of Organisational Culture*. A thesis submitted in partial fulfillment of the requirements for the degree of Masters of Business Administration. Grahamstown: Rhodes University.
- World Bank. 2005. *Capacity Building in Africa: An OED Evaluation of World Bank Support*. Available online: [http://www.worldbank.org/oed/africa\\_capacity\\_building](http://www.worldbank.org/oed/africa_capacity_building). Accessed on 26 August 2011.



# Chapter 10

## ASSESSING GENDER RESPONSIVE BUDGETING IN LOCAL GOVERNMENT

### 10.1 Introduction

In committing itself to achieving gender equality and empowerment of women, the South African government has adopted a number of measures that include antidiscrimination legislation and affirmative action policies. In many countries, governments are increasingly resorting to gender-responsive budgeting (GRB) to turn their gender-equality commitments into reality. GRB (also known as gender budgeting or gender-sensitive budgeting) uses the budget to promote gender equality (Budlender, 2008; **Chakraborty**, 2007; Reyes, Budlender and Melesse, 2009; World Bank, 2005). Its objective is not to formulate a separate budget for women but to promote budgetary processes that are sensitive to the different needs of men, women, boys and girls.

Gender budgeting, is different from, yet is a component of, gender mainstreaming.<sup>1</sup> GRB recognises that traditional budgeting systems are fundamentally patriarchal and fail to recognise the contribution of women – the primary (unpaid) caregivers – to the national fiscus. As unpaid care work does not carry a price tag, and society does not pay for it, policy-makers often assume that its supply is limitless, and care receivers can have as much as they want (Budlender, 2004a).

Gender budgeting is an innovative strategy for achieving gender equality. It makes the fiscal space more democratic and the budgeting process rational, thereby promoting accountability and changing the budget focus to gendered outputs and outcomes (Çağatay *et al.*, 2000). However, although budgeting is based on rational analysis, at heart it is a contested political process that relies on value judgments.

Given the poverty profile of South Africa, any attempt to target public resources at the poor must confront gender-related issues head on. In the mid-1990s, gender budgeting began to be implemented at national level, but the process has gradually lost momentum. It is unclear how these gender commitments are being translated into fiscal commitments at local level. Yet gender-budget initiatives are needed most at local level, where gender disparities in basic services provision are more glaring. Thus, the purpose of this chapter is to assess the gender sensitivity of budgeting in local government in South Africa.

#### 10.1.1 Statement of the Problem

The South African government has shown its commitment to gender equality through various policy and legislative interventions. The country is also a signatory to several international conventions, protocols and frameworks, whose objectives are to advance the cause of women in the socio-economic fabric of the country. These conventions, protocols and frameworks include the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW), the Beijing Platform of Action and the Millennium Development Goals (MDGs).

Despite these commitments, unacceptable gender inequalities remain. African female-headed households are the poorest of the poor in South Africa. According to Statistics South Africa (StatsSA, 2011), 43.8% of households in South Africa are headed by females. Of these female-headed households, 22.8% fall into the poorest quintile 1 compared to 18.1% of male-headed households, and only 31% fall into quintiles 4 or 5, compared to 45% of male-headed households. It is time to look at alternative levers for change.

One avenue that should receive greater emphasis is the intergovernmental fiscal relations (IGFR) system. A successful IGFR system would be sensitive to the needs of women and contribute to moving them out of poverty. Ensuring that

<sup>1</sup> Gender mainstreaming refers to a process that is goal orientated. It recognises that most institutions consciously and unconsciously serve the interests of men and encourages institutions to adopt a gender perspective in transforming themselves. It promotes the full participation of women in decision making so that women's needs move from the margins to the centre of development planning and resource allocation.

resource allocation is gender sensitive will require innovations in policy design and implementation. One such innovation is GRB, but to date very little research has been done in this area. This chapter evaluates gender budgeting in the local government sector and considers whether budgets perpetuate gender disparities by *not* considering that men and women have different roles and responsibilities in society.

### 10.1.2 Objective of this Chapter

This chapter's objective is to assess the gender responsiveness of local government budgets in South Africa and to evaluate them systematically through gender lenses. In addition, the chapter recommends possible interventions by municipalities and other stakeholders to advance gender equality through the IGFR system.

### 10.1.3 Rationale of the Study

This study will benefit the work of the Commission and other stakeholders. The Commission promotes, through fiscal frameworks, equity, efficiency, transparency and accountability in the use of public resources. Given that genderless budgets are inefficient and do not accord with the principles of equality enshrined in the Constitution, this work will add value to the Commission's advisory inputs to take into account the gender impacts of budgets. In addition, this study sits well within the Commission's broader research strategy, particularly around the 'second-generation' issues that require the equitable and efficient allocation of public resources to make a positive impact on communities. The project aligns with the Commission's 2013/14 Annual Submission theme of "Moving People Out of Poverty: Supporting Innovation in Intergovernmental Financing", as it searches for innovative ways of using the fiscal framework to promote inclusive development.

A gendered perspective of budget analysis will also add value to Parliament's oversight work. This study originated from a request by the Select Committee on Cooperative Governance and Traditional Affairs and can therefore assist the Committee in ensuring that public resources are allocated effectively and efficiently and that they are better targeted. Furthermore, the study will benefit officials involved in formulating budgets at local, provincial and national level by raising awareness of the need for gendered budgets as well as their meaning and implications.

## 10.2 Literature Review

Although studies on gender are common in the fields of sociology, micro-economics, labour economics and development economics, studies on the implications of fiscal policies on gender – and gender budgets in particular – are relatively few (Stotsky, 2007). However, since the 1995 Beijing Conference on Women and the advent of MDGs in 2000, there has been a significant amount of research into gender budgeting. These two events galvanised many governments to affirm their commitment to gender equality and to use their budgets to translate their gender equality commitments into fiscal commitments. The studies cover topics that range from conceptualising gender budgets (Elson, 2003; Sarraf, 2003) to developing tools and methodologies for evaluating budgets through gender lenses, (Balmori, 2003; Budlender and Hewitt, 2003; Budlender *et al.*, 2002a; Budlender *et al.*, 2002b; Elson, 2003, Sharp, 2003; Sarraf 2003; UNIFEM, 2005; and World Bank 2005). Studies evaluating gender budgeting in different country settings (Stotsky, 2007; Chakraborty, 2007; Chakraborty and Bagchi, 2007) suggest that, despite efforts to formulate gender-responsive budgets, many countries (including South Africa) still have gender-blind budgets. The reasons for this include ignorance, gender-biased culture, lack of gender budgeting expertise and limited gender-disaggregated data (Sarraf, 2003).

### 10.2.1 Country Experiences with Gender Budgeting

#### **Australia**

Australia was the pioneer in gender budgeting. Starting around 1984, and driven by bureaucrats and feminist lobbyists within the state, Australia's gender budgeting initiatives focussed on the expenditure side of the budget but paid little attention to the gender implications of the revenue component. Initial research on gender sensitivity of budgets indicated that Australian budgets were not gender neutral, — only 1% of budget allocations benefitted women.

The Australian initiative fizzled out in the 1990s mainly because a social democratic regime had launched it during a period of economic expansion. The initiative was abandoned during the economic restructuring that took place amid the neo-liberal policies of the 1990s. This demise highlights the importance of civil society involvement and ownership. Without civil society participation, the wholly government-owned programme was vulnerable to ideological changes.

The Australian experience shows that civil society ownership is very important for sustainability of the gender budgeting process (Çağatay *et al.*, 2000).

The initial Australian experience of gender budgeting may have folded quickly, but it inspired many other initiatives worldwide. In turn, having been influenced by other successful gender budgeting programmes, Australia's gender budgeting initiatives appear to be making a comeback (Sharp and Broomhill, 2002).

### **India**

As early as 1980, civil society in India began evaluating state budgets through the lens of poor men and women. India's gender budgeting took the form of social audits, which aimed to make the budgeting processes responsive to the social needs of both poor men and women. The guiding principle was that the budget process should be participatory, accountable and transparent (Çağatay *et al.*, 2000). Driven strongly by civil society, coupled with extensive mobilisation of poor communities, another critical component was the right to information campaigns. The Indian initiative provides two lessons that could underpin a successful gender budgeting process:

- (i) The right to adequate information for all
- (ii) A strong civil society movement.

### **Tanzania**

A distinguishing feature of Tanzania's gender budgeting process was that it was externally driven by a non-governmental organisation (NGO): Tanzania Gender Networking Project. Subsequently, a strong coalition formed consisting of planners and budget officers from the Ministry of Finance, National Planning Commission, Health and Education and Agriculture, Industry and Commerce, academics and gender activists. The initiative emphasised policy development, planning and budgeting, decision-making processes and the horizontal allocation of budgetary resources among sectors. The coalition also lobbied for legislative reforms to close gender gaps. The Tanzanian initiative focused on building capacity for analysing gender budgets through (a) developing checklists for the finance ministry to facilitate gender mainstreaming of budget processes and (b) formulating guidelines to collect sex-disaggregated data for budgeting processes. Important lessons from Tanzania's experience are:

- (iii) The need for a broad involvement of many actors, including government, NGOs, academics, civil society and parliamentarians.
- (iv) Empowering NGOs, academics, civil society and parliamentarians with skills to hold government accountable.
- (v) Capacity building to mainstream gender for successful gender budgeting.

### **South Africa**

Dating back to 1995, a distinguishing feature of South Africa's gender-budgeting initiative was its location both within and outside government. Although the process was externally initiated (in contrast to Australia), the government later pursued a parallel process. The externally driven process, known as the 'Women's Budget Initiative' (WBI), was spearheaded by NGOs, academics and a group of parliamentarians (Commonwealth Secretariat, 1999). In 1997, National Treasury drove government's parallel initiative, which lost momentum soon after its introduction. However, the Parliament/NGO-driven initiative made several inputs into analysing budgets. In the first three years, it evaluated budgets of 27 national portfolios using set criteria (Budlender, 2005; Sharp, 2003; Budlender *et al.*, 2002a; Budlender *et al.*, 2002b). Focusing on national, and to a lesser extent provincial, governments, the results were published in a series of books (i.e. the First/Second/Third and Fourth Budget Initiatives) that continue to influence thinking on gender budgeting issues, (Budlender, 1996, 1997, 1998, Sarraf, 2003). The WBI used such research to lobby for gender-sensitive policy changes.

Local government only featured in the fourth year, when the gender sensitivity of five of the 800 municipalities was evaluated. This research culminated with "The Fourth Women's Budget Initiative", which focused, among other things, on service provision in local government and the impact of spending and revenue-raising on women (Budlender, 1997).

Country experiences of gender budgeting provide important lessons:

- To sustain momentum, gender budgeting needs strong alliances of key stakeholders, such as Parliament, NGOs, civil society, academics and media. The involvement of non-state parties ensures that changes in government or ideology do not compromise the process.
- Capacity building (on gender budgeting and on general budgeting principles) is essential for budget officers, parliamentarians and civil society, as levels of financial literacy are low.
- The availability of adequate sex-disaggregated data is an important success factor.

### 10.3 Research Methodology

In assessing the gender responsiveness of local government budgets, the study followed a two-pronged approach. First, the study reviewed Integrated Development Plans (IDPs) of 30 randomly selected municipalities. IDPs are crucial documents that provide insights into the strategic goals and detailed action/implementation plans of municipalities. An IDP is an excellent tool to check a particular municipality's commitment to women empowerment and gender equality, as the local budget's aim is to provide resources to the IDP. Therefore, if the IDP and its underlying sector plans are not gender sensitive, the underlying budget is unlikely to be gender sensitive.

Second, the study assesses gender responsiveness of municipal budgeting processes through case studies of municipalities, with a particular focus on local economic development (LED), water and sanitation, early childhood development (ECD) and housing infrastructure. These four sectors were selected because they are well known to ease the plight of women and, as such, are good quality of life indicators.

The case studies covered seven municipalities across four provinces: Gauteng, Western Cape, Eastern Cape and Free State. The municipalities were selected based on their size and location with a good mix of small, medium and large (based on population), and rural and urban municipalities. The following municipalities were selected:

- City of Cape Town Metro Municipality – Western Cape
- Thabo Mofutsanyane District Municipality – Free State
- Mafube Local Municipality – Free State
- Emfuleni Local Municipality – Gauteng
- Randfontein Local Municipality – Gauteng
- Amathole District Municipality – Eastern Cape
- Maletswai Local Municipality – Eastern Cape

Interviews were conducted with the mayors, relevant municipal officials and gender focal persons with additional focus group discussions. The 30 randomly selected municipalities are shown in Table 10.1.

Table 10.1. Sample of municipalities

Random sampling of 30 municipalities – IDPs to be scanned for GRB					
1xMETRO					
				(area km <sup>2</sup> )	(Pop <sup>n</sup> 2007)
1.	Mangaung Metropolitan Municipality	MAN	Bloemfontein	6,284	752,906
9xDMs					
1.	Alfred Nzo District Municipality	DC44	Mount Ayliff	10,732	900,487
2.	Fezile Dabi District Municipality	DC20	Sasolburg	21,301	474,089
3.	West Rand District Municipality	DC48	Randfontein	4,087	754,903
4.	uMgungundlovu District Municipality	DC22	Pietermaritzburg	8,934	988,837
5.	Capricorn District Municipality	DC35	Polokwane	16,988	1,243,167
6.	Gert Sibande District Municipality	DC30	Secunda	31,841	890,699
7.	Ngaka Modiri Molema District Municipality	DC38	Mafikeng	27,889	798,783
8.	Namakwa District Municipality	DC6	Springbok	126,836	126,494
9.	Overberg District Municipality	DC3	Bredasdorp	11,405	212,787
20xLMs					
1.	Mbhashe Local Municipality	EC121	Dutywa	3,050	262,008
2.	Ntabankulu Local Municipality	EC444	Ntabankulu	1,456	141,358
3.	Sundays River Valley Local Municipality	EC106	Kirkwood	3,508	34,935
4.	Kopanong Local Municipality	FS162	Trompsburg	15,248	49,422
5.	Tokolologo Local Municipality	FS182	Boshof	9,326	21,323
6.	Merafong City Local Municipality	GT484	Carletonville	1,631	215,865
7.	Mogale City Local Municipality	GT481	Krugersdorp	1,099	319,641
8.	uMlalazi Local Municipality	KZN284	Eshowe	2,214	175,372
9.	uMhlabuyalingana Local Municipality	KZN271	Kwangwanase	3,619	163,694
10.	Umzumbe Local Municipality	KZN213	Mtwalume	1,259	176,287
11.	Thulamela Local Municipality	LIM343	Thohoyandou	2,899	602,819
12.	Blouberg Local Municipality	LIM351	Senwabarwana	4,541	194,119
13.	Mkhondo Local Municipality	MP303	Piet Retief	4,882	106,452
14.	Emalahleni Local Municipality	MP312	Witbank	2,678	435,217
15.	Kgetlengrivier Local Municipality	NW374	Koster	3,973	37,806
16.	Tlokwe Local Municipality	NW402	Potchefstroom	2,674	124,351
17.	Khéi-Ma Local Municipality	NC067	Pofadder	8,332	12,571
18.	Nama Khoi Local Municipality	NC062	Springbok	15,025	54,644
19.	George Local Municipality	WC044	George	1,072	136,542
20.	Cape Agulhas Local Municipality	WC033	Bredasdorp	2,841	28,444

## 10.4 Findings

### 10.4.1 Gender Responsiveness of IDPs

The IDP is a planning tool and process that involves the municipality and its citizens in finding solutions to achieve good long-term development. It considers the existing conditions and problems that citizens experience and outlines the human and financial resources that are available for development. Therefore, the IDP is an excellent tool to check a particular municipality's commitment to women empowerment and gender equality.

A total of 30 municipalities' IDPs were scanned for their gender sensitivity. The scanning process used a framework to assess to what extent gender mainstreaming is taken into account in the planning and implementation of service delivery programmes in each municipality. Tables 10.2 and 10.3 provide the main findings of the IDP scans of the 30 municipalities.

Table 10.2. An assessment of the gender responsiveness of IDPs

MUNICIPALITY	Gender Mainstreaming	Women Empowerment	Gender Equality	Gender Equity	PGDP/ MDG Support	Sex Disaggregation	Projects: Calendar	Projects: Health	Projects: Gender Based Violence	Projects: LED	Projects: ECD
	(refers to the words / terms in the current IDP. *yes)										
	Metro										
Mangaung Metropolitan Municipality	*			*	*	*		*	*		
District Municipalities											
Alfred Nzo District Municipality				*	*	*				*	
Fezile Dabi District Municipality		*	*		*		*	*	*	*	
West Rand District Municipality		*		*		*	*	*	*	*	
uMgungundlovu District Municipality	*	*	*	*		*		*	*		
Capricorn District Municipality	*	*	*	*	*	*	*	*	*	*	
Gert Sibande District Municipality	*	*		*	*	*	*	*	*	*	
Ngaka Modiri Molema District Municipality				*		*	*		*		
Namakwa District Municipality		*							*		
Overberg District Municipality				*		*				*	
Local Municipalities											
Mbhashe Local Municipality	*	*	*			*		*		*	
Ntabankulu Local Municipality				*		*		*	*	*	*
Sundays River Valley Local Municipality		*	*	*	*	*		*		*	*
Kopanong Local Municipality		*	*		*	*		*	*	*	*
Tokologo Local Municipality				*							
Merafong City Local Municipality		*		*		*	*	*	*	*	*
Mogale City Local Municipality		*		*		*	*	*	*		*
uMlalazi Local Municipality						*		*			*
uMhlabuyalingana Local Municipality				*		*					
Umzumbe Local Municipality		*	*	*	*	*	*	*			
Thulamela Local Municipality	*			*		*	*	*	*	*	
Blouberg Local Municipality											*
Mkhondo Local Municipality		*	*	*	*	*		*	*		*
Emalahleni Local Municipality	*	*		*		*		*	*		*
Kgetlengrivier Local Municipality											
Tlokwe Local Municipality				*	*	*			*	*	*
Khâi-Ma Local Municipality											
Nama Khoi Local Municipality				*							
George Local Municipality				*			*	*			*
Cape Agulhas Local Municipality				*	*	*					



Table 10.2 reveals the following:

**Gender Mainstreaming.** Even though nearly all the IDPs mention women's projects, only 23% refer to gender mainstreaming. This shows the lack of a formal approach to women empowerment and gender equality in the planning and budgeting processes of all departments across the municipality.

**Women Empowerment.** Women empowerment is mentioned in 47% of the IDPs and refers to building critical skills and self-confidence among women in order to enable them to take control of their lives. Empowerment of women is essential for transformation because it addresses the structural and underlying causes of subordination and discrimination of women in their homes, in the workplace, and in religious and cultural institutions.

**Gender Equality and Gender Equity.** Gender equity is referred to in 73% of IDPs, but only 27% refer to gender equality. Gender equity is the fair and just distribution of opportunities and resources between women and men. In line with the *Employment Equity Act* (No. 55 of 1998), the equity process simply focuses on workplace recruitment of women within the municipality, and so many municipalities appear to be complying with legislation by 'playing the numbers game'. However, in comparison, gender equality refers to the existence of equal conditions for both genders in realising their full human rights and potential, whereby they are able to contribute equally to political, economic, social and cultural development and benefit equally from the results.

**Sex-disaggregated Information.** Information disaggregated by sex is provided in 73% of the IDPs but is only in relation to profiling populations and unemployment. Yet even this basic information is apparently not used in the planning and budgeting process.

**Women's Health.** Women's health projects are mentioned in 60% of IDPs and predominantly concern raising awareness of HIV and AIDS and condom distribution. Maternal health issues and Prevention of Mother to Child Transmission (of HIV/AIDS) are sometimes mentioned, responses to a fuller range of health issues affecting women appear to be largely ignored.

**Local Economic Development (LED).** Only 43% of the IDPs allude to supporting women through LED projects. Even where LED support is indicated, projects tend to be either part of the Expanded Public Works Programme (which lacks long-term sustainability) or to 'fit' a constructed role of women (e.g. sewing and catering), which require small amounts of investment.

**Gender-based Violence (GBV).** Just over half (53%) of the IDPs mention supporting projects that deal with GBV, which is of particular concern because of increased levels of crimes against women.

**ECD.** Only 37% of IDPs mention ECD support programmes. Although ECD is largely the responsibility of provincial governments, municipalities are their partners in registering, ensuring compliance and supporting ECD centres. ECD is also an area where women in their roles as primary caregivers of young children experience substantive equality.

**Women Events.** A significant amount of resources goes towards events such as rallies, food or transport, with 33% of IDPs referring to calendar projects (e.g. Women's Month, Sixteen Days of Activism, etc.). However, such events do not improve the lives of women or lead to substantive equality.

In summary, four key messages stand out from the evaluations of municipal IDPs.

### ***There is a lack of gender mainstreaming and women empowerment***

Most municipalities show no formal strategy for women's empowerment. An exception is Maletswai, which includes gender-specific planning and budgeting in the areas of LED and GBV. However, these achievements are subject to poor recording and monitoring processes because of a lack of strategy. The gender-specific processes and programme activities mentioned by other municipalities tend to be associated with calendar events. For example raising awareness during Women's Month or the Sixteen Days of Activism. LED projects aimed at economic empowerment tend to be aligned with women's constructed roles e.g. in the areas of catering and care. In addition, many of these projects are not aligned to the municipality's economic strengths, which makes them unsustainable and the women only temporarily supported.

The absence of a gender-mainstreaming approach does not imply that gender mainstreaming and women empowerment activities are not being pursued. However, municipalities must move away from a 'calendar event' approach to gender mainstreaming becoming more closely associated with the municipality's core business of the municipality (rather



than an add-on). More effective planning, budgeting and monitoring of women empowerment and gender equality will ensure when gender mainstreaming is part of all departments' specific processes and programmes.

### ***Gender equality is seen as a social development issue***

All municipalities are concerned that women's issues appear to be 'pushed' into the area of social development, yet none of the 30 municipalities has integrated women empowerment into their core business and broad planning.

Viewing gender equality only within the context of social problems limits the way in which the substantive equality goals (decision making, resourcing and opportunities) should be addressed. In other words, this limitation fails to recognise the importance of women's economic access to available opportunities and of interventions that target women's skills development, productivity and financial independence (including independence from government grants).

### ***The main focus is gender equity, not mainstreaming for gender equality***

Most IDPs use equity language and, while the equity process is a good entry point into gender mainstreaming and women empowerment, it often stops at the point where the numbers look reasonable. Gender equity, which is about female representation, is often the main focus, not gender equality. Yet gender equality goes beyond gender equity to encompass gender mainstreaming and general empowerment of women.<sup>2</sup>

Nearly all municipalities declare support for gender mainstreaming because of the growing numbers of women at senior and middle management levels and in prominent political portfolios, such as mayors and speakers. Mafube and Randfontein declare that gender mainstreaming is a high priority, despite showing very little evidence of gender-equality measures that target women across the municipality, although they have been more successful at increasing the numbers of women in management and leadership positions. Municipalities are clearly making inroads in ensuring that women occupy more portfolios. However, these positions assume that women in leadership support gender mainstreaming and that an equity process (closing the numbers gap in this case) will lead to substantive equality of citizens.

Therefore, the equity process is a good entry point into gender mainstreaming and women empowerment but often stops when the numbers look 'balanced'. Once this happens, the process is neglected and regression of gains can take place. The literature shows that gains made during the 1990s and early 2000s have regressed, with, for example, decreasing numbers of women councillors.

Finally, an equity process should not be equated with actual interventions for gender mainstreaming across all sectors where substantive equality is the goal. Institutions are likely to just report numbers without clear targets (numbers and percentages) for the interventions and gender-specific indicators to measure the success of mainstreaming.

### ***Gender equality commitments are not translated into fiscal commitments***

Without a clear gender-mainstreaming strategy, IDPs generally group women, children, youth, the elderly and people with disabilities together, as if the group is uniform and with similar needs. Numbers and targets are applied to this group without detailing how different sub-groups will benefit from the resources (e.g. 50% of women will participate in LED programmes).

IDPs show little evidence of planning processes and budgets for gender mainstreaming in key areas of delivery e.g. LED, water and sanitation and housing (areas of significant expenditure), while most municipalities are silent on ECD (a crucial component of women's productivity).

## **10.4.2 Case Studies**

The findings of the seven municipality case studies are discussed below:

### ***Maletswai Municipality***

#### **Background**

Maletswai Municipality is a largely agricultural area located in the Eastern Cape Province, with a population of 42 846 people. The 2001 census revealed that 82% of the economically active population in the Maletswai Municipality lived

<sup>2</sup> Gender equity forms the building block for gender equality. The concept of gender equality refers to full equal rights (political, economic, civil, social and cultural) between men and women, with no one denied such rights.

below the poverty line (earning less than R800 per month), and 54% receive no fixed monthly income. In 2005, the unemployment rate stood at 38.7%, (Maletswai Municipality, 2005), with the highest rates found in the Masakhane (51.2%), and Jamestown (43.5%).

### **GRB in Maletswai Municipality**

Maletswai Municipality is critically aware of women empowerment and gender equality and has a process in place of moving towards developing gender-mainstreaming approaches and budgets. However, officials and community leaders indicated that resources are limited for instituting gender mainstreaming across the board. Gender-mainstreaming projects are driven by donor funding rather than by intergovernmental transfers.

At an institutional level, the municipality has shown commitment to GRB, by appointing a dedicated gender focal person (GFP) who operates from a functioning special programmes unit (SPU).

Furthermore, the municipality supports a number of projects that target women as stakeholders (beneficiaries and implementers). Examples of such LED projects are the refurbishment of Aliwal North Spa, a recycling project and a butchery – tenders for these projects were awarded to women-owned companies. In addition, funds have been sourced to support projects to help victims of GBV. In the area of ECD, the municipality is in the process of providing land for a crèche. Although the SPU liaises with the provincial department on ECD issues, ECD is not viewed as one of the competencies of local government. Furthermore, the GFP is not involved in housing and water and sanitation operations in part because of the limited understanding of the broader portfolio of a GFP within the municipality.

### **Why GRB is absent in Maletswai Municipality**

GRB in Maletswai takes place by default, as the municipality has no gender-mainstreaming policy, and officials have very little or no knowledge of gender mainstreaming as a technical process. On the other hand, citizens (especially women) are not well informed about how they can engage with the IDP process to ensure more effective gender-related planning and consultation. Lastly Maletswai needs to collect sex-disaggregated data to enable GRB.

### **Recommendations for gender sensitive budgeting for Maletswai Municipality**

As gender mainstreaming takes place by default in certain areas of the municipality and gender budgeting is non-existent, Maletswai Municipality needs to:

- Develop a gender policy and a gender-mainstreaming plan of action.
- Train decision makers (officials and political principals) in gender mainstreaming.
- Train budget officers in GRB and planning.
- Develop reporting mechanisms that include sex-disaggregated data.
- Endeavour to collect sex-disaggregated data to inform gender mainstreaming, including gender mainstreaming the budget.

## ***Cape Town Metropolitan Municipality***

### **Background**

The City of Cape Town Metropolitan Municipality is a large urban area with a high population density and many centres of economic activity. Over the last 20 years, Cape Town has experienced rapid urbanisation, which has resulted in its population almost doubling to its current total of 3.5 million. This growth was a result of the 1% annual population growth through natural family formation, and through continued in-migration of approximately 50 000 people (18 000 households) per year, most of whom come to Cape Town in search of jobs.

Service provision, housing, and job creation are priorities for the city. The current IDP formulates a city-wide strategic urbanisation plan, where the focus is to create communities with access to good quality public spaces and services. The eight strategic areas include shared economic growth and development; sustainable urban infrastructure and services; energy efficiency; public transport systems; integrated human settlements; safety and security; health, social and community development; and good governance and regulatory reform.

### **GRB in Cape Town Metropolitan Municipality**

The Cape Town Metropolitan Municipality is adopting a formal gender-mainstreaming approach. The municipality's eight strategic focus areas provide entry points into a mainstreaming approach. Projects, such as the 2020 Economic Development Strategy, training for ECD practitioners and construction of tourism centres, are some of the programmes that link gender equality and women empowerment to the core business of the municipality.

At an institutional level, the municipality has shown commitment to GRB by appointing dedicated GFPs who operate across departments and who form part of the municipality's Gender Task Team. Members of this team report on internal processes and support service managers to mainstream gender. A gender mainstreaming strategy also influences operations within Corporate Services and Social Development.

During the interview process, officials involved in public participation, employment equity, IDP, human settlements and social development provided information that showed an understanding of the strategic approach needed to assist with GRB processes, for example, working towards gender mainstreaming by training senior managers, developing more gender equality indicators and undertaking more public expenditure incidence analysis. Gender equality is monitored on some levels (e.g. employment equity and progress towards achieving objectives against indicators on the City's scorecard), while programmes and projects that support women's empowerment are already in place and form part of departmental business plans. However, many of the LED projects for women still fall into the domain of welfare and crafts (the constructed roles of women).

### **Why GRB is limited in Cape Town Metropolitan Municipality**

During the interviews, officials indicated that some GRB is taking place, albeit in an ad hoc manner and focusing more on the welfare part of women's lives. Key reasons as to why GRB is limited include:

- Lack of a gender policy in place, which results in senior management continuing to shift the responsibility and accountability for gender equality to lower-level officials.
- Absence of a gender-mainstreaming policy that provides the necessary guidelines for GRB across the municipality and takes account of the complexity of a metro and its institutions
- Shifting of gender equality and women empowerment to social development/welfare, as a clear policy and strategy that reflect gender mainstreaming is absent; other key sectors such as LED and housing do not take responsibility for gender equality.

### **Recommendations for GRB for Cape Town Metropolitan Municipality**

Gender mainstreaming is poorly understood and so mainstreaming and GRB are not taking place. The City of Cape Town Metropolitan Municipality needs to:

- Train key decision makers (senior managers and political principals) in gender mainstreaming and GRB.
- Finalise the draft gender policy and implement a gender-mainstreaming strategy and plan of action that guides departments across the municipality.
- Train implementers in GRB and planning as well as budget officers to assist with tracking expenditure.
- Develop a monitoring and evaluation system that supports gender-responsive reporting (including the collection of sex-disaggregated data) across all departments.
- Utilise the eight strategic areas of focus to gain entry into gender mainstreaming and contribute to GRB across the municipality.

### **Mafube Local Municipality**

#### **Background**

Mafube Local Municipality is situated in the Free State Province. Nearly 25% of the population is dependent on manufacturing, and unemployment stands at around 24.6%. In Mafube, 77% of people live in poverty and 26.8% of households have no income.

### **GRB in Mafube Local Municipality**

Mafube Local Municipality has no formal gender-mainstreaming processes or gender budgeting in place.

### **Recommendations for GRB for Mafube Local Municipality**

Gender mainstreaming is a poorly understood concept within the municipality, and GRB is absent. Mafube Local Municipality needs to:

- Train decision makers (officials and political principals) in gender mainstreaming and GRB.
- Appoint a GFP.
- Develop a gender policy and gender-mainstreaming plan of action.
- Train implementers in GRB and planning.
- Develop reporting mechanisms that include sex-disaggregated data.

### **Thabo Mofutsanyane District Municipality**

#### **Background**

Thabo Mofutsanyane District Municipality is located in the Free State Province, and 57% of its residents live in rural areas. The unemployment rates within this district municipality are the highest in the province, at an average of 36.55%, although unemployment levels vary considerably among the local municipalities: Setsoto (23.11%) and Nketoana (23.94%) show lower levels than others, while Maluti a Phufong (49.42%) has the highest. The decline in the agricultural sector has adversely affected employment in the district. The district municipality was placed under Section 139(b) between November 2009 and September 2010.

### **GRB in the Thabo Mofutsanyane District Municipality**

There is no evidence that the municipality is involved in gender mainstreaming. However, the mayor has requested a shift away from budgeting for events to budgeting for programmes that benefit citizens' standard of living. This is an opportunity to consider how gender mainstreaming is approached in the municipality.

### **Why Gender Budgeting is absent in Thabo Mofutsanyane District Municipality**

Institutional arrangements do not support GRB, and officials have very little or no knowledge of gender mainstreaming and GRB.

### **Recommendations for GRB in Thabo Mofutsanyane Municipality**

The possibility is unrealistic in a municipality that experiences a range of difficulties and where gender mainstreaming is a poorly understood concept. Thabo Mofutsanyane Municipality needs to:

- Train decision makers (officials and political principals) in gender mainstreaming and GRB.
- Ensure that the GFP has a job description and budget (as well as a computer).
- Determine the role of the district in providing support for and monitoring of gender mainstreaming with the municipality, as well as within the local municipalities.
- Develop a gender policy and gender-mainstreaming plan of action.
- Train implementers in GRB and planning.
- Develop reporting mechanisms that include sex-disaggregated data.

### **Emfuleni Local Municipality**

#### **Background**

Situated in Gauteng Province, Emfuleni Local Municipality is a largely urbanised municipality, with a high population and density compared to other municipalities in the Sedibeng District. Emfuleni Local Municipality houses around

80% of the district's total population and is the economic hub of Sedibeng. However, unemployment (at 54%) is the highest in the province and is rising, driven primarily by immigration of unemployed people from other provinces into the area.

### **GRB in Emfuleni Local Municipality**

There is little evidence to suggest that women are recipients of gender equality and women empowerment interventions in the municipality. However, the GFP, a recent appointee, has suggested that the municipality (political principals and senior managers) prioritise gender mainstreaming.

### **Why GRB is absent in Emfuleni Municipality?**

GRB is not possible where officials have very little or no knowledge of gender mainstreaming, while the absence of a gender policy, a gender-mainstreaming strategy and plan of action does not support a gender-responsive approach. Without these key enablers, even with a GFP now in position to provide the necessary support, the municipality will not be able to ensure that all departments implement gender mainstreaming and GRB.

### **Recommendations for GRB in Emfuleni Local Municipality**

Gender mainstreaming is a poorly understood concept leading to an absence of GRB. Emfuleni Local Municipality needs to:

- Train decision makers (officials and political principals) in gender mainstreaming and GRB.
- Develop a gender policy and gender-mainstreaming plan of action.
- Train implementers (including budget officers) in GRB and planning.
- Develop reporting mechanisms that include sex-disaggregated data.

### **Randfontein Local Municipality**

#### **Background**

Randfontein Local Municipality is situated in Gauteng province and is home to a population with low levels of education and income. Nonetheless, it has become a migration destination for many South Africans from other provinces, especially the North West Province, seeking a better quality of life.

### **GRB in Randfontein Local Municipality**

The municipality attaches significant interest to empowering women through support for women in LED and as beneficiaries of tenders. However, these projects fall within the constructed roles of women (e.g. provision of clothing and uniforms, poultry farming) and, as officials note, tend to be ad hoc rather than part of a deliberate strategy towards women empowerment and gender equality. Nonetheless, such projects serve as good entry points towards a gender-mainstreaming approach.

The municipality is conscious of its role in ECD and gives varying levels of support to the 92 centres registered in the municipality.

Another example of female empowerment is the awarding of one tender to a woman in housing construction during the last financial year. No further information was provided during the assessment.

### **Why GRB is absent in Randfontein Local Municipality?**

Moving away from women-specific projects towards a sustainable approach to women empowerment and gender equality will be difficult because existing institutional arrangements and strategic interventions do not support an approach to gender mainstreaming across the municipality. For example, there is no GFP or SPU, no gender policy and no gender-mainstreaming strategy to support GRB across all departments of the municipality. Furthermore officials have very little or no knowledge of gender mainstreaming.

### **Recommendations for GRB in Randfontein Local Municipality**

Although there are women-specific projects, gender mainstreaming is a poorly understood concept leading to an absence of GRB. Randfontein Local Municipality needs to:

- Appoint a GFP.

- Train decision makers (officials and political principals) in gender mainstreaming and GRB.
- Develop a gender policy and gender-mainstreaming plan of action.
- Train budget officials in GRB and planning.
- Develop reporting mechanisms that include sex-disaggregated data.

### ***Amathole District Municipality***

#### **Background**

Amathole District Municipality is situated in the Eastern Cape province and is home to 1.7 million people. The district's economy is dominated by Buffalo City, King William's Town, Mdantsane and the provincial administrative capital Bisho. Buffalo City accounts for 42% of the district's population, 83% of the district's economic output and 72% of the district's formal employment. Sectors that provide formal employment in the district are public services (75 000 jobs), manufacturing (27 000 jobs), trade (25 000 jobs) and agriculture (17 000 jobs). The district's existing manufacturing sector includes the automotive, textile, pharmaceutical, electronics and food-processing industries. Nevertheless, unemployment and poverty levels are high, particularly in local municipalities in the former Ciskei and Transkei.

#### **GRB in Amathole District Municipality**

Although the municipality has a GFP and a SPU, the institutional arrangements do not support a mainstreaming approach, as the GFP has minimal/no influence on gender mainstreaming across all departments within the municipality. A number of intervention areas potentially support women empowerment, e.g. construction and LED projects. However, the process is ad hoc rather than part of a sustainable mainstreaming strategy for women empowerment and gender equality.

#### **Why GRB is absent in Amathole District Municipality**

The institutional arrangements in Amathole District Municipality do not support the gender equality agenda, while officials have very little or no knowledge of gender mainstreaming, making GRB unlikely.

#### **Recommendations for GRB for Amathole District Municipality**

Gender mainstreaming in the Amathole District Municipality is a poorly understood concept, and GRB is absent. The municipality needs to:

- Determine the role of the district in providing the necessary support and monitoring of gender mainstreaming within the municipality, as well as to the local municipalities.
- Provide the necessary support to the GFP and SPU to implement gender mainstreaming across the municipality.
- Ensure that the GFP is has sufficient capacity to provide support for GRB.
- Train decision makers (officials and political principals) in gender mainstreaming and GRB.
- Develop a gender policy and gender-mainstreaming plan of action.
- Train implementers and budget officials in GRB and planning.
- Develop reporting mechanisms that include sex-disaggregated data.

The findings of the seven case studies are summarised in Table 10.3.

Table 10.3. Summary of the case study findings

	Maletswai LM EC	Emfuleni LM GP	Mafube LM FS	Randfontein LM GP	Thabo Mofutsa - Nyana DM FS	Amathole DM EC	City of Cape Town Metro WC
1. Approved gender policy							
2. A gender mainstreaming strategy							*CS&SD <sup>3</sup>
3. Dedicated GFP (work portfolio)	*	*			*	*	*
4. An SPU unit	*				*	*	*
5. SPU trained in gender mainstreaming							*
6. Budget officers trained in gender mainstreaming							*some
7. Senior managers trained in gender mainstreaming							*some
8. Senior managers regard gender mainstreaming as a high priority			*	*			
9. Political principals regard gender mainstreaming as a high priority		*	*	*			
10. Gender equality part of performance agreement of senior managers							*some
11. Gender equality indicators	*some						*some
12. Information disaggregated by sex	*some			*some			*
13. All departments plan / budget for gender equality							
14. Monitoring plan for gender equality							*some
15. Sex disaggregated reporting from all departments							
16. Sex disaggregated public expenditure incidence analysis							*partly
17. Tenders issued to 100% women ownership	*			*			*
18. Tenders issued to ≥50% women ownership	*					*	*
19. Tenders issued to women-owned companies ≥R500,000	*			*		*	*
20. Tenders issued to women-owned companies ≤R500,000				*		*	*
21. ECD centres run by the municipality				*			
22. Participation of IDP officer in the completion of questionnaires	*						*
23. Participation of budget officers in completion of questionnaires	*	*	*				
24. Participation of councillors in completion of questionnaires	*						
25. Funded projects: calendar events e.g. Sixteen Days, Women's Month, etc	*	*		*	*	*	*
26. Funded projects: LED	*					*	*
27. Funded projects: GBV	*						*
28. Indicates the number of indigent women in the municipality							

NB: \* indicate existence



As suggested in Table 10.3, gender mainstreaming and gender budgeting in local government is limited. The reasons for this include:

- The absence of an approved gender policy across all municipalities.
- No municipality has a municipal gender-mainstreaming strategy.
- While municipalities generally provide resources (human and financial) for GFP and SPU portfolios, incumbents are not trained in gender mainstreaming and gender budgeting.
- Personnel in management (who make decisions) and budget officers (who track expenditure) have not been trained in gender mainstreaming.
- Gender equality indicators and the collection of sex-disaggregated information are limited.

The GRB study included an additional component that addressed the gender sensitivity of the budgeting process in the areas of LED, ECD, water and sanitation, and housing. These four areas of service provision impact significantly on the ability of women to experience substantive equality and are good indicators to measure quality of life.

Women are the primary caregivers, and so providing adequate water and sanitation will have an impact on women's time. This includes collecting water at the communal tap or nearest water source, as well as the availability of water for cooking, cleaning or caring for children, the elderly and sick people.

The availability of adequate housing or shelter affects the way in which women can provide for their dependents, especially given the increase in women-headed households. Adequate housing also has an impact on women's safety (their own and that of their dependents), particularly in areas that experience high levels of gender-based violence.

The availability of affordable ECD allows women to participate in other income-generating activities and to play greater roles as community leaders in public decision making. (Besides which, quality education in the early years of a child's life leads to more positive educational outcomes, enabling the next generation to shift away from the circumstances of poverty). Women experience a greater burden of responsibility for poorly educated children and unemployed young adults.

For women, the shift away from the cycle of poverty is closely linked to economic independence and the acquisition of relevant skills. Some of the barriers to women's economic empowerment include accessing financial institutions, the availability of capital, business skills and access to markets. Because women's income is so strongly linked with households' ability to shift away from poverty, the economic empowerment of women cannot be over-emphasised.

Gender responsive planning and budgeting requires commitment to a specific set of outcomes that can be reported on as part of gender equality commitments. GRB requires that municipalities implement mechanisms to disaggregate consciously all data by sex. Municipalities should comply with a set of indicators that can measure substantive equality; these four areas of service are key to assessing whether gender mainstreaming (and by implication GRB) is taking place in a municipality.

Table 10.4. Summary of findings in four areas of service provision

	Maletswai LM	Emfuleni LM	Mafube LM	Randfontein LM	Thabo Mofutsanyana DM	Amathole DM	City of Cape Town Metro
1. LED funding for companies that are 100% Women Owned	*			*			*
2. LED funding for companies which are 50%-99% Women Owned	*			*		*	*
3. Tenders of ≥R500,000 issued to Women Owned Companies	*			*		*	
4. Tenders of ≤R500,000 issued to Women Owned Companies	*			*		*	
5. A municipality has ECD Policy Guidelines (detailing operational relationship with province)				*			
6. There are ECD Centres that are registered in the Municipality	*			*			*
7. There are ECD Centres run / managed by the municipality				*			
8. Does the municipality collect sex disaggregated data on the provision of housing? If so, when was the last update?				*		*	
9. ≥ 50% of households served water pipe connection							*
10. ≥ 50% of households served by communal water pipe	*					*	*

As suggested in Table 10.4, the main finding of the seven case studies in the specific focus areas indicates that municipalities are currently not well placed to provide requested data. Mafube, Emfuleni and Thabo Mofutsanyane were unable to provide any data, while the City of Cape Town only provided data for LED. It was not possible to verify information provided by Amathole and Randfontien, as the data was filled in by one person some weeks after the fieldwork had been conducted.

## 10.5 Conclusion

If municipalities are to move towards a gender-mainstreaming approach and institutionalise GRB, the following are key areas of intervention:

- **Collection of gender-disaggregated data** is fundamental for GRB and planning. Without meaningful data on the situation of men and women, an analysis of target group(s) is not possible.
- **Sensitisation of decision makers** (political principals and officials) to raise awareness about gender issues and to provide them with skills to analyse and address issues and to act as change agents. Gender mainstreaming and GRB is not only about planning and budgeting but also about the local government approach to women empowerment and gender equality

- **Increase the number of women in the decision-making processes of local government** where they can ensure that gender commitments are translated into fiscal commitments. Within patriarchal structures, women are more likely to champion the cause of gender equality and speak directly to the needs and priorities of women.
- **Sensitisation of planning and budget officials** so that municipal officials who plan and draw up budgets see that their work may affect women and men differently. Gender sensitisation must not only focus on a change in attitudes towards patriarchy and gender equality, but also provide officials with skills to plan for gender responsiveness and to track budgets accordingly.
- **Training and capacity building** to ensure that officials can develop actions at every stage of the project cycle that supports a gender-mainstreaming approach. Awareness raising and sensitisation are not enough to empower municipal officials across all departments, but must include planning, project implementation, budgeting, community participation and monitoring and evaluation.
- **Advocacy** so that decision makers (political principals and officials) are influenced to ensure that women empowerment and gender equality is part of the municipality's strategic agenda. Raising awareness of gender mainstreaming and GRB is central to the issue of sustainability (and the move away from events-driven equality).
- **Institutionalising GRB** not simply as an add-on activity with reports provided by GFPs and SPUs. Municipal budget guidelines, including planning formats, annual budget circulars, quarterly performance and annual reporting requirements should be designed in ways that guide gender-responsive planning and budgeting.
- **Gender analysis of existing revenues and expenditures**, so that local government finance officers can promote post-budget, gender-aware impact analysis to determine GRB and the impact of public finance. The way in which government raises revenues and its pattern of public expenditures could support gender-blind macroeconomic planning, which will unfairly disadvantage women.
- **GRB guidelines** for government departments, issued by national and provincial treasuries in consultation with the Department of Cooperative Government and local governments. Gender responsive planning and budgeting requires that government departments approach gender equality as part of fulfilling their core business rather than just an add-on activity. Such guidelines would advance the agenda on gender mainstreaming and the institutionalising of GRB

## 10.6 Recommendations

Two sets of recommendations are proposed, one that requires the attention of national and provincial governments, and the other that requires the attention of municipalities themselves.

With respect to assessing gender-responsive budgeting in the local government, the Commission recommends that:

- National and provincial governments should:
  - Run gender budgeting pilots in a few municipalities first and evaluate results before wider application. These pilots could be linked to ensuring gender disaggregated data for key conditional grants as part of the grant framework in the Division of Revenue Act.
  - Ensure municipal IDPs institutionalise gender planning by sector (e.g. water and sanitation, LED etc.) and include gender disaggregated performance indicators and targets.
  - Provide gender budgeting good practice guides and toolkits.
  - Provide guidelines for collecting sex-disaggregated data for budgeting processes and ensure that municipalities have the capacity to analyse budgets from a gender perspective.
- Local government should:
  - Institutionalise gender-responsive budgeting process linked to IDPs.

- Build capacity for gender mainstreaming and GRB at local level.
- Ensure gender-responsive appropriations and budget allocations.
- Ensure gender-sensitive public participation and consultations at local level.

## References

- Balmori, HH. 2003. How Gender Budget initiatives are implemented in practice, paper presented at the *Pan Island Gender Budget Conference, Pan Islands*. July 8.
- Budlender D (ed) (1996) *The Women's Budget* Cape Town: Institute for Democracy in South Africa
- Budlender D (ed) (1997) *The Second Women's Budget* Cape Town: Institute for Democracy in South Africa
- Budlender D (ed) (1998) *The Third Women's Budget* Cape Town: Institute for Democracy in South Africa
- Budlender, D. 2004a. The Department of Labour. Paper obtained through personal communication, 31 July 2005.
- Budlender, D. 2004b. *Why Should We Care About Unpaid Work*, Johannesburg: UNIFEM,
- Budlender, D. 2005. Expectations versus Realities in Gender-responsive Budget Initiatives. Draft Working Document. Geneva, UNRISD.
- Budlender, D. 2008. Integrating Gender-Responsive Budgeting into Aid Effectiveness Agenda; Ten Country Overview Report, Community Agency for Social Enquiry, November 2008.
- Budlender, D and Hewitt, G. 2003. Engendering Budgets A Practitioners' Guide to Understanding and Implementing Gender-Responsive Budgets. UK, Commonwealth Secretariat.
- Budlender, D, Elson, D, Hewitt, G, Mukhopadhyay, T. 2002a. A Profile of Country Activities, in *Gender Budgets Make Cents: Understanding Gender Responsive Budgets*, pp 131–64. London: Commonwealth Secretariat.
- Budlender, D, Elson, D, Hewitt, G and Mukhopadhyay T. 2002b. Gender Budgets Make More Cents Country Studies and Good Practice. UK, Commonwealth Secretariat.
- Ça atay, N, Keklik, M, Lal, R and Lang, J. 2000. Budgets as if people mattered: democratizing macroeconomic policies. Paper Presented at the *Fourth World Conference on Women (Beijing) and the World Summit for Social Development (Copenhagen)*. Available from [http://www.undp.org/seped/publications/conf\\_pub.htm](http://www.undp.org/seped/publications/conf_pub.htm).
- Chakraborty, LS. 2007. Gender responsive budgeting and fiscal decentralisation in India: A preliminary appraisal, *Working Paper*. India: National Institute of Public Finance and Policy
- Chakraborty, LS and Bagchi, A .2007. Fiscal Decentralisation and Gender Responsive Budgeting in South Africa: An Appraisal. *Working paper*. India: National Institute of Public Finance and Policy.
- Commonwealth Secretariat. (1999) *Gender Budget Initiative*. Commonwealth Secretariat, London.
- Elson, D. 2003. Gender mainstreaming and gender budgeting Paper presented to a conference on 'Gender Equality and Europe's Future' European Commission, Brussels, 4 March.
- Maletswai Municipality 2005. *Maletswai Municipality Spatial Development Framework*, Maletswai, South Africa
- Reyes, C, Budlender, D and Melesse, M. 2009. Gender-Responsive Budgeting through the Community-Based Monitoring System (CBMS), Lens: Implementing the Community-Based Monitoring System in a Way that facilitates Gender-Responsive Budgeting. Available online <http://www.pep-net.org/fileadmin/medias/pdf/CBMS-GRB/Budlender-Reyes-Melesse.pdf>
- Sarraf, F. 2003. Gender-Responsive Government Budgeting. *IMF Working Paper*, New York
- Sharp, R. 2003. *Budgeting for equity: Gender budget initiatives within a framework of performance oriented budgeting*. New York: UNIFEM.
- Sharp R and R. Broomhill 2002. Budgeting for Equality: The Australian Experience, *Feminist Economics* Volume 8, Issue 1, 2002

- StatsSA (Statistics South Africa). 2011. *Report on the Living Conditions of Households in South Africa*. Pretoria: StatsSA.
- Stotsky, JG. 2007. „Budgeting with Women in Mind, *Finance and Development*, 44(2). June.
- UNIFEM. 2005. *Tools for a Gender-Sensitive Analysis of Budgets*. Johannesburg: UNIFEM.
- World Bank. 2005. *Integrating Gender Issues into the World Bank's Work The Role of the Norwegian–Dutch Trust Fund for Gender Mainstreaming GENFUND*. Washington, DC: World Bank.

320 | Submission for the 2013/14 Division of Revenue