

NATIONAL RESEARCH FOUNDATION

Pretoria, South Africa

A photograph of a large, multi-story building with a dark roof and many windows, surrounded by lush greenery and trees. A paved path leads towards the building. The image is framed with a blue border.

**Overview of the South African research
landscape and contribution of the NRF
to the knowledge economy
Stellenbosch University 2011
Annual Library Symposium
Dr Andrew M. KANIKI
Andrew@nrf.ac.za
17 November 2011**

Strategic Context: Towards the knowledge society/economy



National
Research
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The South African Government has set itself the objective of transforming South Africa into a knowledge society that competes effectively in a global system

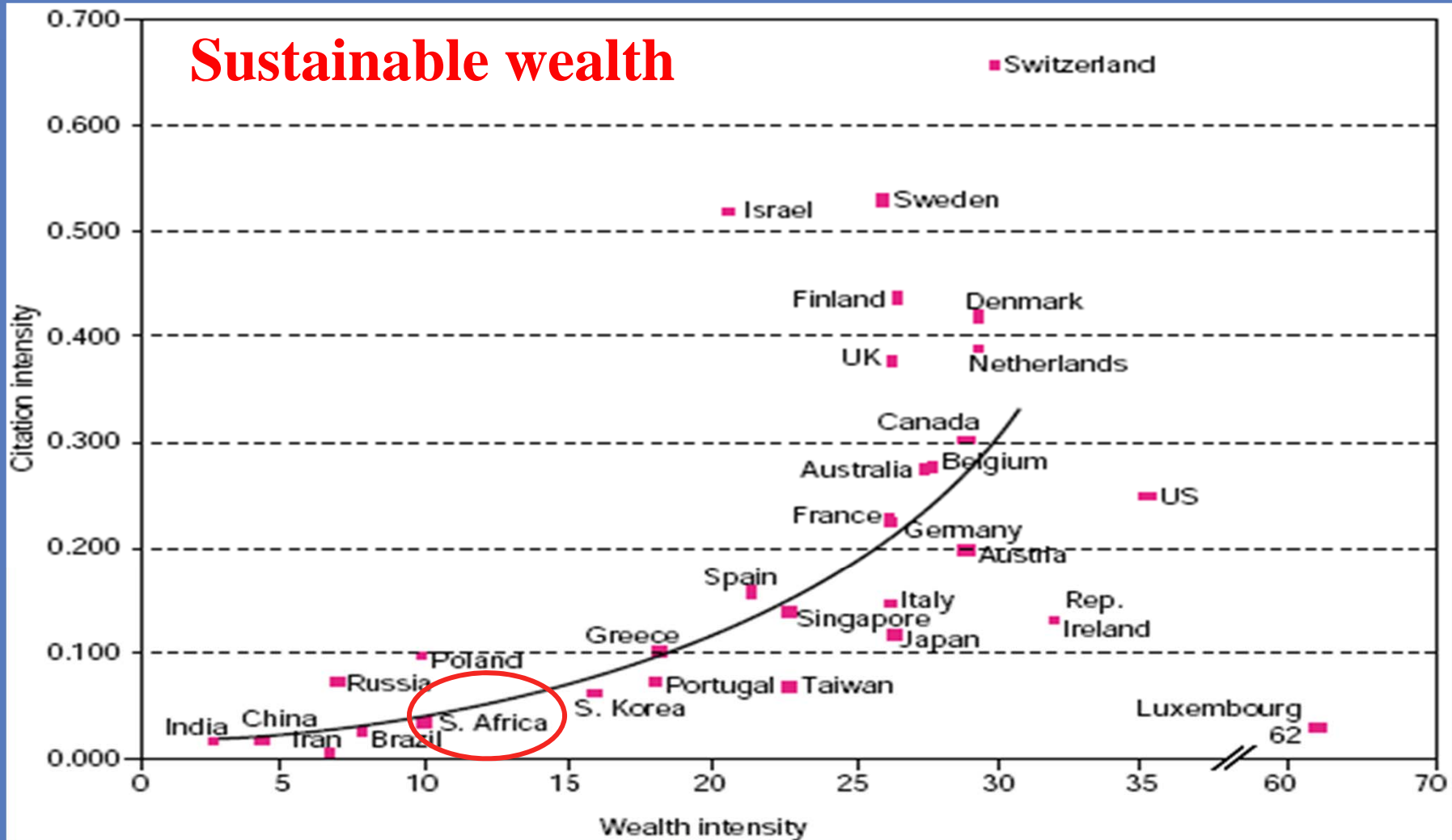
cf: *National R&D Strategy*
National Plan for Higher Education (NPHE)
Human Resources Development Strategy for SA
Ten year innovation plan

Strategic Context: Why the Knowledge Economy?



More than 50% of new wealth creation in the world's largest economies is ascribed to knowledge based industries, where the major proportion of the workforce is employed in knowledge-based jobs and the major proportion of firms that innovate use technology to do so. The DST aims to lead a programme of interventions over the next ten years to drive the transformation of the South African economy to a knowledge economy.

Towards the Knowledge Economy



Source: DA King, Nature 430 (2004) 311 (15 July 2004)

Towards international competitiveness



- Improve country's contribution to world research (knowledge) and innovation world output
 - % of highly skilled experts to population
 - Publications output – books and journal articles
 - Artefacts
 - Patents
 - Processes
 - Products
 - Commercialization

Towards international competitiveness



- Government's deliberate policy to improve gross expenditure on R&D (GERD)
 - 2003/04 R4.1b i.e. 0.69% of GDP;
 - 2004/05 R12.0b or 0.87% of GDP
 - 2007/08 0.95% of GDP
 - 2008/09 0.93% of GDP

(Tanzania moved from 0.028 to 0.1% of GDP)
Move away from military R&D spend
- 2% contribution to world research output

Drivers of Economic Competitiveness & The Knowledge Economy



1. HUMAN CAPITAL: Investing in human beings is the best way to enhance productive capacities – profits and efficiencies

(Riane Esler 2007 – The real wealth of nations)

2. TECHNOLOGICAL CHANGE (*Knowledge production, Innovation: US study on Productivity Growth*)

Economic studies indicate that even before the IT revolution as much as 85% of measured US growth per capita was due to technological change (US National Academy of Science)

Institutions and levels of the South African National System of Innovation (NSI)



Level 1: High-level policy

The Presidency – National Planning Commission and Monitoring and Evaluation
 Advisory: HRD Council, CHE, NACI, ASSAf

Level 2: Ministry

DST	DHET/ DBE	The dti	DME	DoH	DWEA	DAFF	National Treasury	Other Departs
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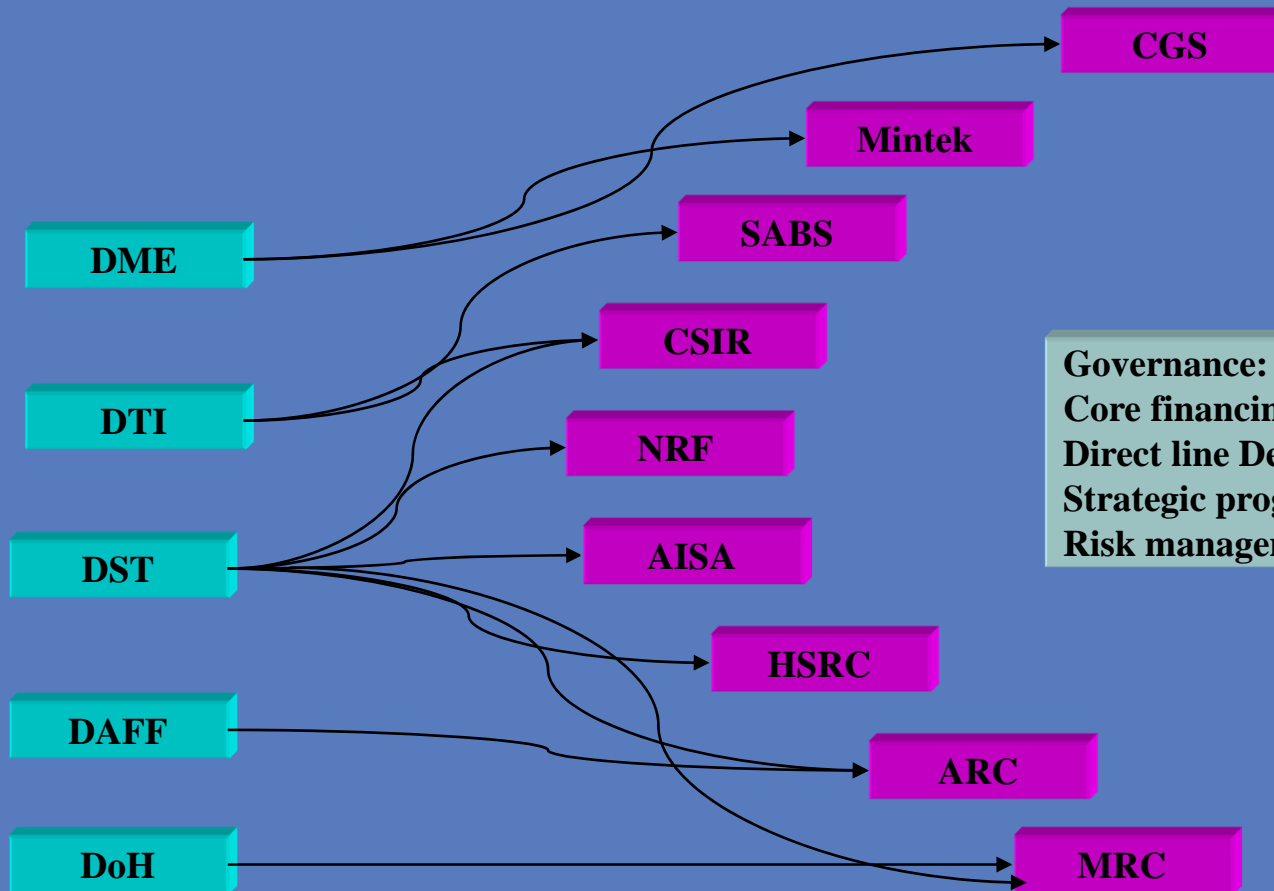
Level 3: Agency

NRF	TIA	SANERI	IDC	MRC	WRC	DBSA
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Level 4: Research and Innovation Performers

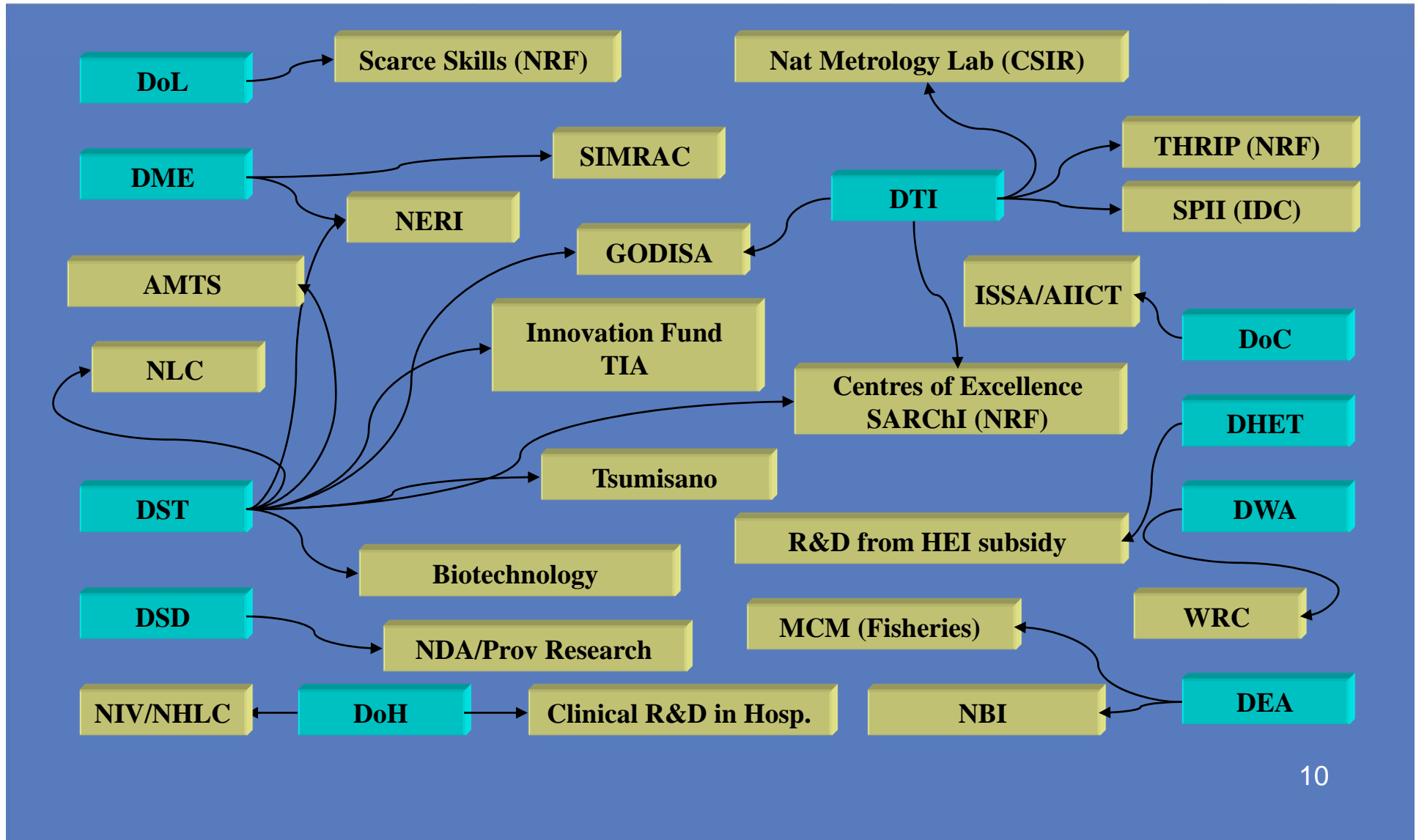
National Facilities of NRF	Universities	SABS	Mintek	MRC	ARC	Weather Services	Business Enterprises	Etc.
AISA			CGS			MCM		
HSRC			NECSA			SANBI		
CSIR								

National Government Departments and some of their S&T Institutions

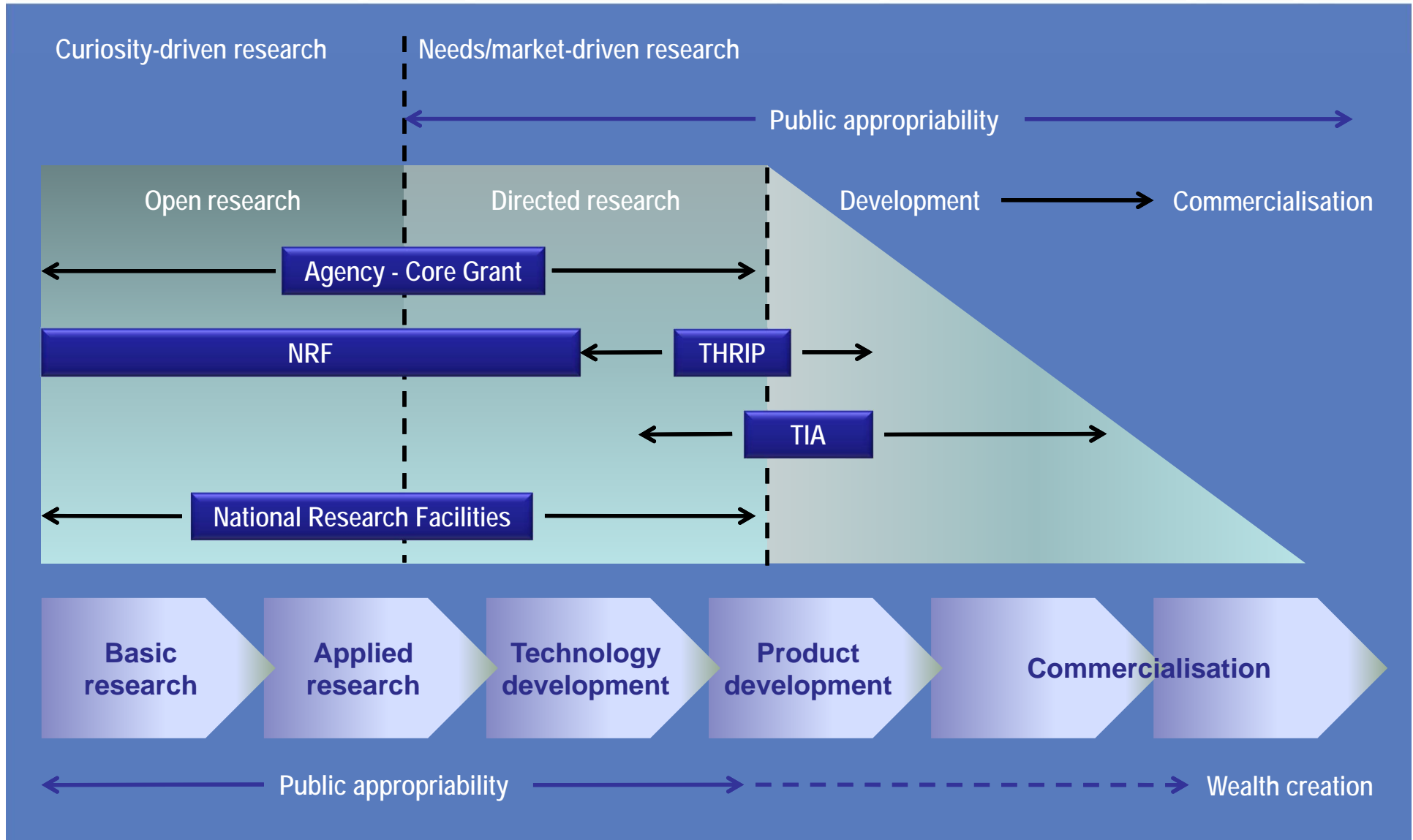


Governance: Line department
Core financing: DST
Direct line Dept: needs often unmet
Strategic programmes: mainly DST
Risk management: DST

Government departments and their S&T programmes



Research and Innovation Value Chain



Key R&D policies: post 1994



- Formation of DACST in 1994 and later split into DST and DAC to drive and coordinate research
- *White Paper on Science and Technology* – to revise national imperatives and ensure system alignment with relevant issues of the day; outline the need and process for regular institutional performance evaluation; scale the dimension of the required transformation in order to achieve more representative demographic participation in the system
- *White paper on Education* – main feature relevant to S&T landscape are the recognition of Mode 2 knowledge production; need for quality control at both institutional and programme levels (work of CHE – HEQC); need for HEIs R&D to contribute to devt; demographic transformation to achieve human resource equity ; & need to reduce number of institutions

Key R&D policies: post 1994

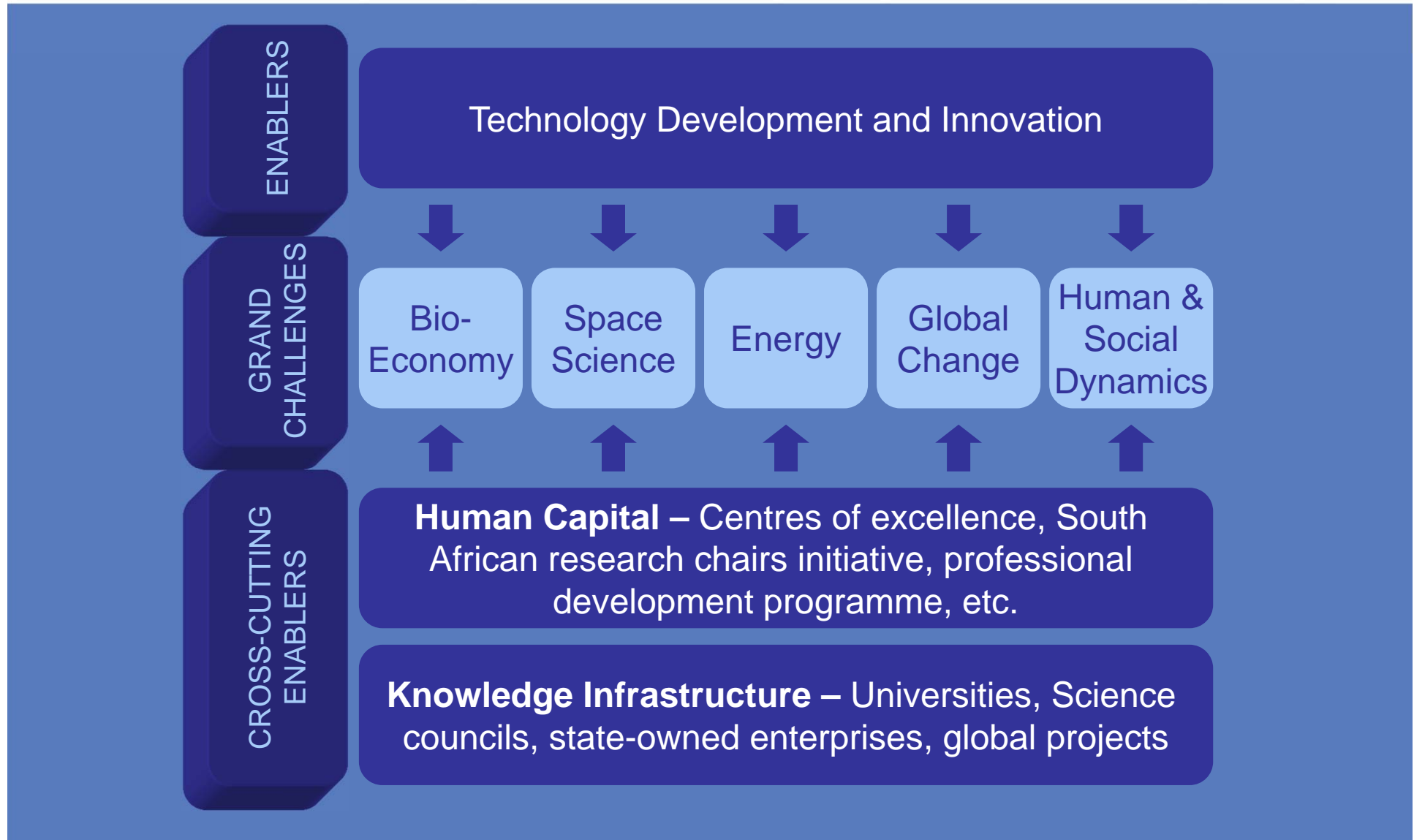
The National R&D Strategy



Science missions/Areas of geographical advantage:
Astronomy, Human paleontology, Biodiversity,
Antarctic and Southern Oceans, and Indigenous
Knowledge Systems. *National R&D Strategy (2002)*

Key R&D policies: post 1994

10yr Innovation Plan – Grand Challenges



mandate –



Promote and support research

through

funding, human resource development and the provision of the necessary **research facilities**

in order to

facilitate the **creation of knowledge**, innovation and development in all fields of science and technology, including indigenous knowledge

and thereby to

contribute to the **improvement of the quality of life** of all the people of the Republic

NRF Act, No 23 of 1998

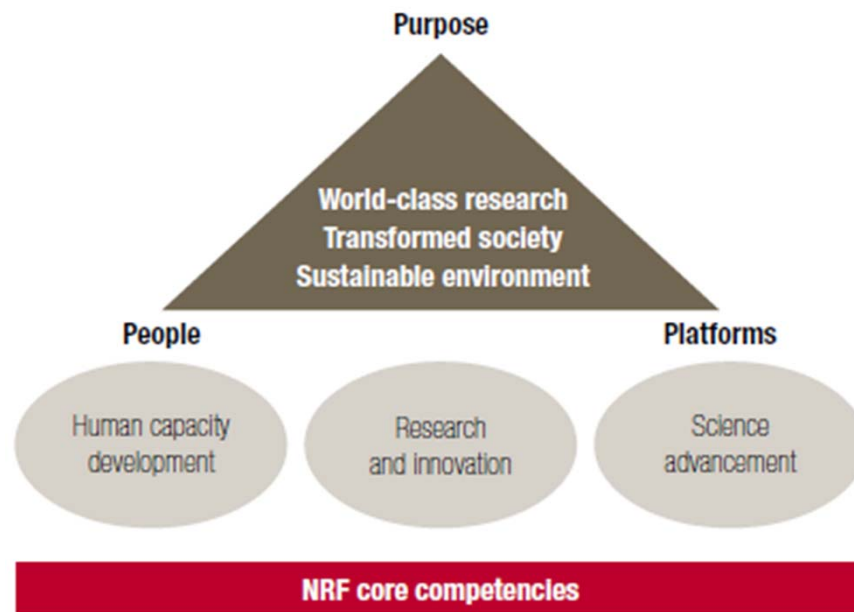


Strategic Plan

of the National Research Foundation



February 2008



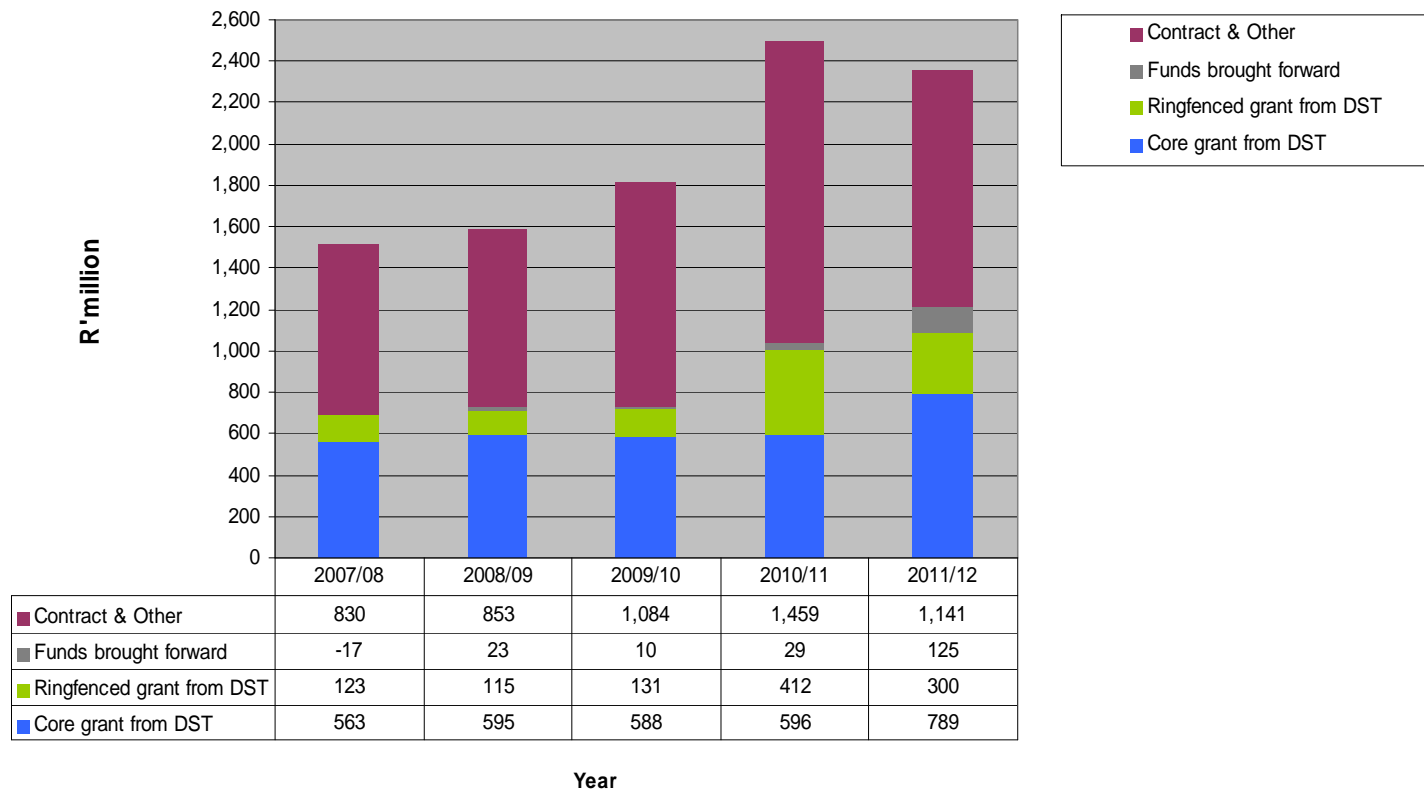
NRF
VISION

2015



Contribute to the knowledge economy in South Africa to attain at least 1% of the global R&D output by 2015

SOURCES OF FUNDING



- Of relevance here is the stellar growth of contract income over and above MTEF (core) income
- One major contract shifted to MTEF (Research Chairs 2011/12)

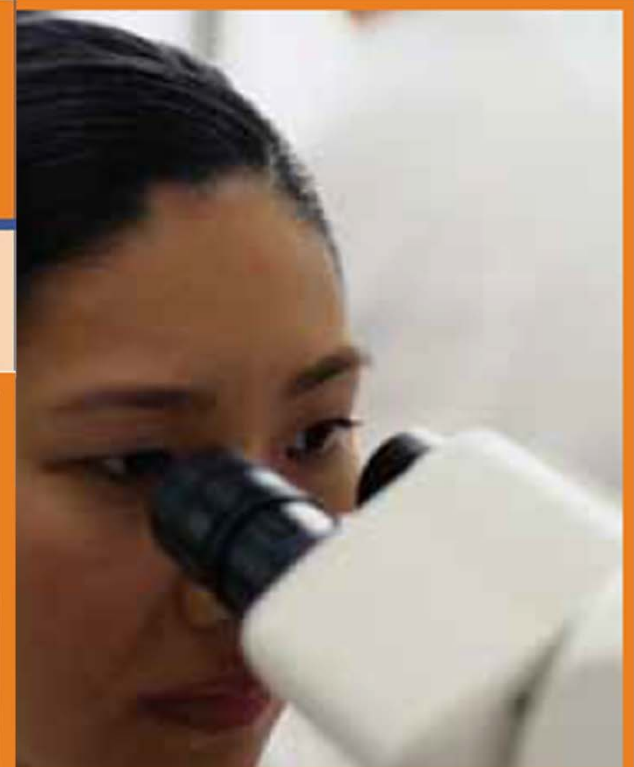


R324m

Investment in research areas where South Africa has a geographic advantage.

R52.7
MILLION

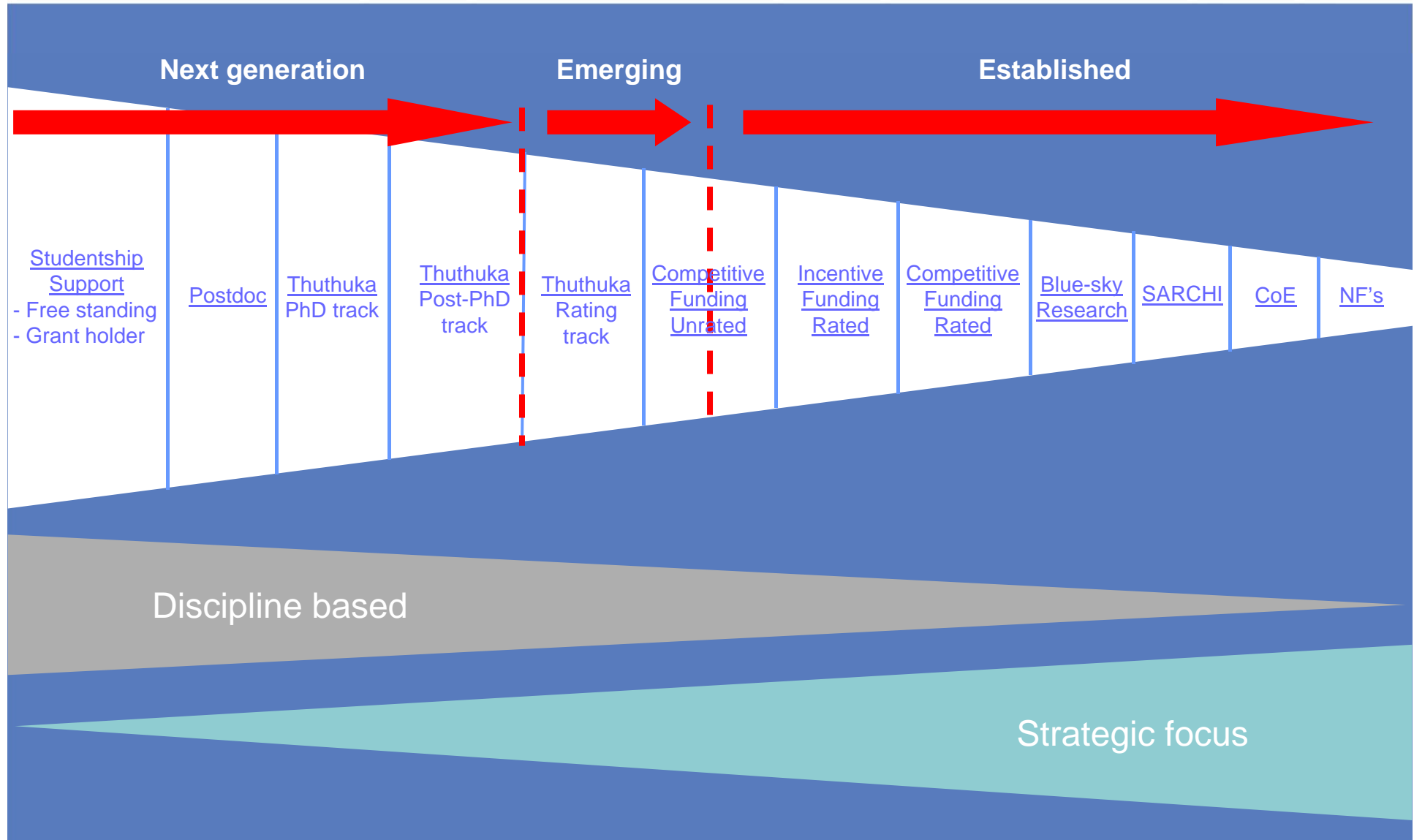
Monies were received from DST to supplement bursary values.

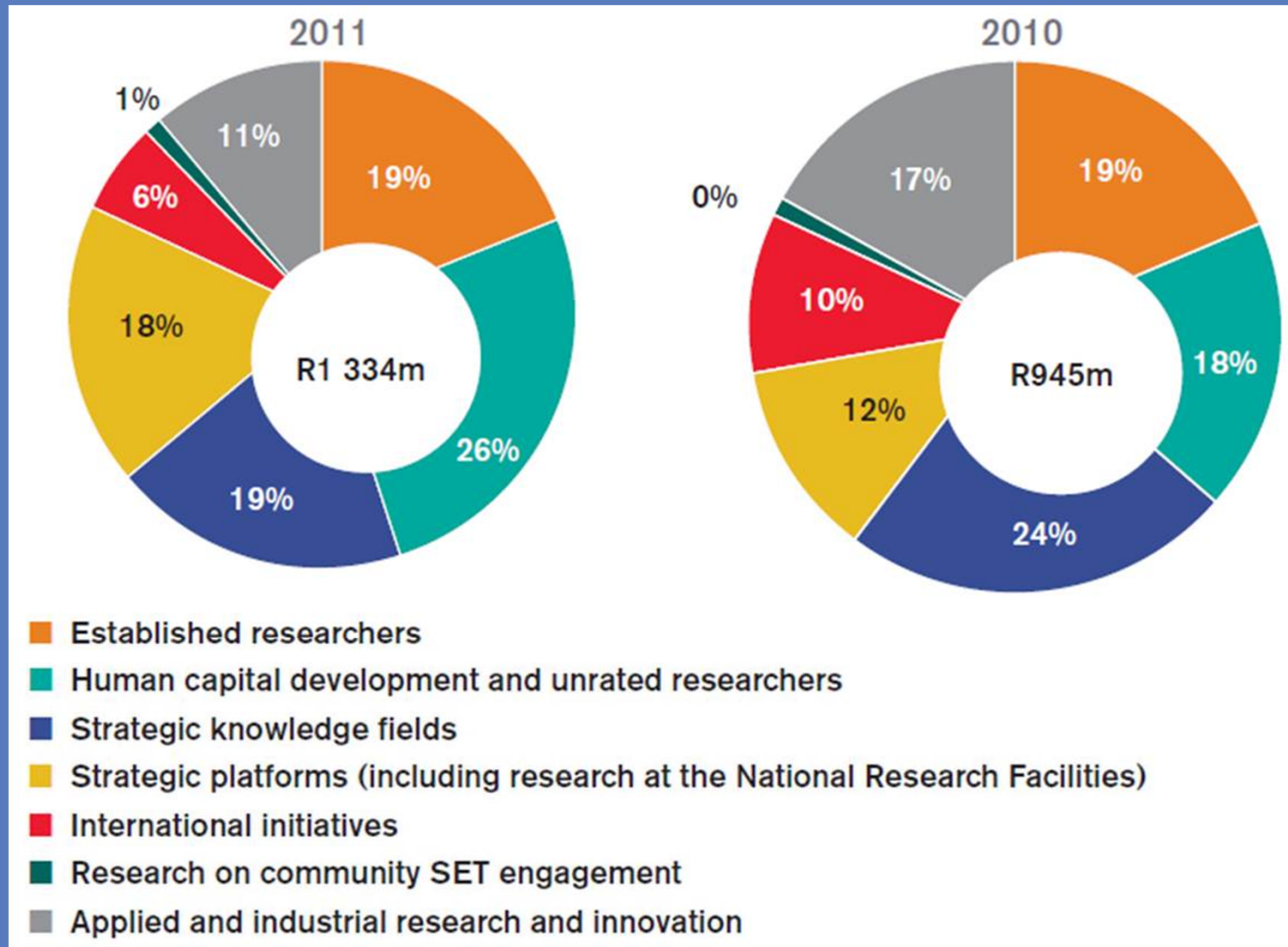


R255m

Additional support from DST to expand bursaries, support women and young researchers and upgrade infrastructure.

- Healthy balance: strategy-driven vs. demand-pull
- Effective, goal oriented resource allocation
- Competitive funding
- Merit-based and rigorous peer review
- The Ph.D. as a driver
- Cross-fertilisation of talent within NSI
- Fairness, transparency, accountability
- Transformation and excellence





2 927

Researchers supported as
grantholders.

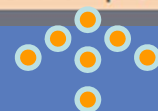
29% of grantholders are black.

34% of grantholders are women.

R1,3
BILLION

2010/
11

Total resources expensed to grants
(including scholarships).



2009/
10

R930 850 000

2008/
09

R929 199 000

2007/
08

R625 650 000

Energy Security	2009/10	4%
	2010/11	3%
Space, Science and Technology	2009/10	1%
	2010/11	3%
Bio-economics	2009/10	1%
	2010/11	2%
Global Change	2009/10	8%
	2010/11	8%
Human and Social Dynamics	2009/10	2%
	2010/11	3%
Human Capacity Development	2009/10	21%
	2010/11	30%
Institutional Environments for Knowledge Production	2009/10	52%
	2010/11	51%

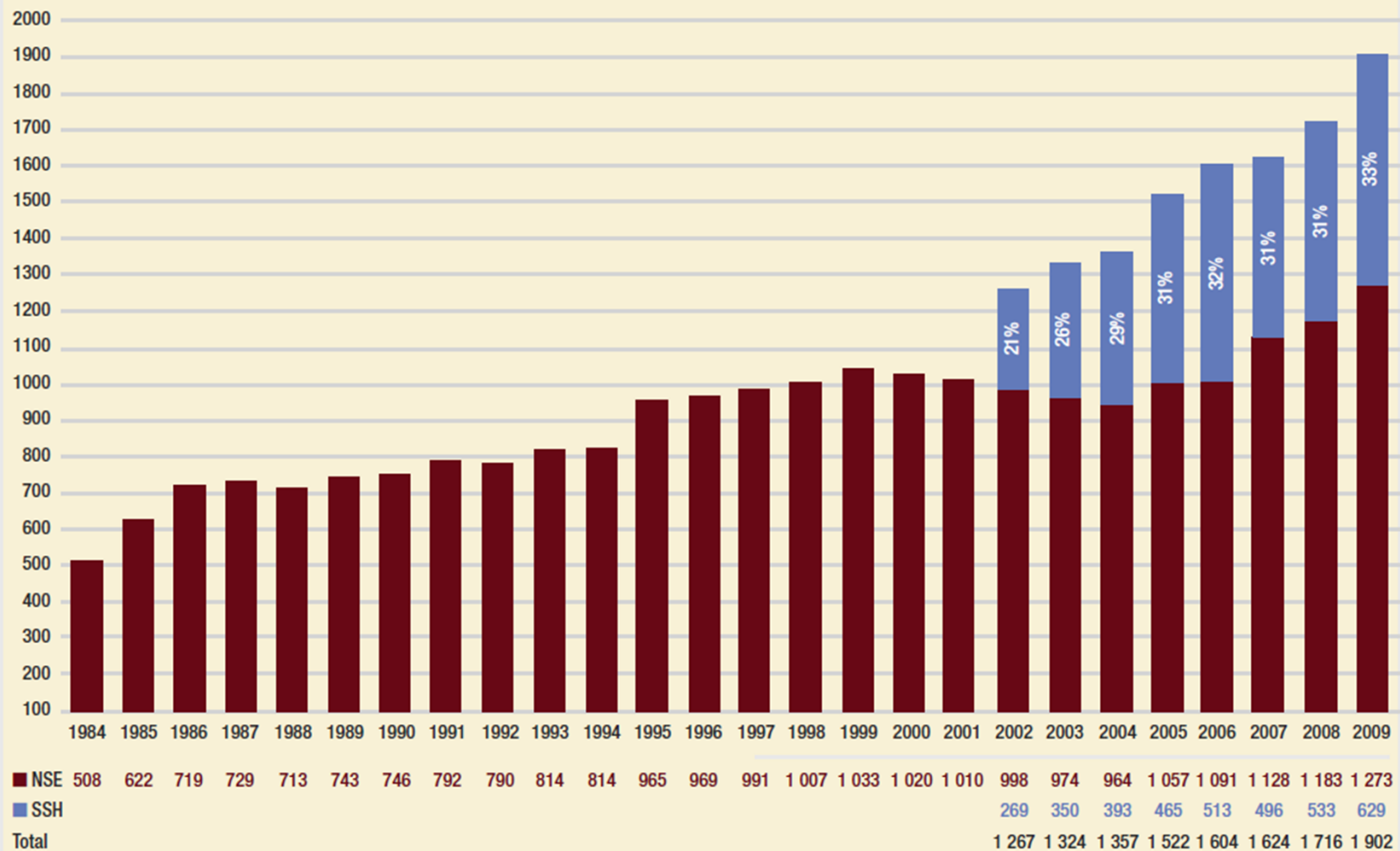
“We are building a globally competitive science system in South Africa, and regard the NRF’s evaluation and rating system as one of the key drivers of this ambition. It is a valuable tool for benchmarking the quality of our researchers and our entire research system against the best in the world.”

“The NRF has a strategic responsibility to develop young researchers, especially during their PhD studies and up to six years thereafter. Beyond that, the funding for unrated researchers becomes limited and highly competitive. Therefore, we encourage young scientists to pursue an NRF rating as a way of securing their own research careers and to track their own achievements over time.”

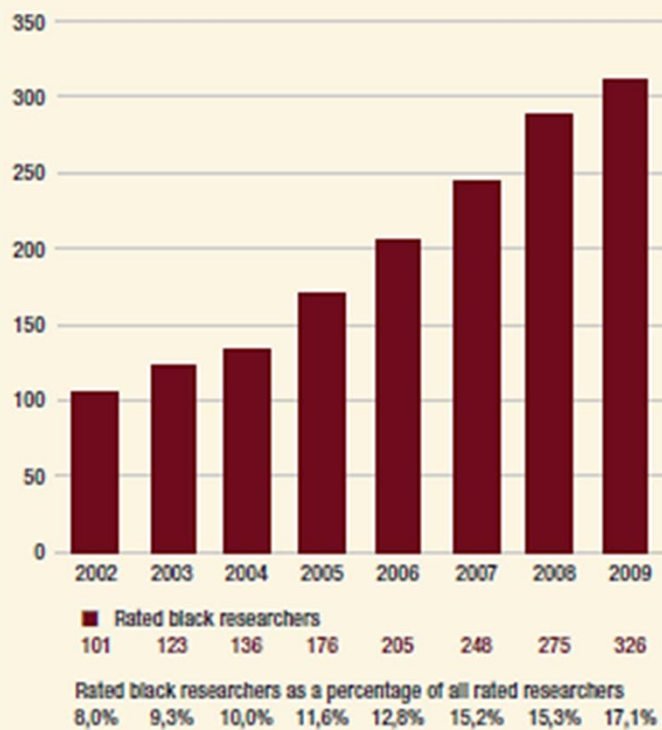
Evaluation and rating:
facts & figures

2010

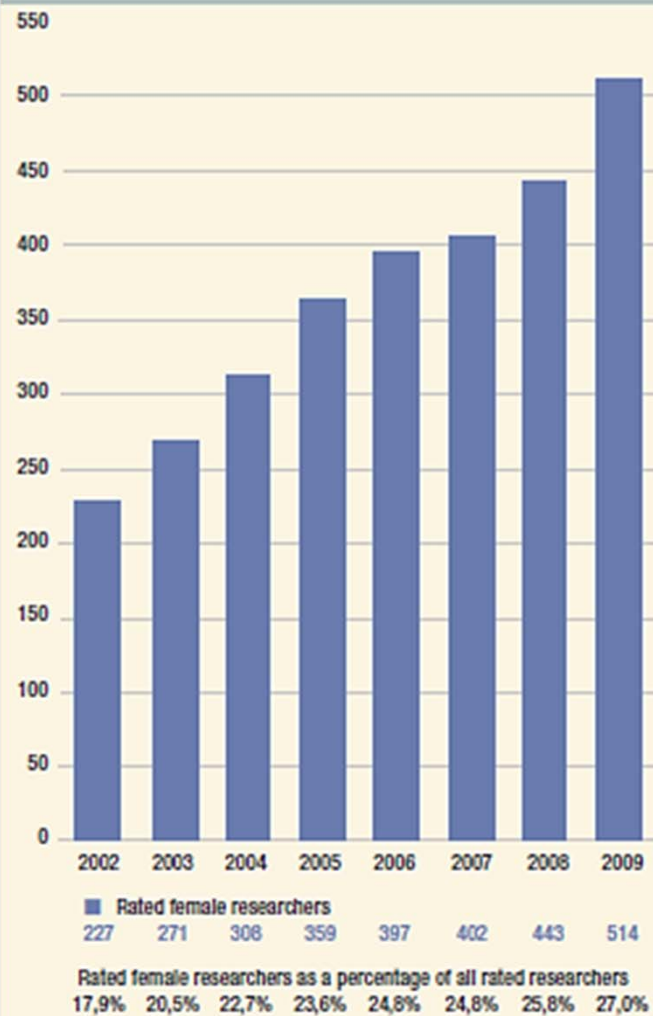
Growth in the total number of rated researchers across all disciplines at South African higher education institutions since 1984



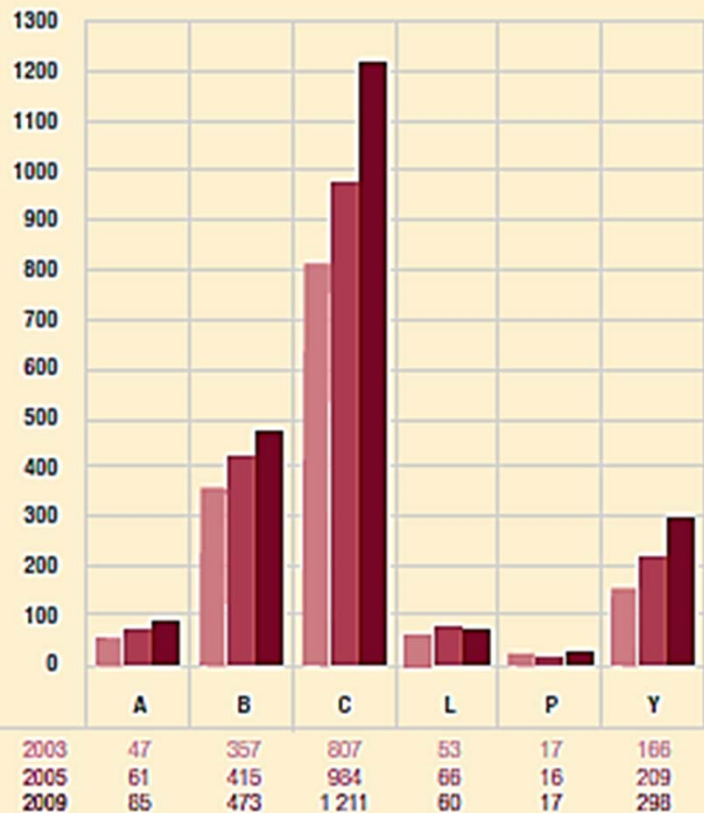
Growth in the number of rated black researchers at South African higher education institutions and museums



Growth in the number of rated female researchers at South African higher education institutions and museums



Number of researchers per rating category in 2003, 2005 and 2009



Where do NRF-rated researchers work?

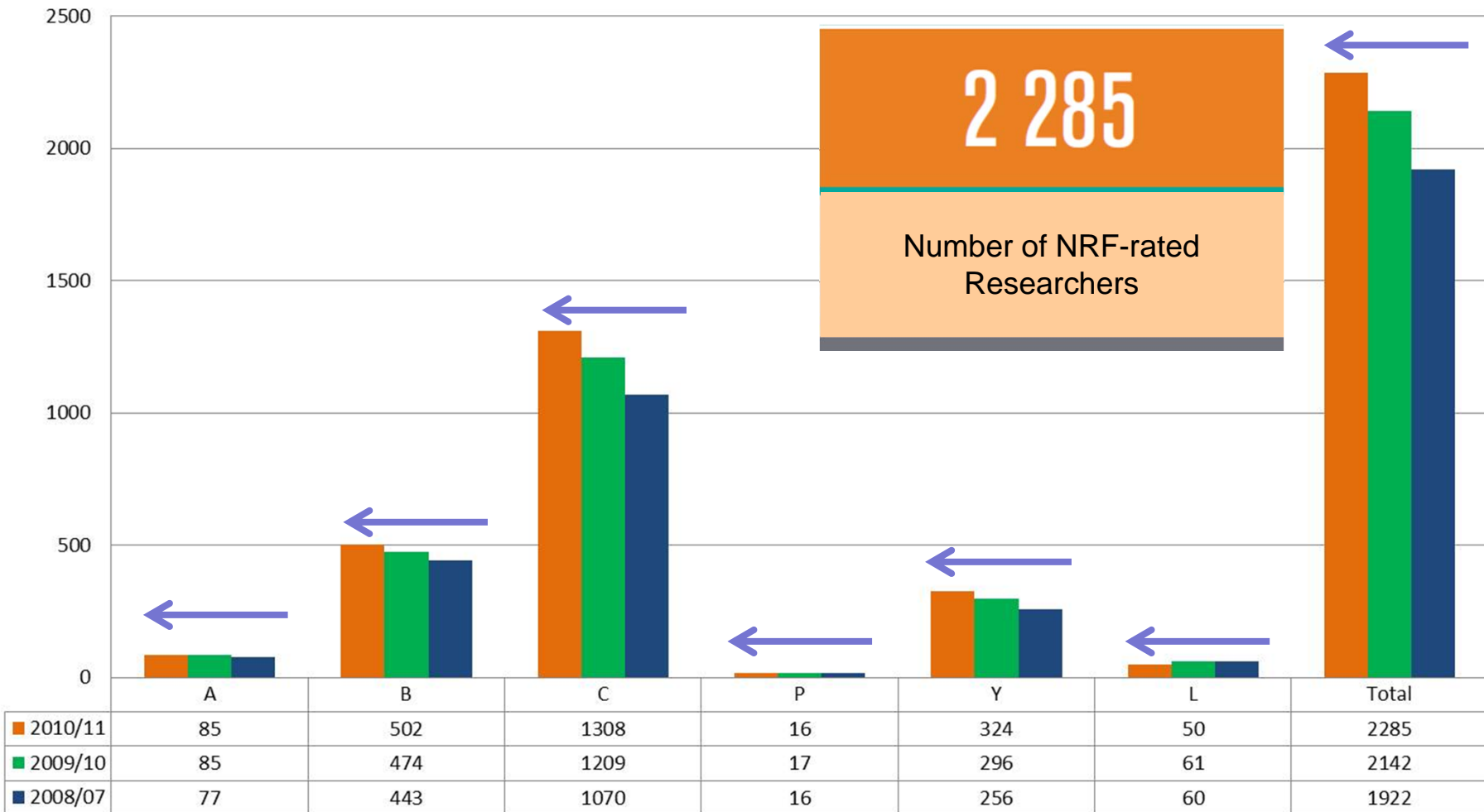
About 86% of researchers with a valid rating from the NRF are attached to South African universities, while close to 9% are employed at science councils, museums or national research facilities. The rest are retired, in industry or have left South Africa to work abroad.

The top 10 universities in South Africa in 2008 in terms of the percentage of their research/instruction staff with a valid NRF rating

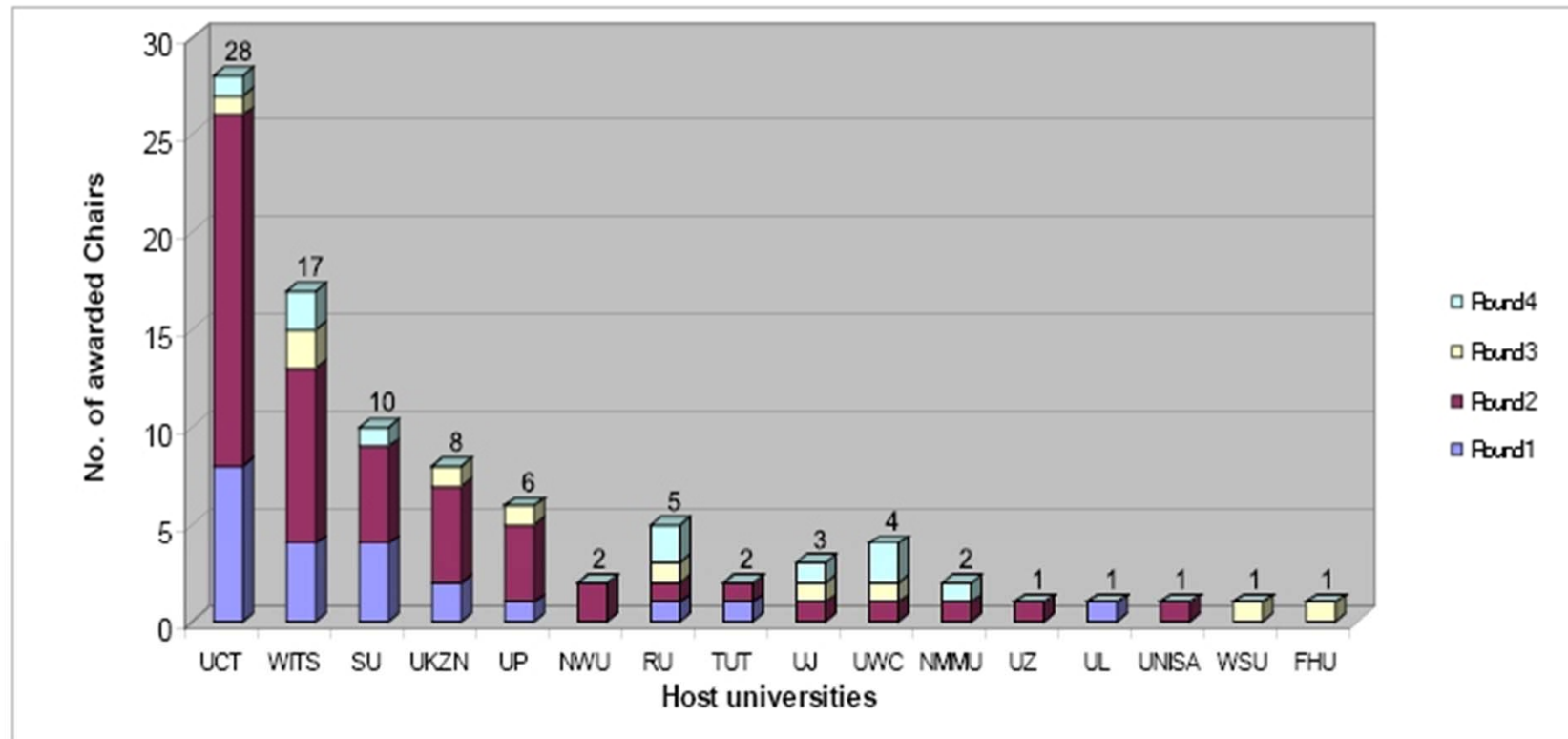
Institution	Rated researchers	Instruction/research professionals*	Percentage rated
University of Cape Town	291	937	31,1%
Stellenbosch University	247	867	28,5%
University of Pretoria	241	1 638	14,7%
University of the Witwatersrand	177	979	18,1%
University of KwaZulu-Natal	155	1 476	10,5%
North-West University	102	927	11,0%
University of South Africa	78	1 313	5,9%
University of the Free State	78	756	10,3%
University of Johannesburg	71	853	8,3%
University of the Western Cape	57	518	11,0%
Nelson Mandela Metropolitan University	56	531	10,5%

*Higher Education Management Information System (HEMIS) Report, Department of Education (DoE), 2008

No. of rated researchers in all disciplines

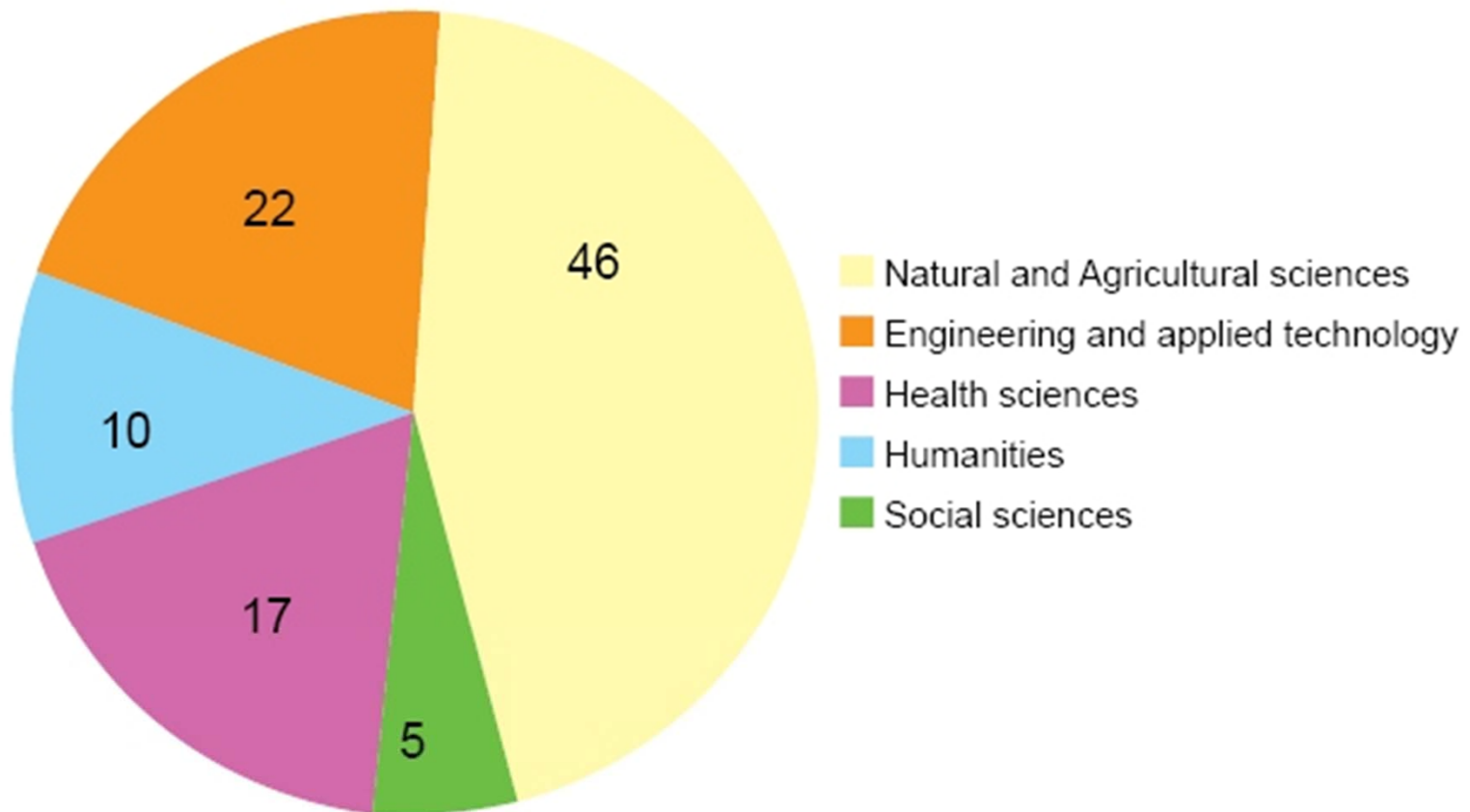


• Number of awarded Research Chairs	92
• Number of operating Research Chairs	84
• Total number of approved incumbents	88
• National recruits	69 (83%)
• International recruits	19 (17%)
• Tier 1 Research Chairs	69 (83%)
• Tier 2 Research Chairs	19 (17%)
• Female incumbents	17 (19%)
• Male incumbents	71 (81%)
• Black (African, Indian and Coloured) incumbents	33 (29%)
• White incumbents	55 (71%)



Internal Review
Five-year Programme Review

2011
2012

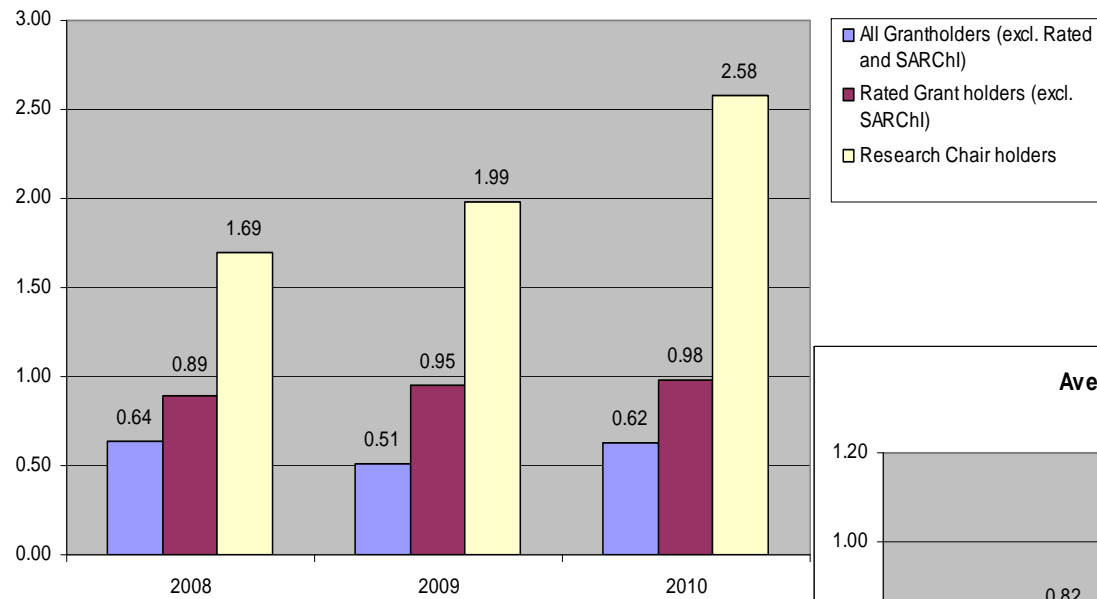


ISI OUTPUTS

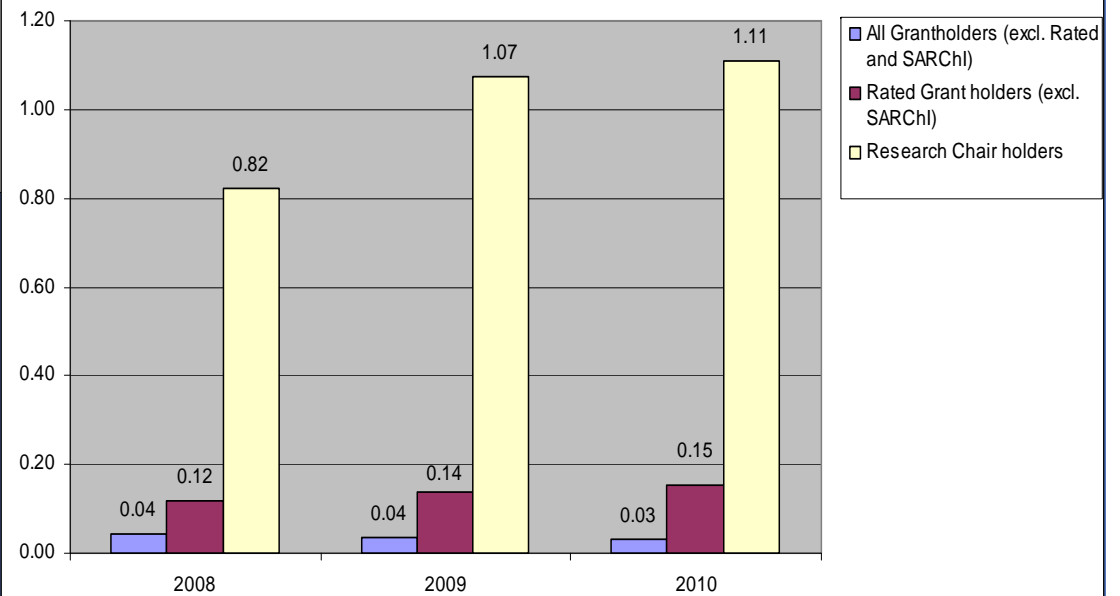
	2008	2009	2010
Publications by SA Authors*	8707	9264	9326
Publications by SARChI Authors	368	404	416
	4.23%	4.36%	4.46%
Number of SA Authors*	4682	4838	5028
Number of Research Chairs	68	70	78
	1.45%	1.45%	1.55%

* Includes SARChI due to co-authoring of papers

Average number of Doctoral students per grantholder

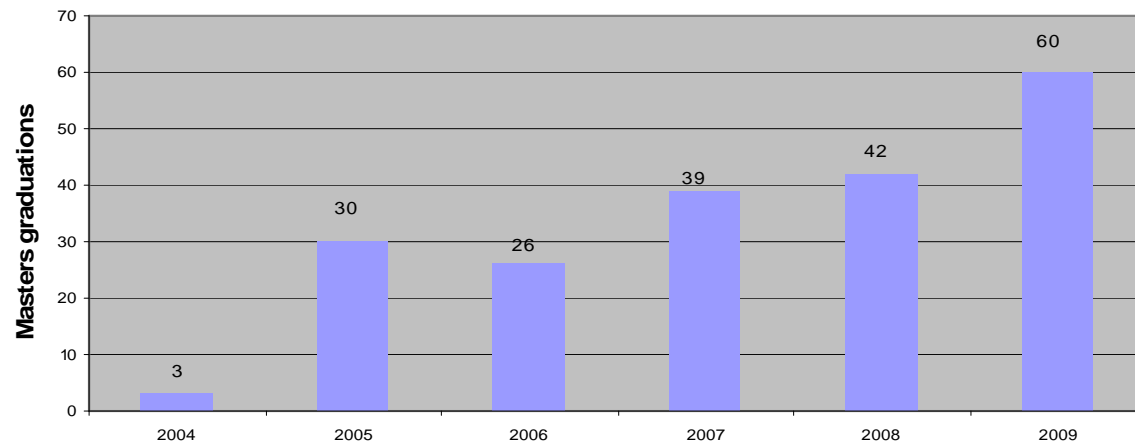


Average number of Postdoctoral students per grantholder

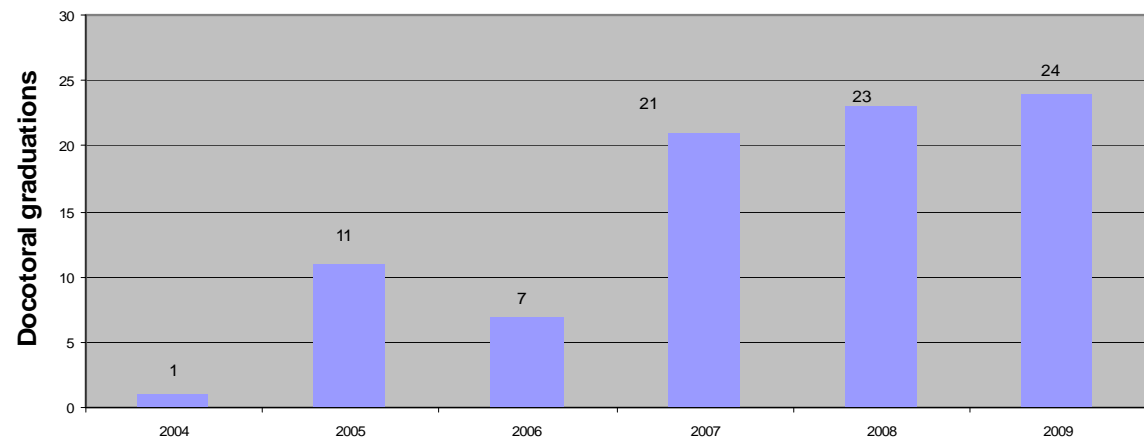


- **Biomedical TB Research:** New tools for the diagnosis, treatment and prevention of tuberculosis (WITS, Stellenbosch)
- **Birds as Keys to Biodiversity Conservation:** Understanding and maintaining biodiversity using birds as indicators (UCT)
- **Invasion Biology:** Biodiversity consequences of biological invasions (Stellenbosch)
- **Tree Health Biotechnology:** Understanding and combating diseases of South Africa's indigenous trees (Pretoria)
- **Catalysis:** Innovation in catalysis as a key process in the chemical and manufacturing sector (UCT)
- **Strong Materials:** Understand and improve properties of advanced strong materials to increase efficiency and reduce cost (WITS)
- **Epidemiological Modelling and Analysis:** Mathematical Modelling to understand, predict and combat diseases (STIAS)
- **Applied Centre for Climate and Earth System Science (ACCESS):** Modelling approaches to better understand coupled Southern Oceans, Atmospheric and Earth systems (CSIR/UCT)

Total number of Masters graduations



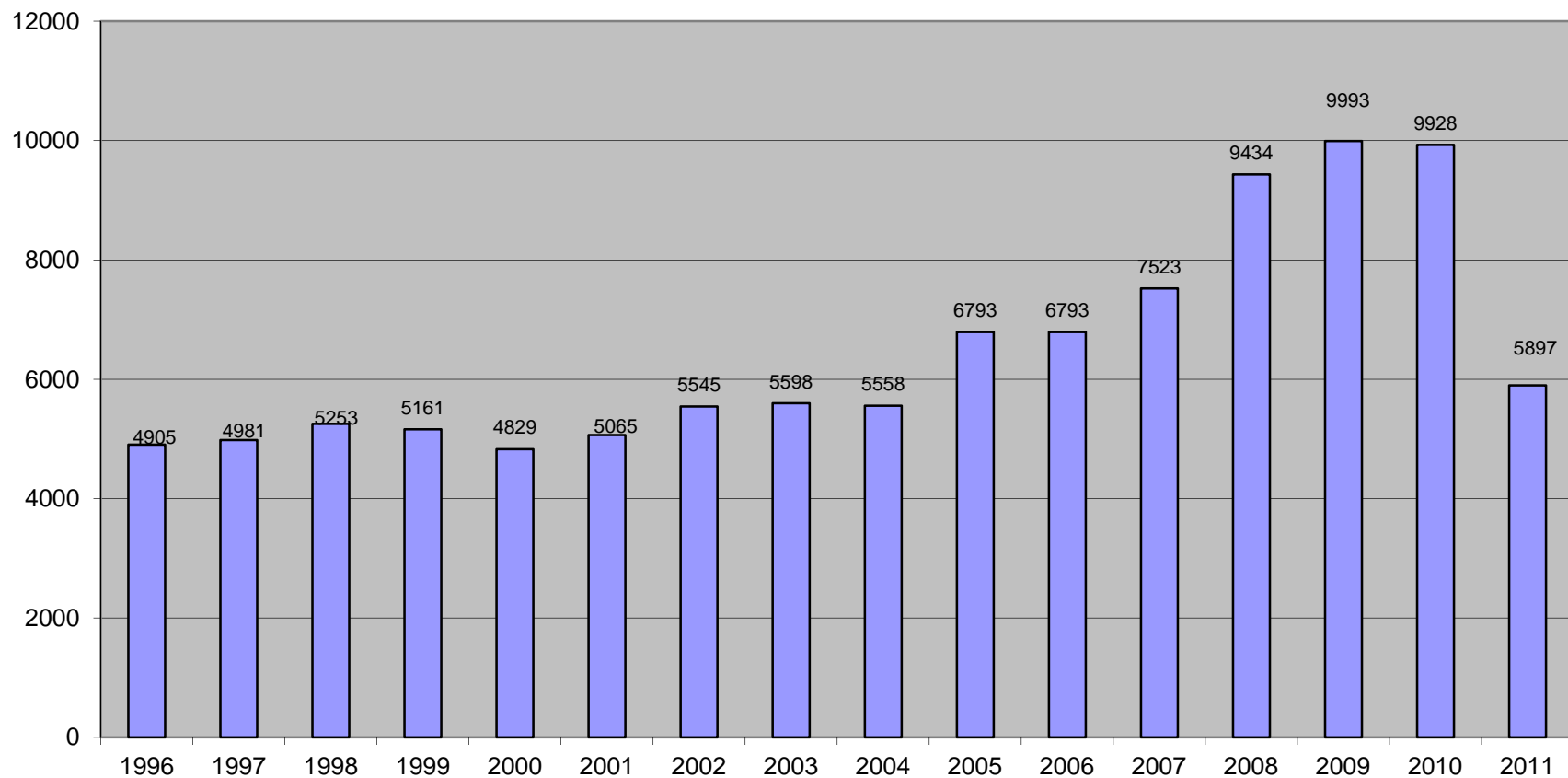
Total number of Doctoral graduations



SA Authored ISI Papers [as at 27 June 2011]



South African authored ISI outputs

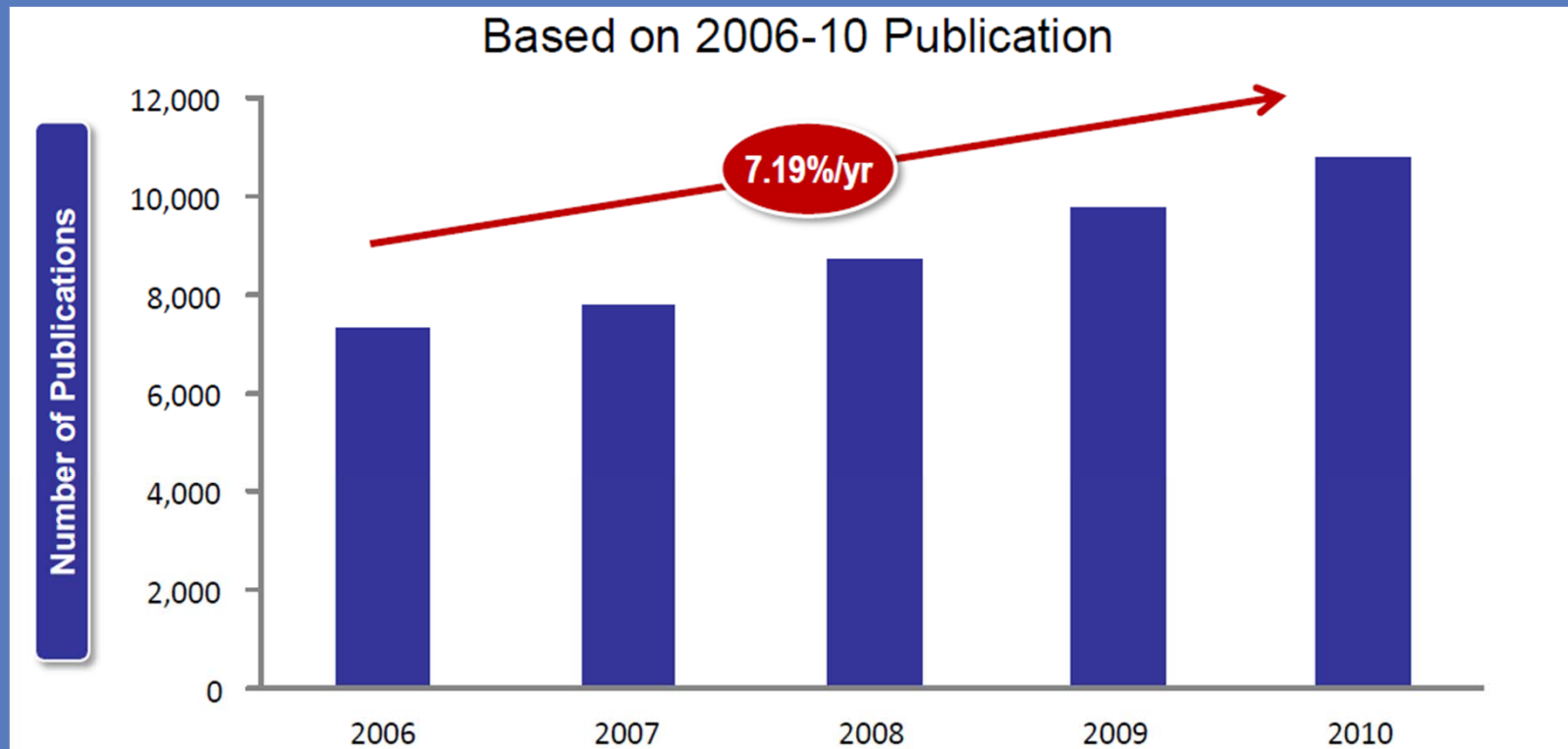


SA Competitiveness by Discipline Relative ISI Citation Ranking [as at 26 May 2011]



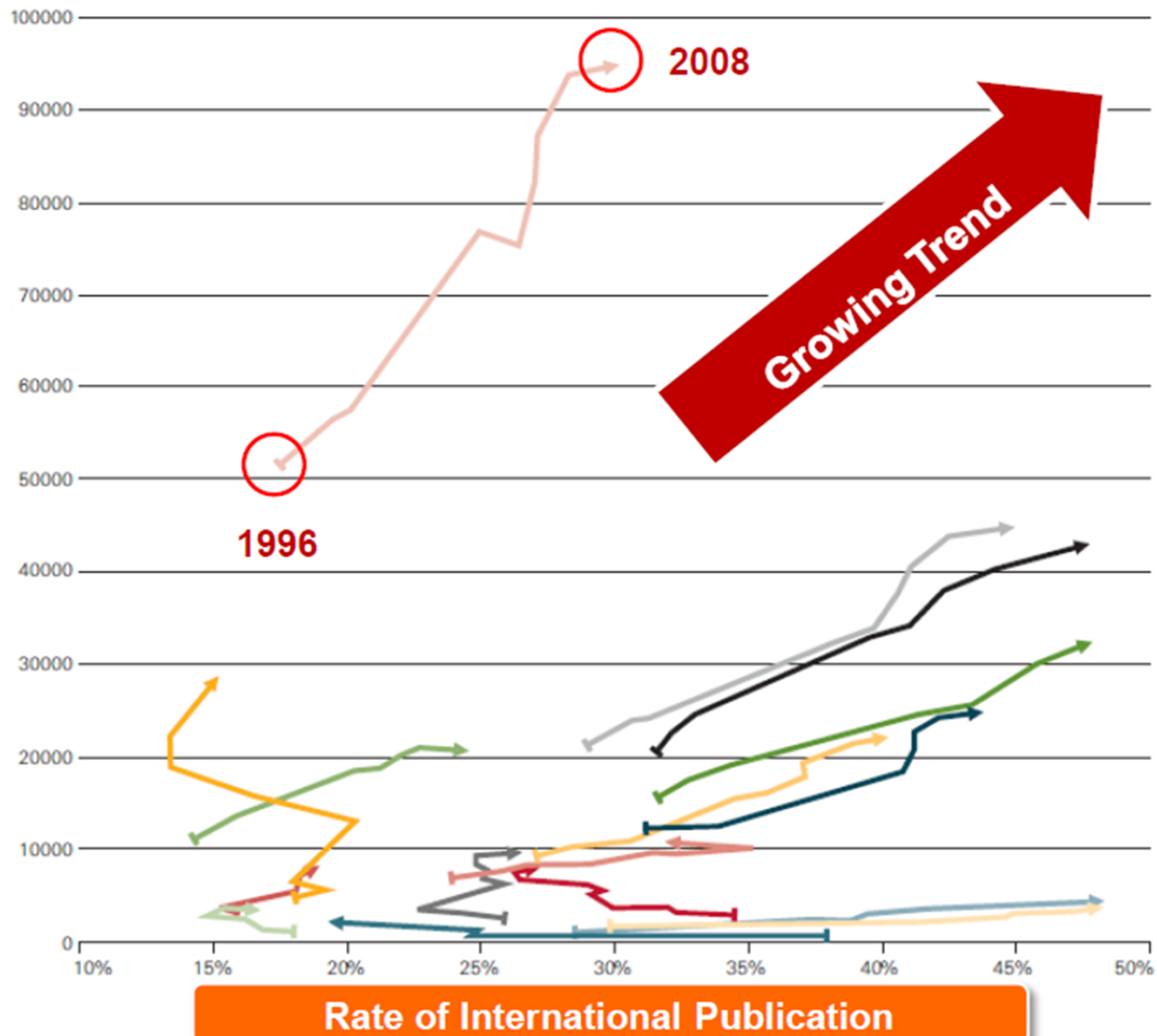
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DISCIPLINE	NATIONAL DISCIPLINARY CITATION RANKING	
	2011	2008
Multidisciplinary	19 (Austria)	16 (Israel)
Social Sciences (general)	19 (Wales)	22 (Japan)
Environment and Ecology	22 (India)	22 (India)
Immunology	23 (Norway)	24 (Ireland)
Plant and Animal Sciences	23 (Israel)	23 (Finland)
Geosciences	26 (South Korea)	24 (Finland)
Microbiology	28 (Norway)	28 (Taiwan)
Psychiatry/Psychology	28 (Turkey)	25 (Brazil)
Space Science	29 (Austria)	32 (Ukraine)
Clinical Medicine	32 (Singapore)	31 (Wales)
Economics and Business	32 (Brazil)	35 (Mexico)
Agricultural Sciences	34 (Austria)	34 (North Ireland)
Computer Science	38 (Iran)	38 (Mexico)
Biology and Biochemistry	38 (Wales)	38 (Turkey)
Mathematics	38 (New Zealand)	41 (Ireland)
Neuroscience and Behaviour	39 (Chile)	39 (Chile)
Molecular Biology and Genetics	40 (Chile)	38 (Argentina)
Pharmacology and Toxicology	40 (Wales)	37 (Ireland)
Chemistry	42 (New Zealand)	43 (Slovakia)
Engineering	44 (Thailand)	44 (Slovenia)
Materials Science	47 (Wales)	44 (Slovakia)
Physics	49 (North Ireland)	47 (Iran)
<i>All fields</i>	<i>38 (Wales)</i>	<i>38 (Argentina)</i>



Nation with one of the highest growth rate in number of publication after China, India and Brazil

Number of International Collaborated Papers



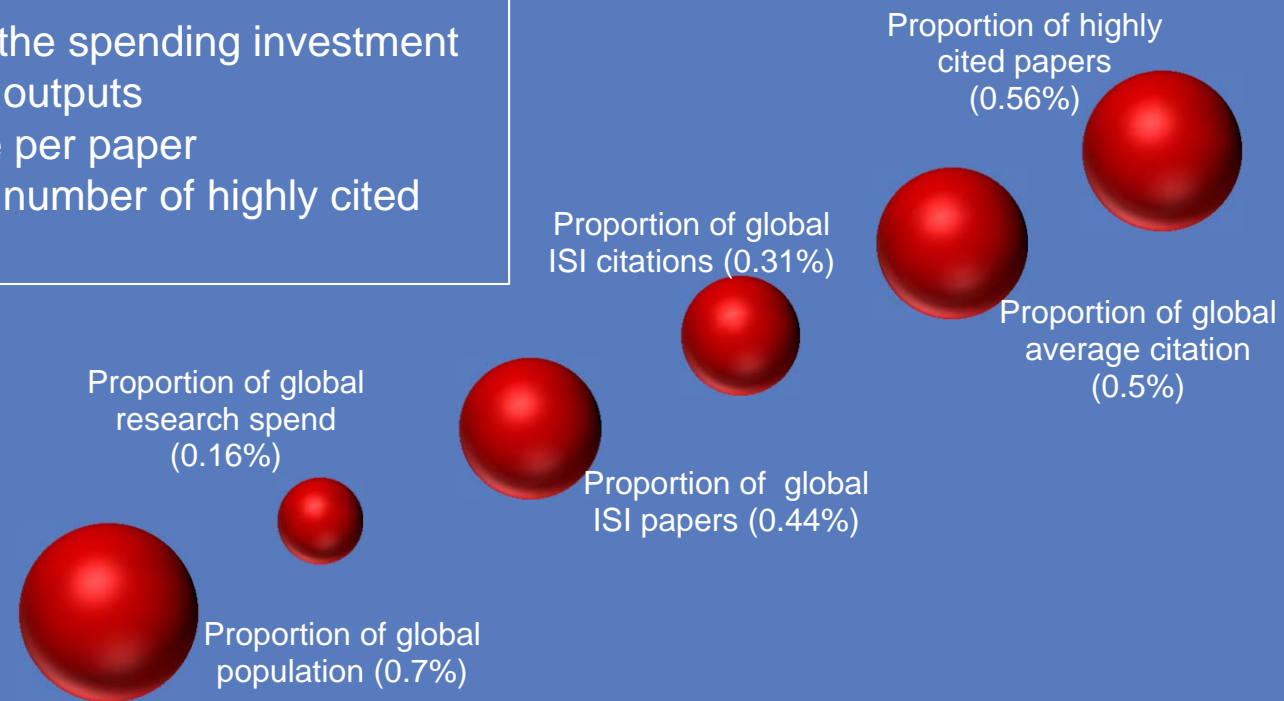
Key

1996 figures are shown with a dash, and 2008 figures with an arrow, indicating progression over time.

- Brazil
- Canada
- China
- France
- Germany
- India
- Iran
- Italy
- Japan
- South Korea
- Russia
- Singapore
- South Africa
- Turkey
- United Kingdom
- United States

The SA research system is characterised by:

- Below par spending
- Outputs that double the spending investment
- Lower citations than outputs
- Average citation rate per paper
- Considerably higher number of highly cited papers



Consequences

- Below par spending is restricting research performance
- Significant parts of the science system is driven by number of outputs (lower citation levels)
- System does harbour significant strengths as highly cited papers
- Dual system – pockets of excellence in a landscape of average performance

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