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Institute for Economic Research on Innovation
TSHWANE UNIVERSITY OF TECHNOLOGY

SciSTIP
DST-NRF Centre of Excellence in Scientometrics and Science, Technology and Innovation Policy

Developments in South African STI Policy: Emerging Future Challenges

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South-Africa Keynote

SPRU-AFRICA CONFERENCE: 'The Past and Future of Innovation Policy'

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Outline

1. Introduction
   - Selected Socio-economic Characterisation
   - NSI Periodisation and Policy Evolution
2. R&D Data
3. Higher Education Reform
4. NSI Challenges
5. Initiatives
6. Conclusions
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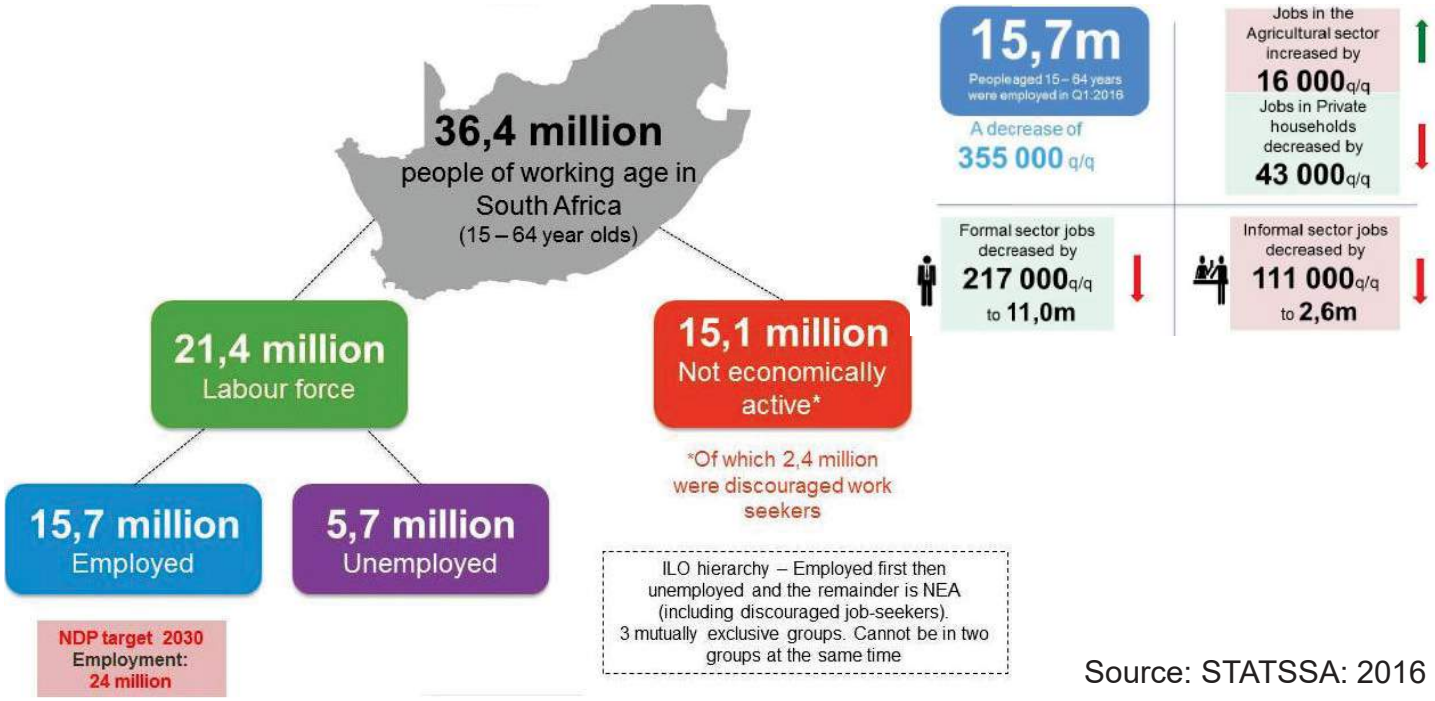
Selected Basic Domestic Characteristics



Source: STATSSA: 2016

South African Policy Periodisation

	-1989	*~1990*	*~1994*	*~1997*	*~2001*	*~2007*	*2012+*
Political Economy	Racial Capitalism	Siege Economy	Mixed	Mixed Market-led	Mixed Market-led	Mixed State-led	Mixed Market-led
Dominant Ideology	Apartheid	Dual Power	Post-Keynesian	Structural Adjustment	Neo-liberal	Neo-liberal	Neo-liberal
Governance Framework	Authoritarian - Military	*Negotiations*	Democratic Developmental	New Public Management	NPM	NPM	NPM
Macroeconomic Policies	Normative Economic Model	*Normative Economic Model*	**R**econstruction and **D**evelopment **P**rogramme	**G**rowth, **E**mployment **A**nd **R**edistribution Strategy	**A**ccelerated and **S**hared **G**rowth **I**nitiative for **SA**	**N**ew **G**rowth **P**lan	**N**ational **D**evelopment **P**lan
Microeconomic Policies	Sub-regional Industrialisation	Deregulation & GATT	WTO	Privatisation & Structural Adjustment	Reducing Costs of Doing Business	Industrial Policy Action Plans	Infrastructure and Sector Strategies
Science, Technology, & Innovation	Science and Technology discrete and stratified	International Mission Review and Contestation	Green Paper on S&T	White Paper on S&T (NSI-Perspective)	The National Research and Development Strategy	The 10-year Innovation Plan	Ministerial Review of the Science, Technology and Innovation

Source: adapted from Maharajh: 2011

South African STI Policy Evolution

~20kya – Long evolutionary background

1652 – 1993 - Insertion into Mercantilist Circuit (Colonialism), Racial Capitalism, Apartheid, Crisis

1994 - Green Paper on Science and Technology

1996 - White Paper on Science and Technology: Preparing for the 21st Century

1997 - White Paper on Higher Education 3: A Programme for the Transformation of Higher Education

2002 - The National Research and Development Strategy

2006 - The 10-year Innovation Plan

2012 - Ministerial Review of the Science, Technology and Innovation Landscape

2013 - The National Development Plan (Vision 2030)

2014 - White Paper for Post School Education and Training

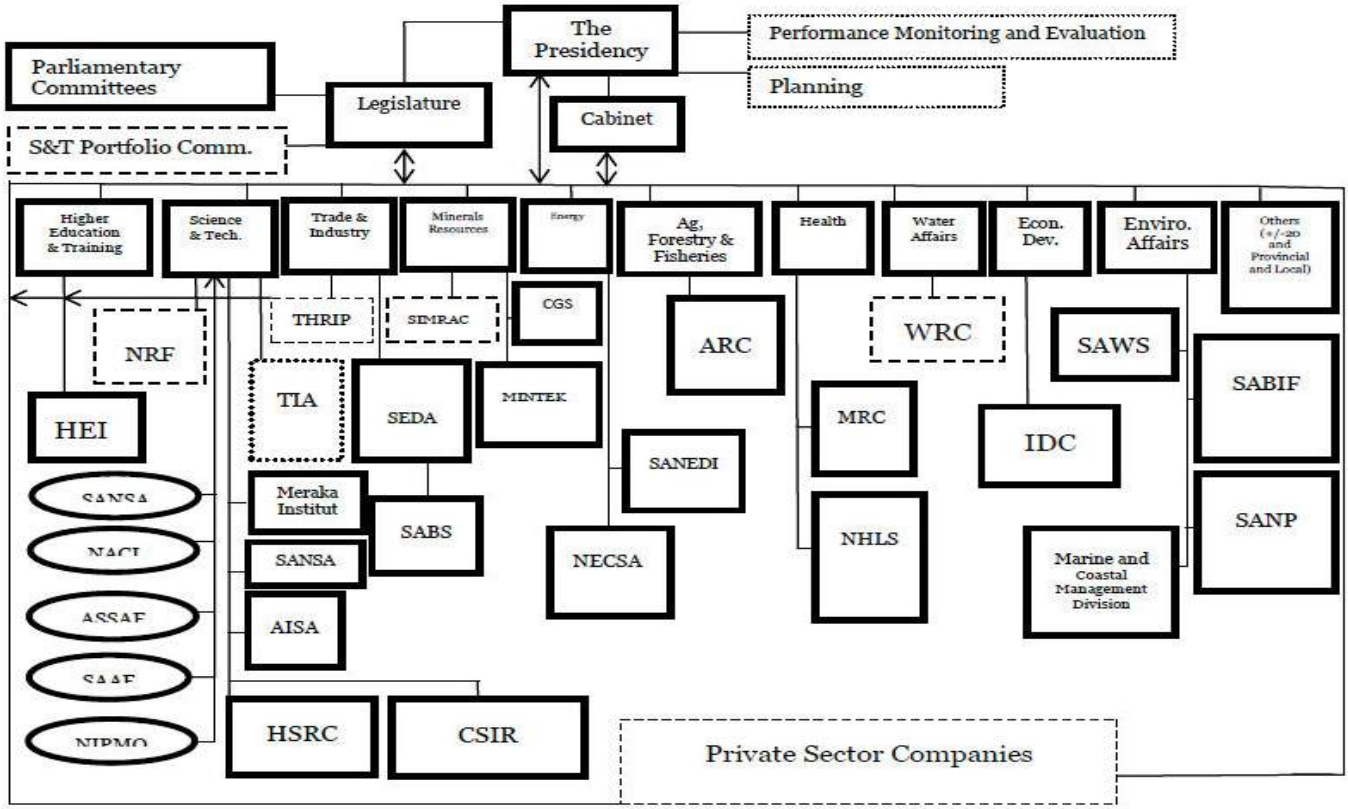
2016 – Preparing for Next Phase – new White Paper

STI and the NSI in the RSA

"Innovation tends not to arise by itself; it is generated and sustained through the efforts of people: innovation is where the spirit is. It cannot be legislated, or brought about by edict. It comes from individuals and from creative and interactive communities. Like happiness, innovation wilts in a climate of criticism and repression yet thrives in an environment of encouragement and support" (Canadian AG quoted in RSA: 1996).

"Innovation is the application in practice of creative new ideas" (RSA: 1996).

"a national system of innovation can only be judged as healthy if the knowledge, technologies, products and processes produced by the national system of science, engineering and technology have been converted into increased wealth, by industry and business, and into an improved quality of life for all members of society" (RSA: 1996).

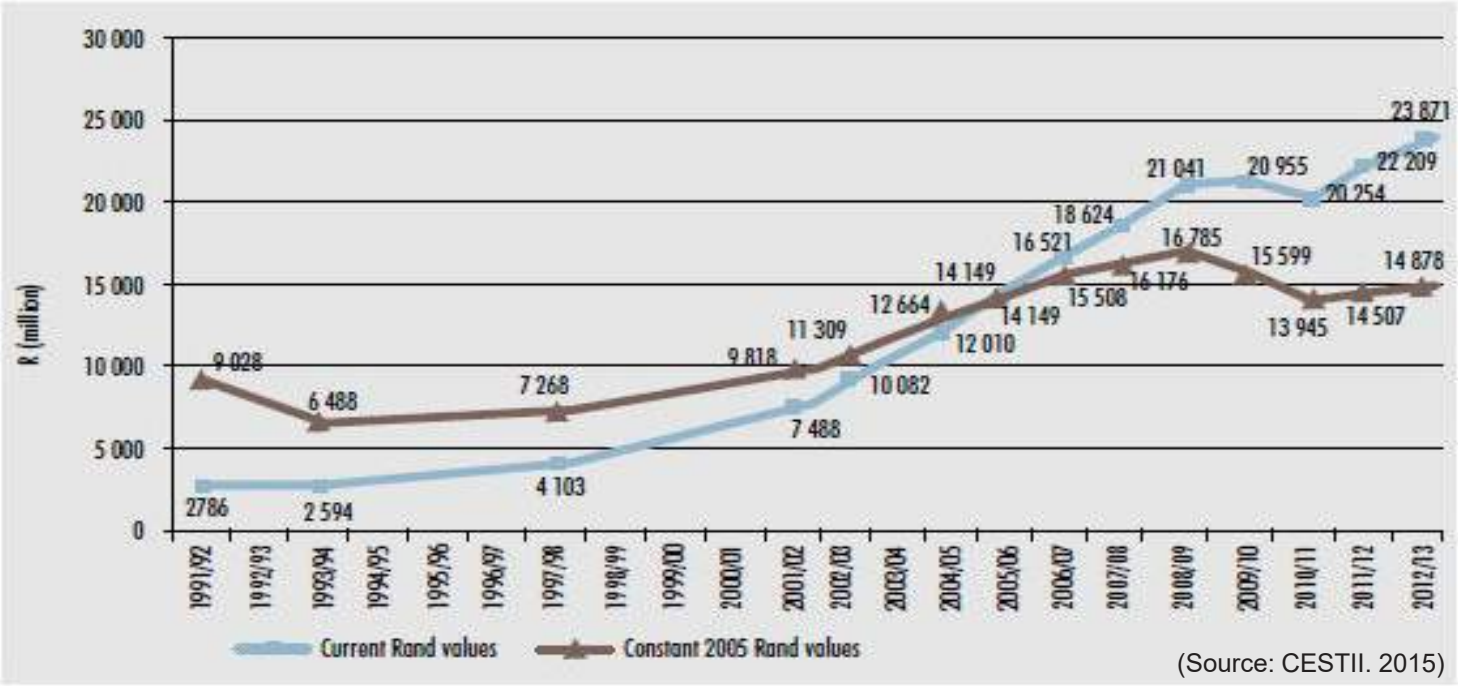


Basic S&T Data

(Source: CESTII. 2015)

KEY INDICATOR	VALUE		
	2010/11	2011/12	2012/13
Gross domestic expenditure on R&D (GERD) (R million)	20 254	22 209	23 871
Gross domestic product (GDP) at current prices (R million)	2 664 269	2 917 539	3 138 980
GERD as a percentage of GDP (%)	0.76	0.76	0.76
Civil GERD as a percentage of GDP (%)	0.71	0.72	0.72
Basic research (R million)	4 848	5 440	6 031
Total R&D personnel (FTE*)	29 486.4	30 978.4	35 050.3
Total researchers (FTE*)	18 719.6	20 115.1	21 382.4
Total researchers (FTE*) per 1 000 in total employment	1.4	1.5	1.5
Total R&D personnel (FTE*) per 1 000 in total employment	2.2	2.3	2.4
Total researchers (headcount)	37 901	40 653	42 828
Female researchers (headcount) as a percentage of total researchers (%) #	41.7	42.3	43.7
Total employment	**13 118**	**13 497**	**14 558**

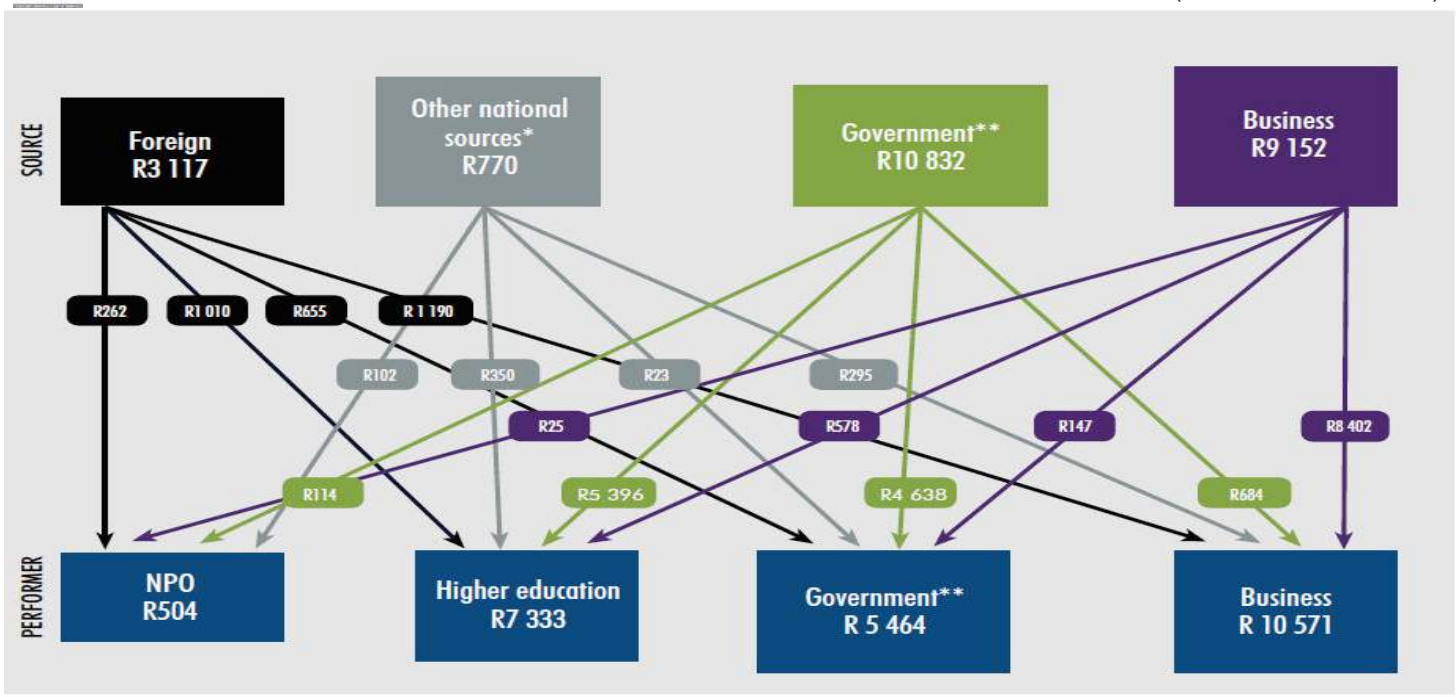
GERD (1991- 2013) Current & Constant [2005] Values



(Source: CESTII. 2015)

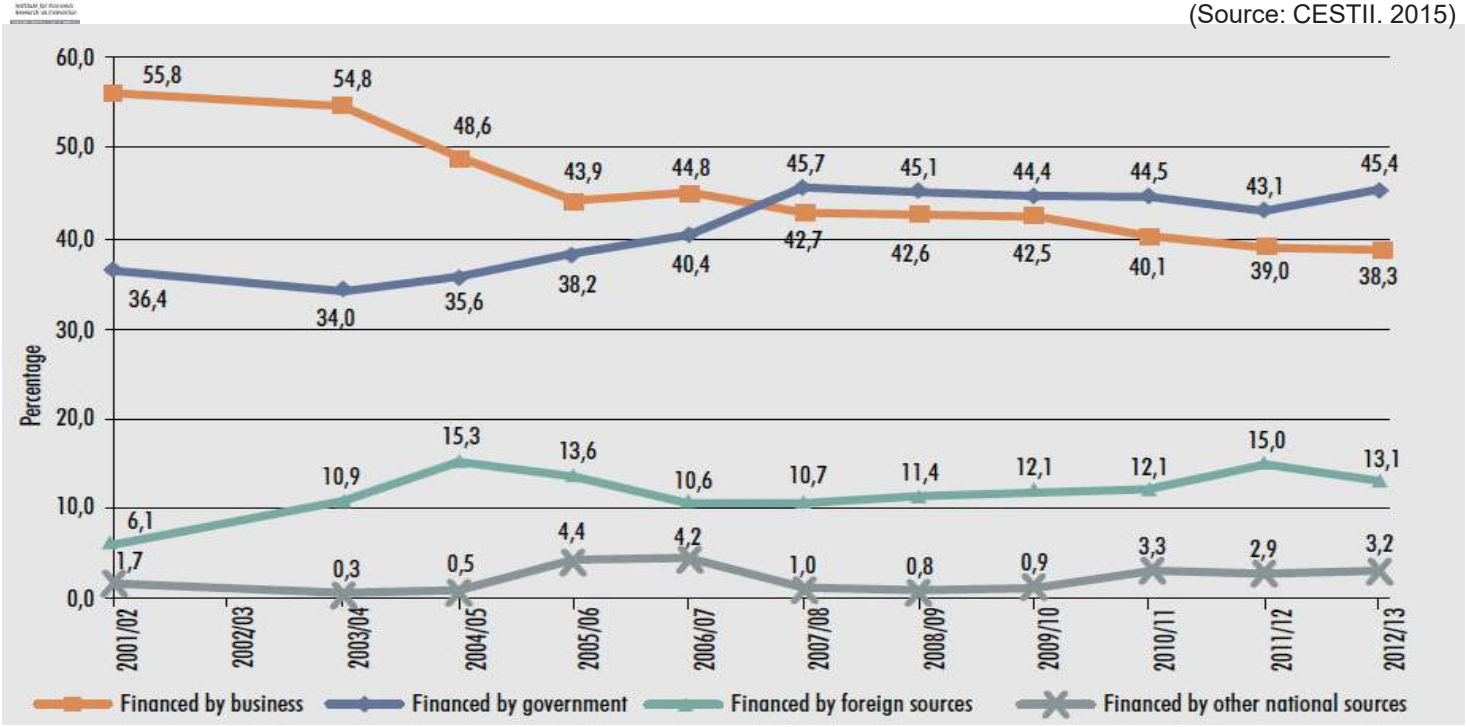
Major Flows of Funds (2012/13)

(Source: CESTII. 2015)

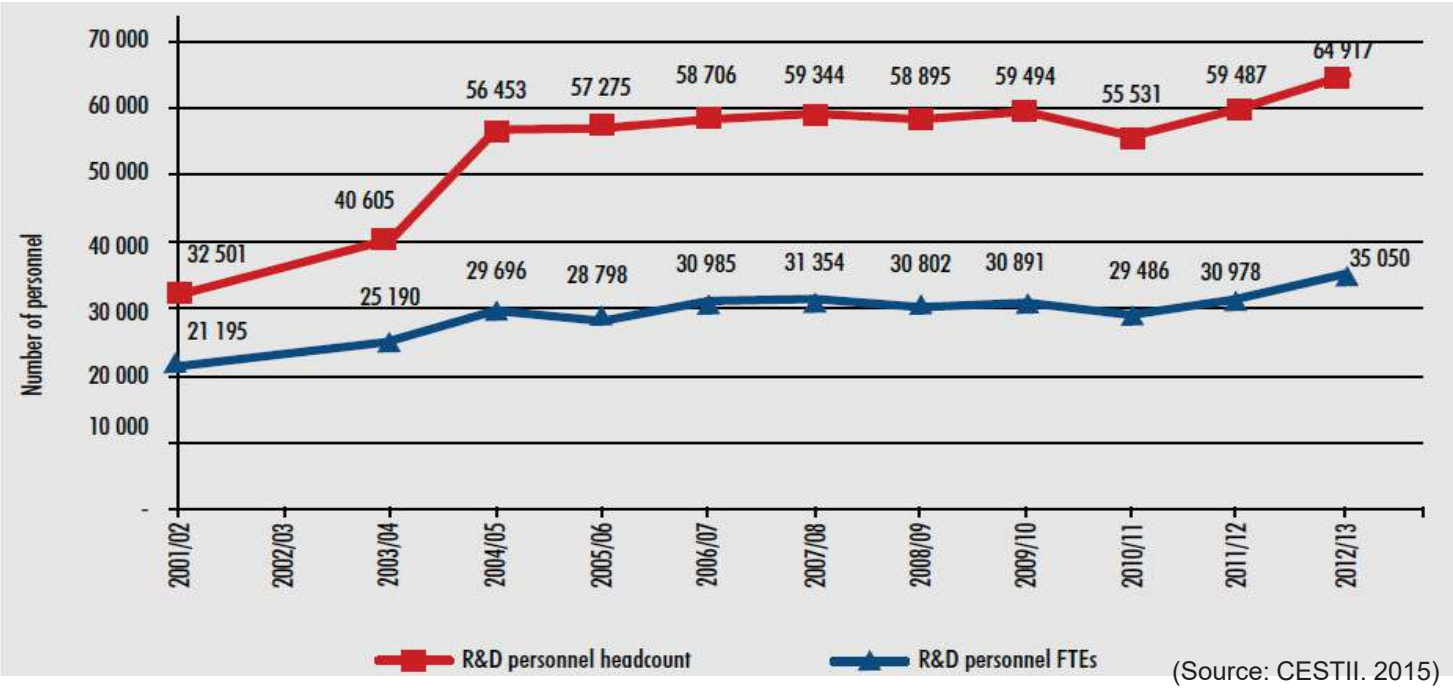


GERD by Source of Funding (2001 – 2013)

(Source: CESTII. 2015)



R&D Personnel (2001 – 2013)



(Source: CESTII. 2015)

National Qualifications Framework

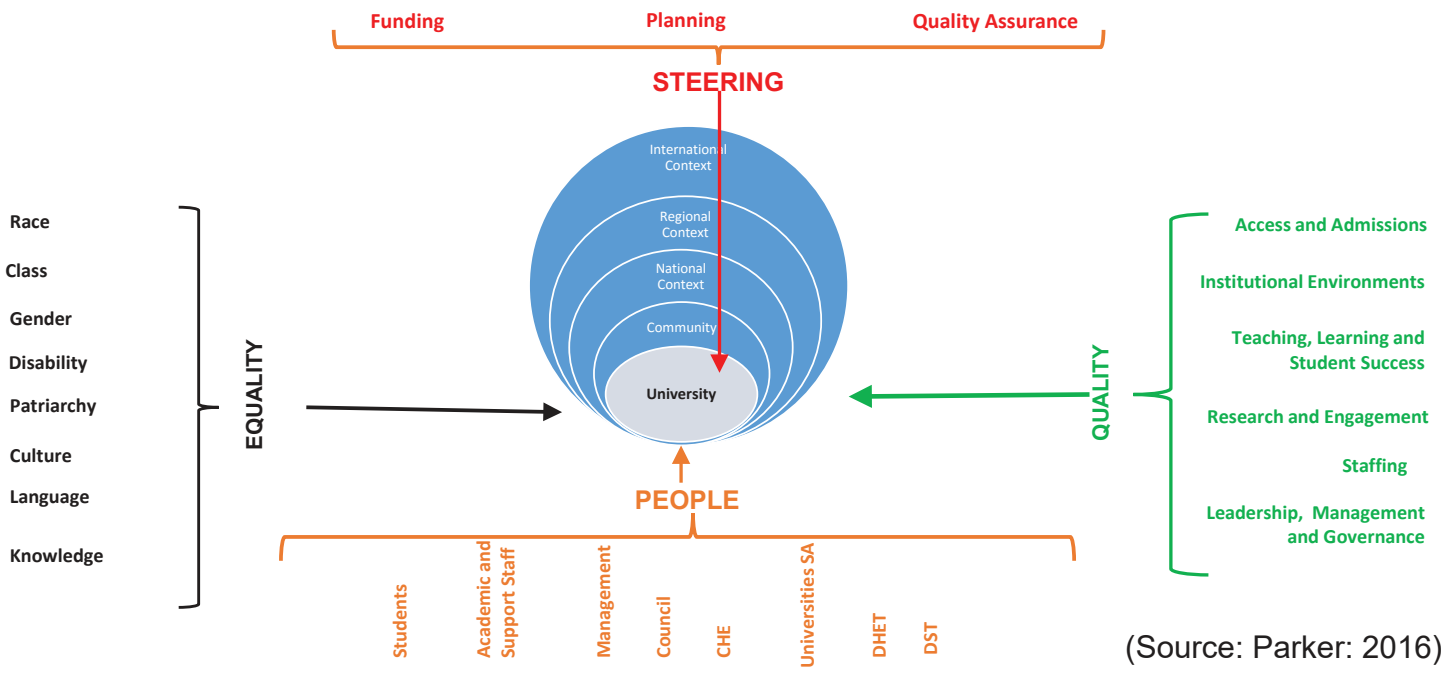
Levels	Band	Qualification type	School	ABET	NCV	NATED	OC	Providers	Q-type
10	HET	Doctoral degree (professional)						University	Degrees
9		Masters degree (professional)							
8		Bachelor honours degree					OC 8		Diplomas
		Postgraduate diploma							
7		Bachelor's degree					OC 7		
		Advanced diploma							
6		Diploma advanced certificate					OC 6		Certificates
5		Higher certificate				N4-N6	OC 5	TVET	
4	FET	National certificate	Grade 12 / NSC		NCV 4	N3	OC 4		
3			Grade 11		NCV 3	N2	OC 2		
2			Grade 10		NCV 2	N1	OC 1		
1	GET	General certificate	Grade 9	Level 4				ABET centres	
			Grade 7	Level 3					
			Grade 5	Level 2					
			Grade 3	Level 1					

Notes:
GET – General Educational and Training
ABET – Adult Basic Education and Training
NCV – National Certificate Vocational

FET – Further Educational and Training
TVET – Technical and Vocational Education and Training
NATED – Nationally Accredited Technical Education Diploma

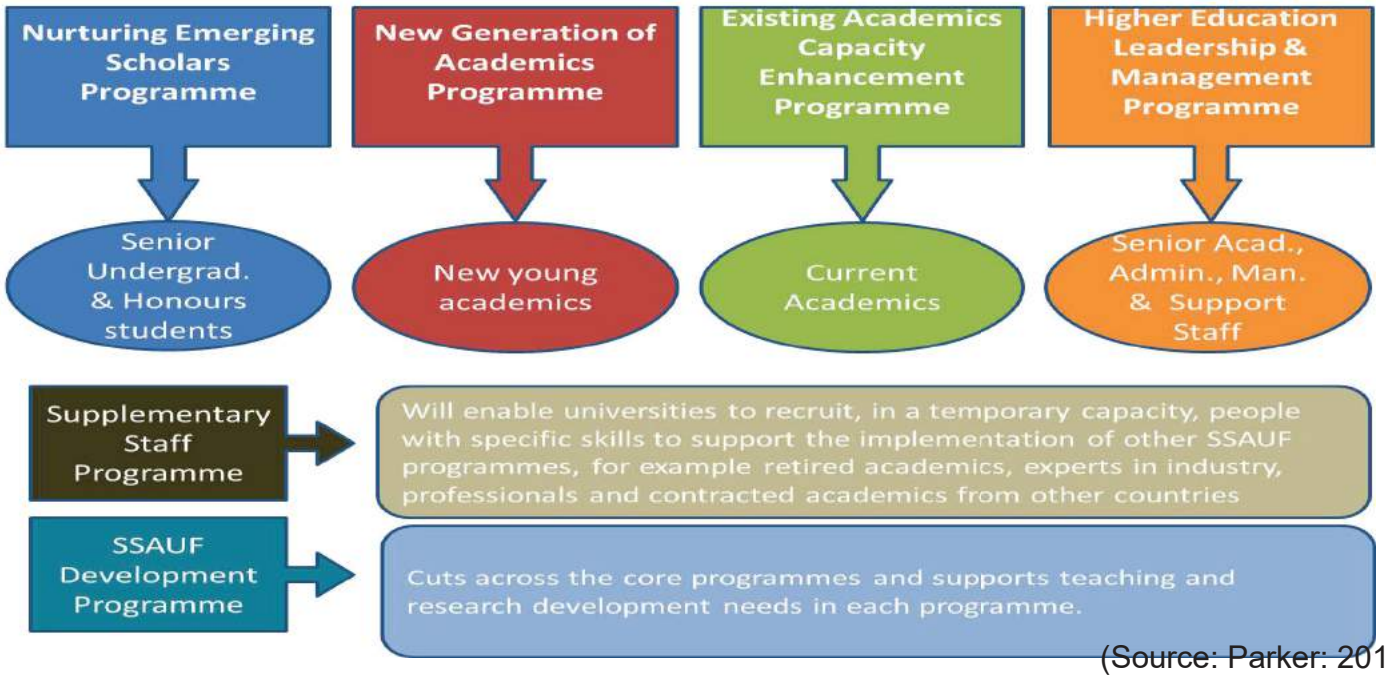
HET – Higher Education and Training
NSC – National Senior Certificate
OC – Occupational Certificate

Higher Education Reform Model



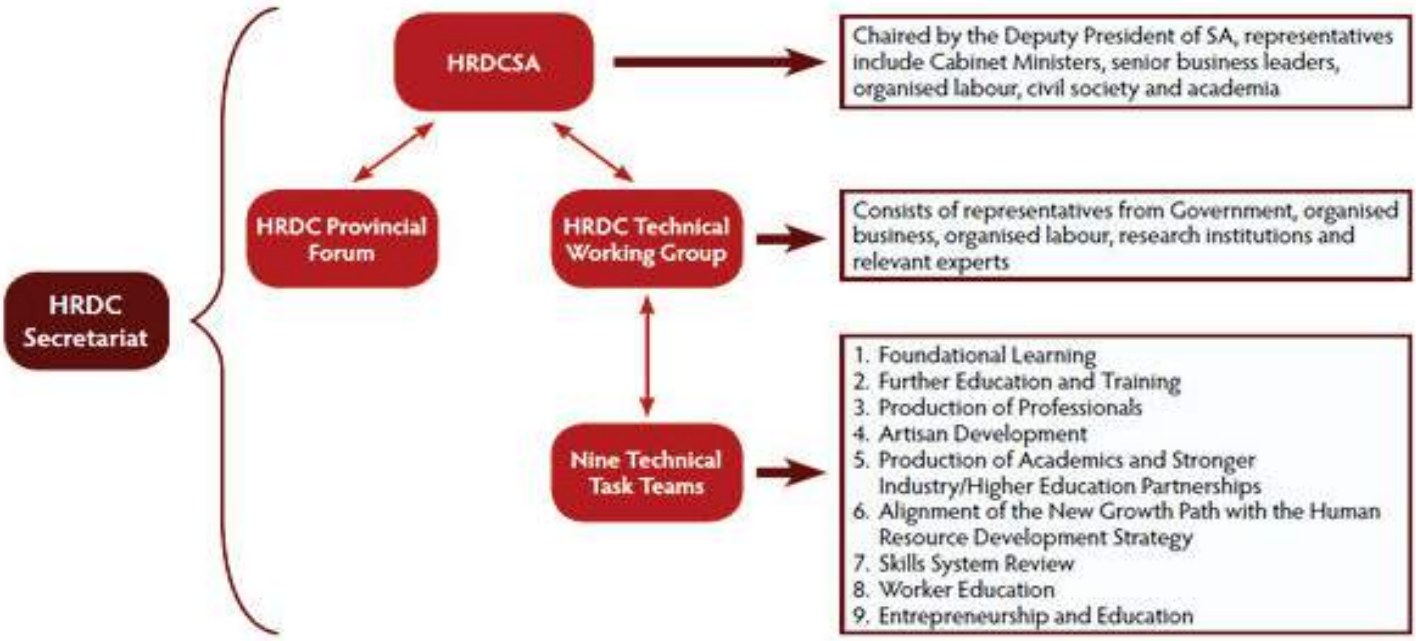
(Source: Parker: 2016)

Higher Education Reform Initiatives



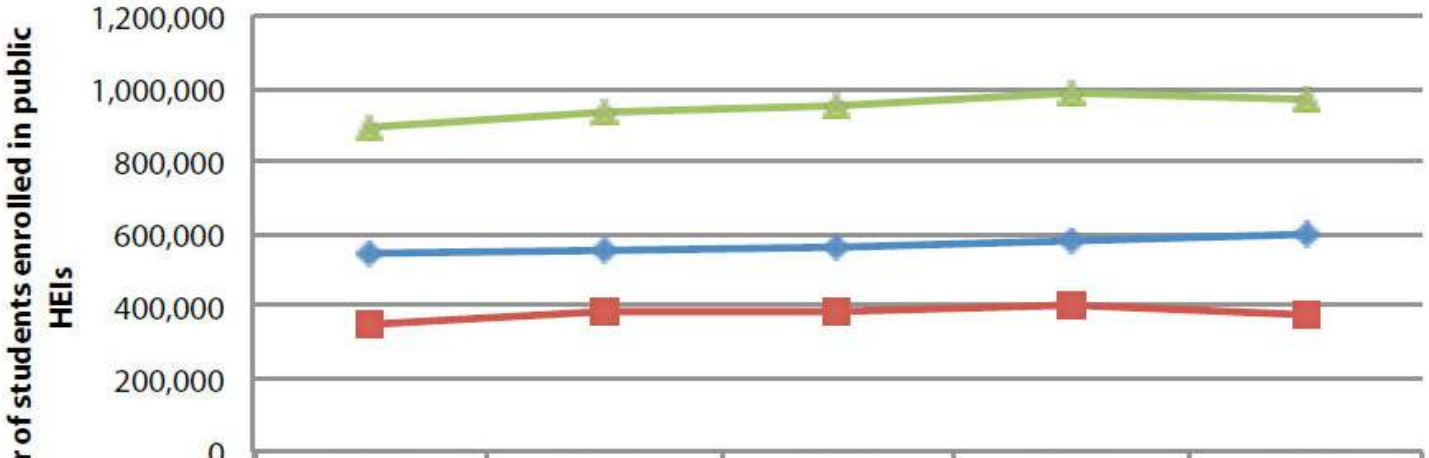
(Source: Parker: 2016)

Human Resources Development Council of South Africa



(Source: NACI: 2016)

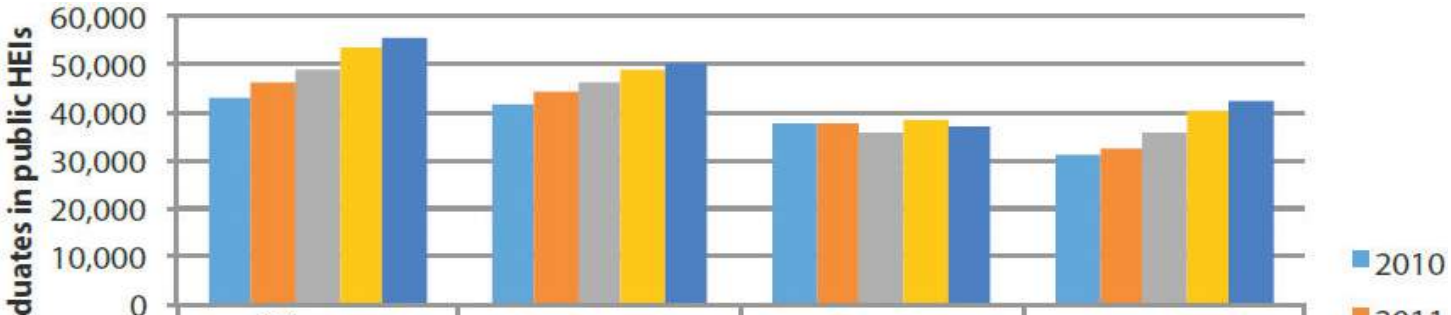
Higher Education Enrolments (2010-2014)



	2010	2011	2012	2013	2014
Contact	545,759	556,695	566,239	581,048	596,824
Distance	347,177	381,506	387,134	402,650	372,331
Total	892,936	938,201	953,373	983,698	969,155

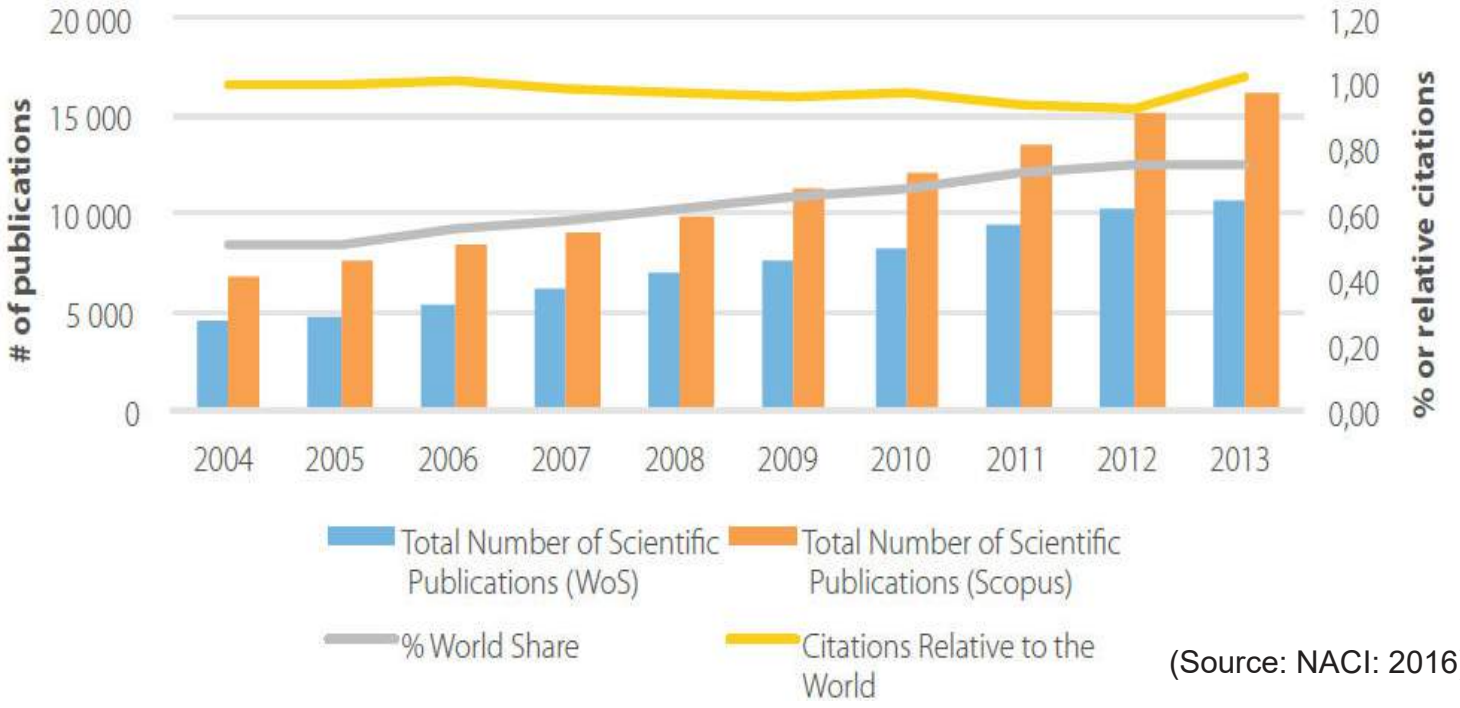
(Source: NACI: 2016)

Higher Education Graduations (2010-2014)



	Science, Engineering and Technology	Business and Management	Education	All other Humanities
2010	42,760	41,657	37,892	31,016
2011	46,100	44,155	37,879	32,484
2012	48,848	46,042	35,478	35,618
2013	53,176	49,051	38,212	40,384
2014	55,574	50,381	37,076	42,344

Scientific Publications (2004 – 2013)



(Source: NACI: 2016)

Outcomes of the SA Ministerial Review

- The state's investment on innovation has been biased towards "big science" and inadequate focus had been placed on requirements for meeting the social development priorities;
- The role of social innovation in the NSI is under-conceptualised and under-developed;
- Supply-side thinking was prevalent and this contributed to continuing poor responses to market and social demand; and
- Inadequate institutionalization of science, technology and innovation measurement capacity.

(Source: DST: 2012)

STI Challenges (Domestic)

1. The creation of a responsive, coordinated and efficient NSI with robust planning, monitoring and evaluation capacity.
2. The development and strengthening of regional and provincial innovation systems and capabilities to meet community and industry demands.
3. The expansion and transformation of human resources for STI.
4. The commercialisation of the results of public research and development.
5. The improvement of knowledge generation and diffusion.
6. The provision and maintenance of state-of-the-art STI infrastructure.
7. Water, energy and food security.
8. The financing of the system, especially as regards increasing private-sector investment in RDI.
9. The uptake of locally developed technologies by government.

(Source: DST: 2016)

STI Challenges (Global)

1. The effects of a fiscally constrained environment on STI and the need to demonstrate how public investment in STI benefits the economy and society.
2. Better impact indicators and impact assessments required.
3. How to strengthen the innovation capacity of small and medium enterprises.
4. The rapid digitisation of the world through the development of information and communication technologies, open science and big data. Infrastructure, human capital, access and good governance, among other things, will be required.
5. The globalisation and growing complexity of STI, which requires greater and interdisciplinary cooperation.
6. The balance between basic research and applied research.
7. The role of STI in creating sustainable and inclusive growth.
8. Growing societal engagement with science and technology, and the need to ensure public trust.
9. The improvement of scientific advisory mechanisms.
10. The international coordination of scientific advice in times of crisis.

(Source: DST: 2016)

Initiatives

- Department of Science and Technology's Innovation for Inclusive Development Initiative
- Ministerial Panel to Review South Africa's Science, Technology and Innovation Institutional Landscape
- Second Science Forum South Africa (8-9 December 2016)
- DST/ National Advisory Council on Innovation road-mapping *Next Generation* of Science, Technology, and Innovation White Paper, Foresight, and Decadal STI Plans

Conclusions

"a national system of innovation can only be judged as healthy if the knowledge, technologies, products and processes produced by the national system of science, engineering and technology have been converted into increased wealth, by industry and business, and into an improved quality of life for all members of society" (RSA: 1996).

- Evaluation of national STI policy
  - Low efficiencies and differentiated impacts
  - Systemic disharmony
  - Structural and Institutional incoherence
- Human resources in STI
  - Unemployment and Under-employment
  - Skills and Qualifications Premium in Labour Markets
  - De-link between Institutional reform and Labour process transformations
- Building of competitive advantages in STI
  - Sub-regional hegemony ("hub of research excellence with world-class facilities")
  - International collaborations ("Global Knowledge Partnerships")
  - *Refocus*: Innovation for Inclusive, Sustainable, and Resilient Local and Global Development …

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*dankie*enkosi*ke a leboga*ke a leboha*
*ndi a livhuha*ndza khensa*
*ngiyabonga*ngiyathokoza*thank you*

Obrigado
Спасибо
धन्यवाद
谢谢
ngiyabonga

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Reform and Transform

- “[People] make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past. The tradition of all dead generations weighs like a nightmare on the brains of the living. And just as they seem to be occupied with revolutionizing themselves and things, creating something that did not exist before, precisely in such epochs of revolutionary crisis they anxiously conjure up the spirits of the past to their service, borrowing from them names, battle slogans, and costumes in order to present this new scene in world history in time-honoured disguise and borrowed language.”

(Marx: 1852)