

2020 South African Science, Technology and Innovation Indicators Report

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28 August 2020

A global
pandemic of
historical
proportions



COVID
19

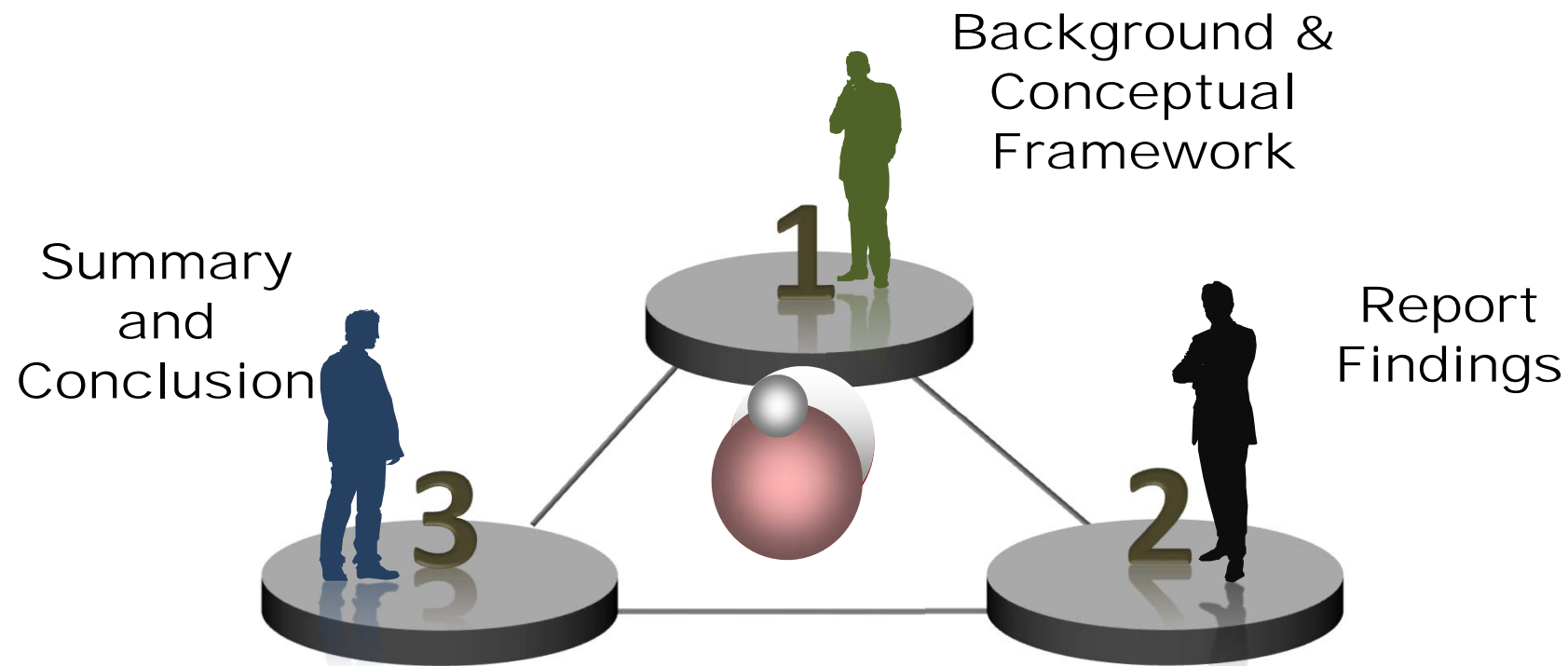




**BY PLACING STI AT THE
CENTRE OF SOUTH
AFRICA'S DEVELOPMENT
AGENDA, WE HAVE AN
OPPORTUNITY TO ENSURE
THAT THE COUNTRY
BECOMES A GLOBAL
CENTRE OF SCIENCE,
TECHNOLOGY AND
INNOVATION.**

*Dr BE Nzimande,
Minister of Higher Education,
Science and Innovation*

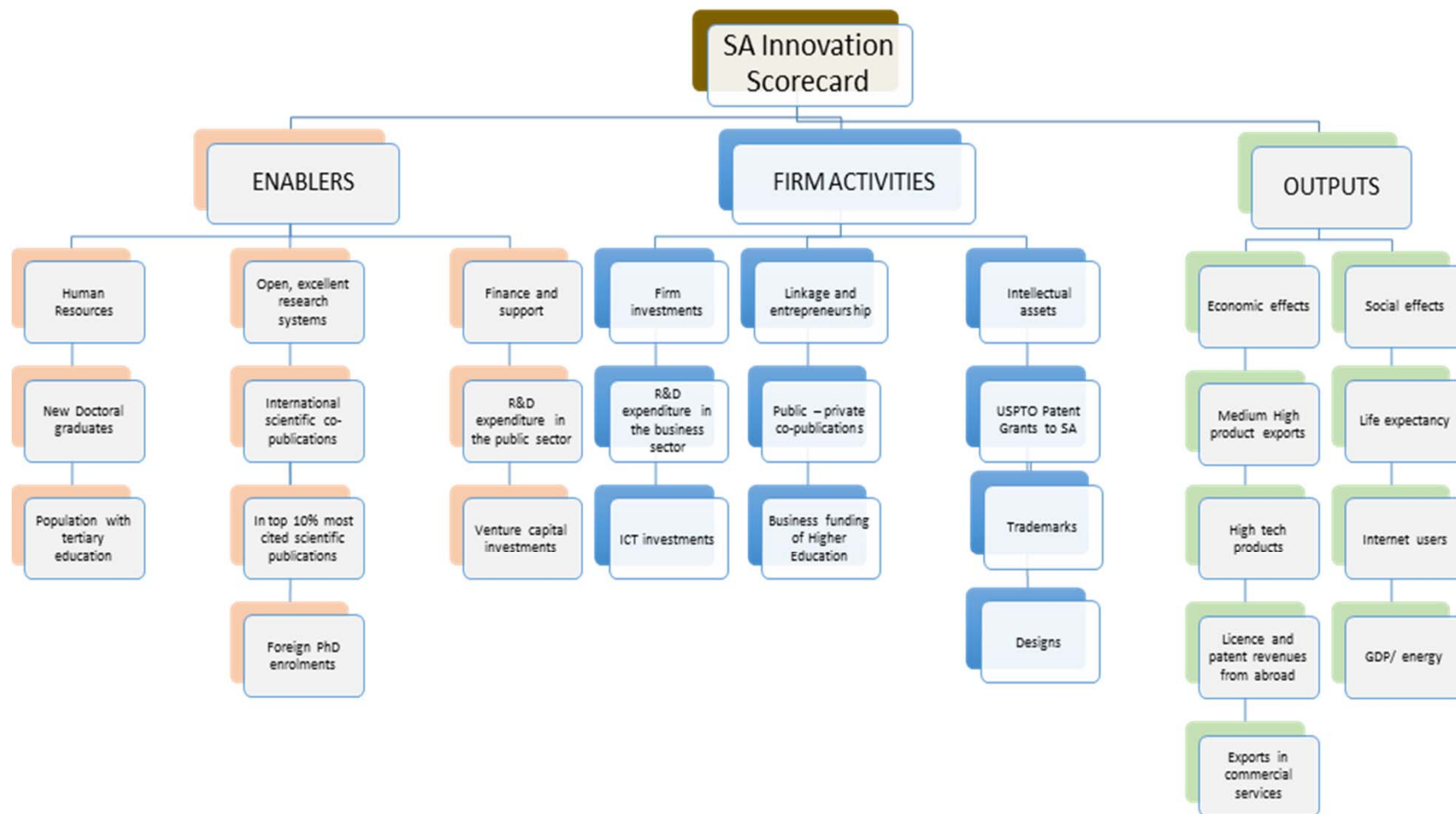
Presentation Outline



Introduction and Background

- The STI Indicators Report provides statistics and assessment of NSI contextualised globally since 2019.
 - **Generation and maintenance of up-to date data remain a challenge.**
- COVID-19 pandemic, economic crisis, ecological crisis and social challenges facing SA and world.
- Highlights NSI opportunities and challenges.
 - Knowledge production
 - Knowledge exploitation and utilisation
 - Investment
 - Human resources

South African Innovation Scorecard



Findings

International comparisons

Global Innovation Index equivalent ranking by income group

	Overall GII		Innovation inputs		Innovation outputs	
	2018	2019	2018	2019	2018	2019
High-income	30	30	26	26	30	29
Low-income	117	122	110	117	115	118
Lower middle-income	88	88	96	94	79	76
Upper middle-income	66	67	66	70	67	65
World	51	53	51	56	53	56
South Africa	58	63	48	51	65	68

Global Competitiveness Index equivalent ranking by income group

	Overall GCI		Enabling environment		Human capital		Markets		Innovation ecosystem	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
High-income	29	30	32	31	31	28	33	35	31	30
Low-income	122	128	124	129	120	127	125	128	118	122
Lower middle-income	101	110	98	104	103	107	93	99	101	108
Upper middle-income	74	76	77	77	78	74	64	67	72	73
World	69	74	69	71	87	86	61	65	55	63
South Africa	67	60	66	61	114	108	31	32	46	50

NSI Focus

STI Human Resources

HUMAN CAPITAL RANKING

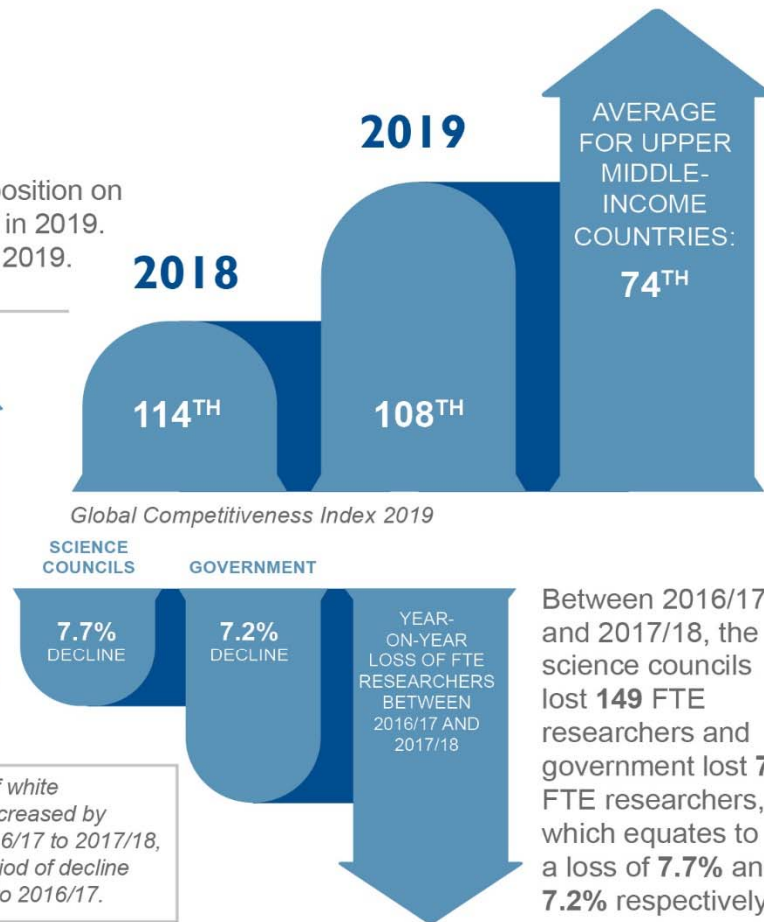
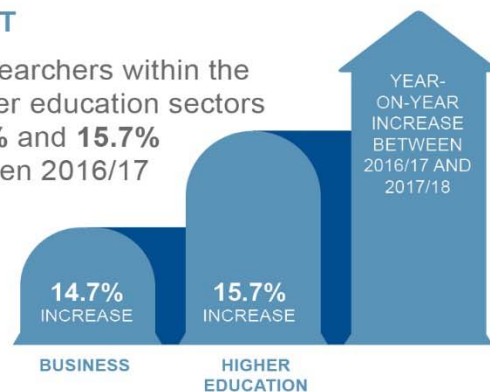
The country's human capital ranking improved from **114th** position on the Global Competitiveness Index in 2018 to **108th** position in 2019. The average of upper middle-income countries was **74th** in 2019.

STI EMPLOYMENT

The number of researchers within the business and higher education sectors increased at **14.7%** and **15.7%** respectively between 2016/17 and 2017/18.

The number of full-time equivalent (FTE) researchers per 1 000 in total employment is **1.8** in 2018, which is similar to what it has been for at least the past 10 years.

The number of white researchers increased by 4.3% from 2016/17 to 2017/18, following a period of decline from 2015/16 to 2016/17.

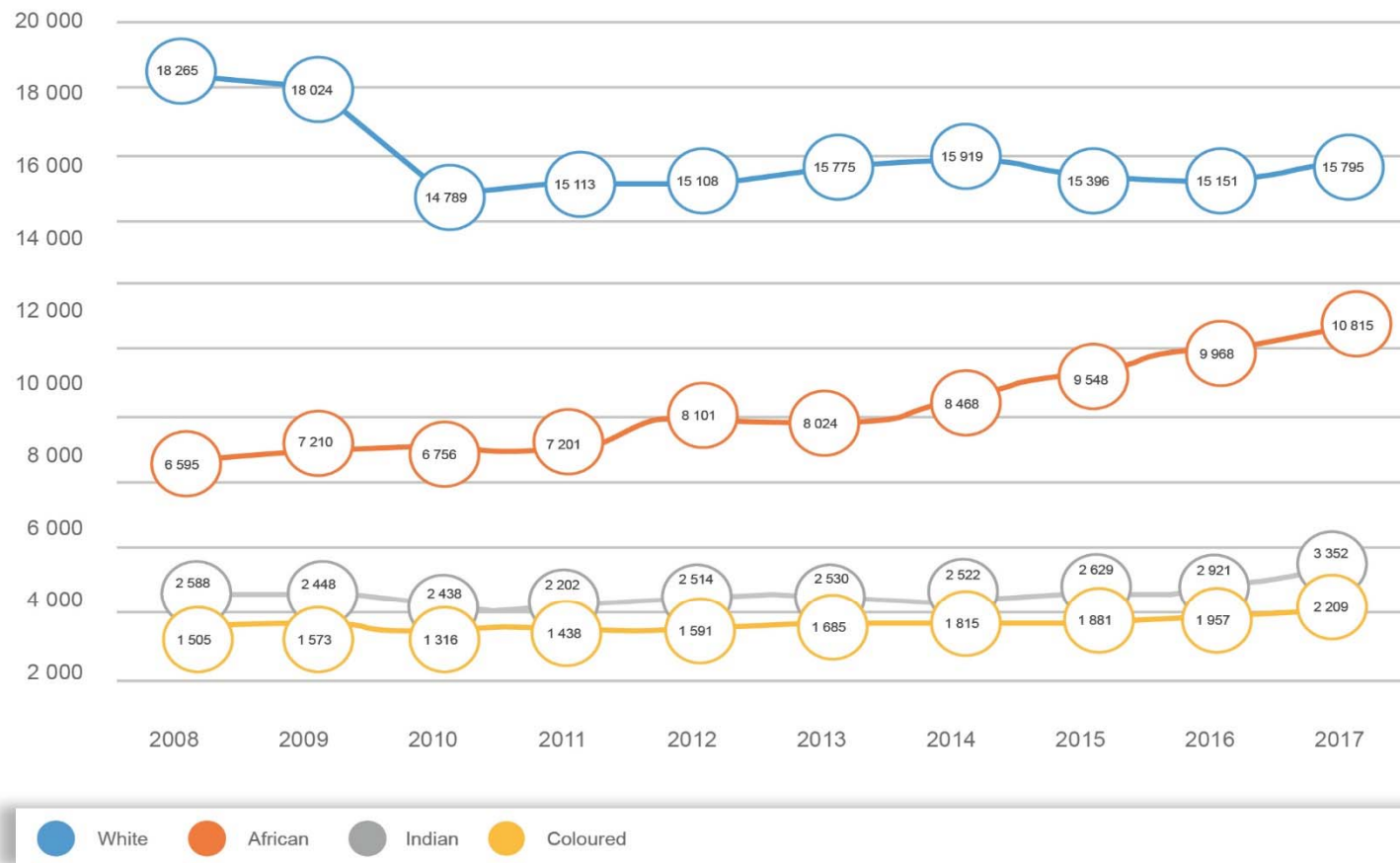


Female Researchers

Year	Researchers (HC)	% Female
2008	28 952	38.8
2009	29 255	39.8
2010	25 300	41.4
2011	25 954	41.9
2012	27 314	43.7
2013	28 014	44.6
2014	28 723	44.9
2015	29 455	45.1
2016	33 035	45.6
2017	36 233	45.3



Distribution of SA Researchers by Race



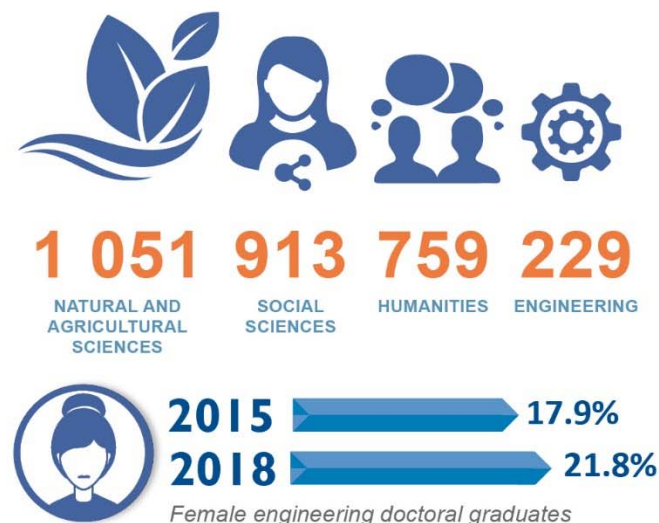
STI Human Resources

DOCTORAL RESEARCH

Most of the doctoral degrees produced in South Africa are in the field of natural and agricultural sciences, with **1 051** doctorates produced during 2018. Doctoral degrees in social sciences and humanities follow with **913** and **759** doctoral degrees, respectively. Engineering fared the lowest, with **229** doctorates during 2018.

Only 7% of the doctoral degrees produced are in the field of engineering.

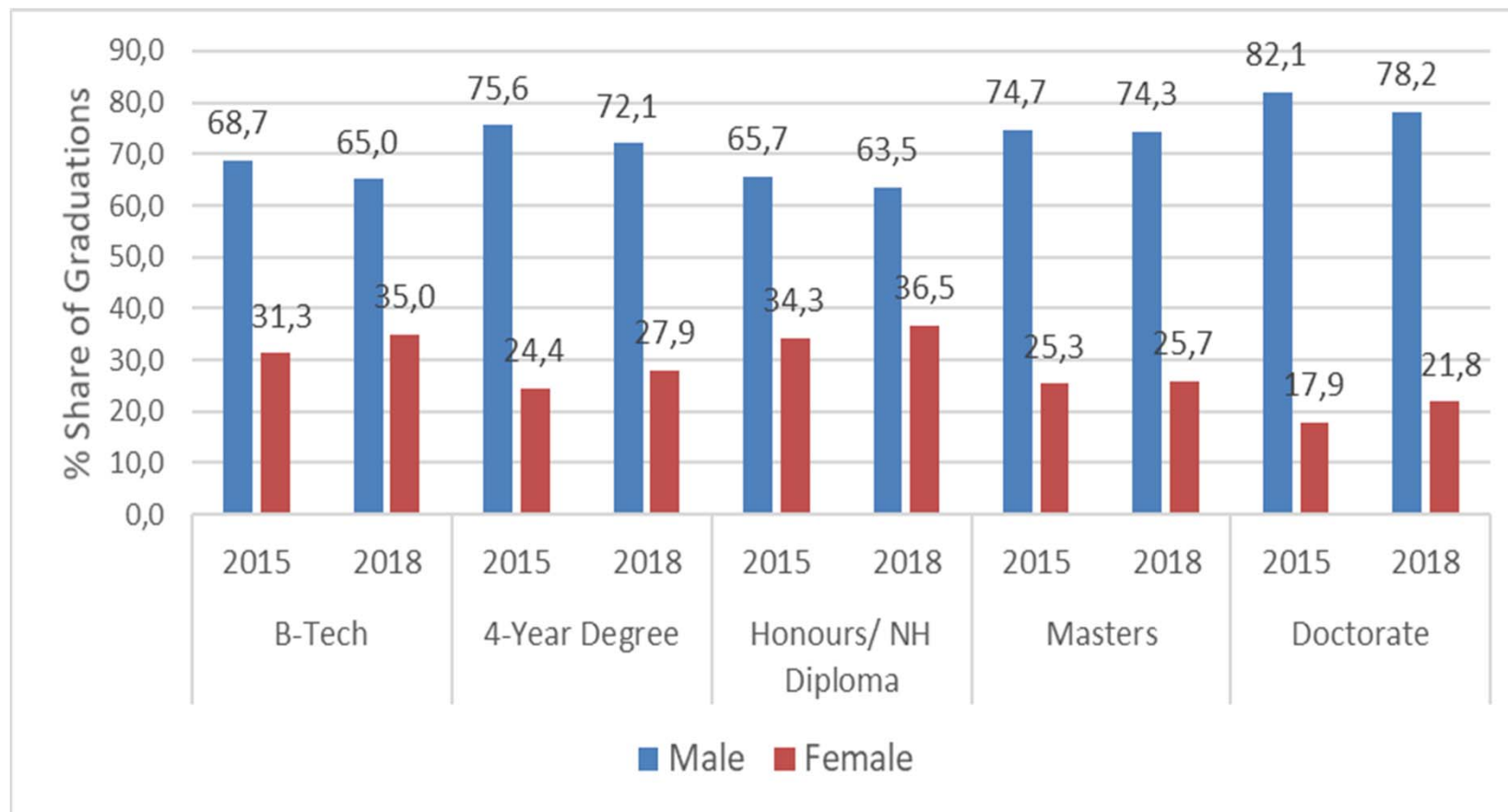
Engineering, as a career, is still male-dominated, although between 2015 and 2018, there was a visible shift across all qualification types in the proportion of female engineering graduates. The imbalance is more at the doctoral level as the share of female graduates was **21.8%** in 2018, which increased from **17.9%** in 2015.



NATIONAL SENIOR CERTIFICATE PASS RATE IN SELECTED STI SUBJECTS



Distribution of engineering graduates by gender and level



Percentage distribution of engineering graduates by race

	BTech		Four-year degree		Honours/ National Higher Diploma		Master's degree		Doctoral degree	
	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018
African	77	82	30	36	46	56	36	49	37	53
Coloured	5	5	4	5	2	4	4	4	2	2
Indian	6	5	11	13	6	5	9	8	8	7
White	11	8	53	44	45	35	46	36	48	35

INVESTMENT

STI Funding

GROSS DOMESTIC EXPENDITURE ON R&D (GERD) AS A PERCENTAGE OF GDP

GERD, as a percentage of GDP, was **0.83%** in 2017/18 (in constant 2010 rand values), and remains below the **1.5%** target set by government. In constant rand values, GERD amounted to **R25.96 billion** in 2017/18, which was a small increase from **R25.19 billion** in 2016/17.

1 BUSINESS



R&D funding for the business sector remains constrained. As a result, business expenditure on R&D (BERD), as a percentage of GERD, declined from 42.7% in 2015/16 to 41.0% in 2017/18. Despite this, the business sector remained the largest performer of R&D in 2017/18, with BERD amounting to R15.85 billion.

2017/18

TARGET
46.9
BILLION

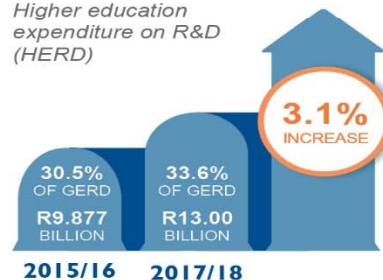
2016/17

25.19
BILLION

25.96
BILLION

2 HIGHER EDUCATION

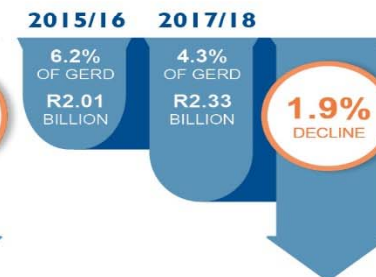
Higher education expenditure on R&D (HERD)



3 SCIENCE COUNCILS



4 GOVERNMENT



5 NOT-FOR-PROFITS



STI Funding

NRF RESEARCH GRANTS

**R1.72
BILLION**

2017

**R1.61
BILLION**

2018

**R1.52
BILLION**

2019

For the past two years, NRF research grants have been on the decline (in nominal terms) from **R1.72 billion** in 2017 to **R1.61 billion** in 2018 and **R1.52 billion** in 2019.



Provincial R&D expenditure trend (2017/18)

	Eastern Cape	Free State	Gauteng	KwaZulu- Natal	Limpopo	Mpumalanga	Northern Cape	North West	Western Cape
Total R&D expenditure (R million)	2 300	2 149	17 319 <i>(1.1% pGDP)</i>	4 172 <i>(0.6%)</i>	854	715	576	1 306	9 328 <i>(1.5%)</i>
Provincial GDP	331 093	217 849	1 507 082	692 222	311 686	323 722	90 883	279 733	596 043
Provincial expenditure as % of GERD	0.7	0.99	1.15	0.61	0.28	0.22	0.64	0.47	1.57
BERD (R million)	707	1 105	8 285	1 679	223	304	565	60	2 927

Knowledge production

Scientific Outputs

PUBLICATIONS

The number of scientific publications per million population was **360** in 2018 and **371** in 2017. The average of upper middle-income countries was **327** in 2018.



77.4%

South Africa

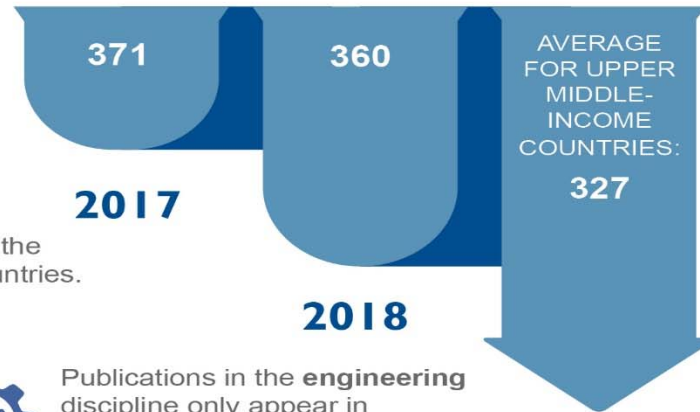
South Africa accounts for **77.4%** of the publications arising from SADC countries.



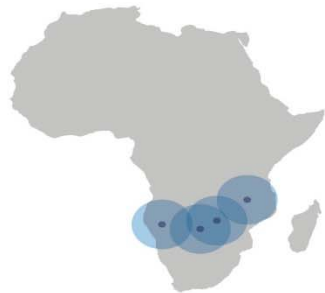
The publications on **infectious diseases** appear among the top three most prolific scientific disciplines in 15 of the 16 SADC countries.



Publications in the **engineering** discipline only appear in publications from Botswana, South Africa and Mauritius.



CO-AUTHORS



South African scientific publications are co-authored with scientists from various SADC countries. Between 2013 and 2017, the major co-authors for South Africa were Zimbabwe (**1 113**), Namibia (**578**), Botswana (**560**) and Malawi (**555**).

HIGHLY CITED PAPERS



2 022

GLOBALY RECOGNISED
32ND

South Africa is ranked **32nd** in the world in terms of most highly cited papers, with **2 022** papers recognised as such between 1 January 2010 and 29 February 2020.

Knowledge exploitation and utilisation

Technology Outputs

PATENTS

The majority of patent applications filed with the Companies and Intellectual Property Commission are in the following areas:

5 609



PHARMACEUTICALS

4 469



ORGANIC FINE
CHEMICALS

2 892



BASIC MATERIALS
CHEMISTRY

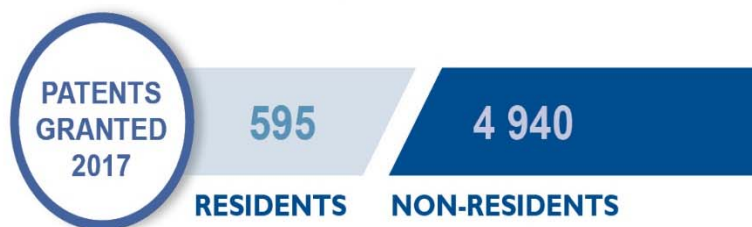
2 635



BIOTECHNOLOGY

Note: Out of 44 204 foreign patents (2008 to 2015)

The majority of patents were granted to non-residents of South Africa.



South Africans are granted a limited number of patents in the USPTO – the largest technology market in the world.

During 2017, South African inventors received **182** utility patent and **10** plant patent grants. South Africa is ranked **30th** in the world in terms of utility patents and **16th** in terms of plant patents.

10

Granted
plant patents

16TH

South Africa ranked
globally for plant
patents

182

Granted
utility patents

30TH

South Africa ranked
globally for utility
patents

0.05%

University-industry-government partnerships

Innovation-active industrial and service sector enterprises



During the period 2014–2016, **69.9%** of the enterprises from the industrial and service sectors were innovation-active.

Service sectors are more likely to get the information that they require to innovate from education and research institutions than is the case with industrial sectors.

Information for innovation for service sector enterprises



Between 2014 and 2016, **11.9%** of service sector enterprises derive the information that they require to innovate from public research institutions; **11.1%** from government. By contrast, only **1.2%** of industrial sector enterprises derive the information that they require from public research institutions and **1.5%** from government.

Information for innovation for industrial sector enterprises



Technology Exports

South Africa's exports are focused in primary products and medium-technology manufacture.

26.6%

Primary products

28.2%

Medium-technology manufacture

South Africa has a low share of high-technology exports as a percentage of manufactured exports

5.2%

South Africa

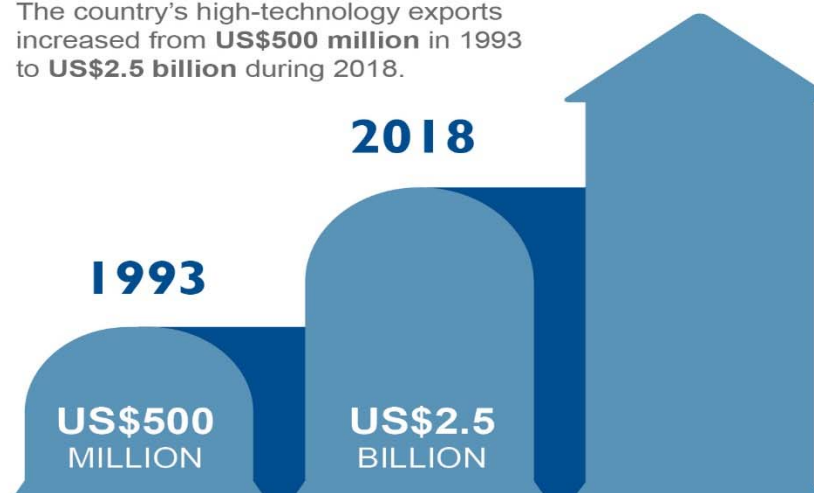


30%+

Korea and China



The country's high-technology exports increased from **US\$500 million** in 1993 to **US\$2.5 billion** during 2018.



COMMERCIAL SERVICE EXPORTS VS IMPORTS

US\$120 MILLION

Receipts

RANKED 30TH

Exporter of commercial services

US\$1.8 BILLION

Payments

RANKED 33RD

Importer of commercial services

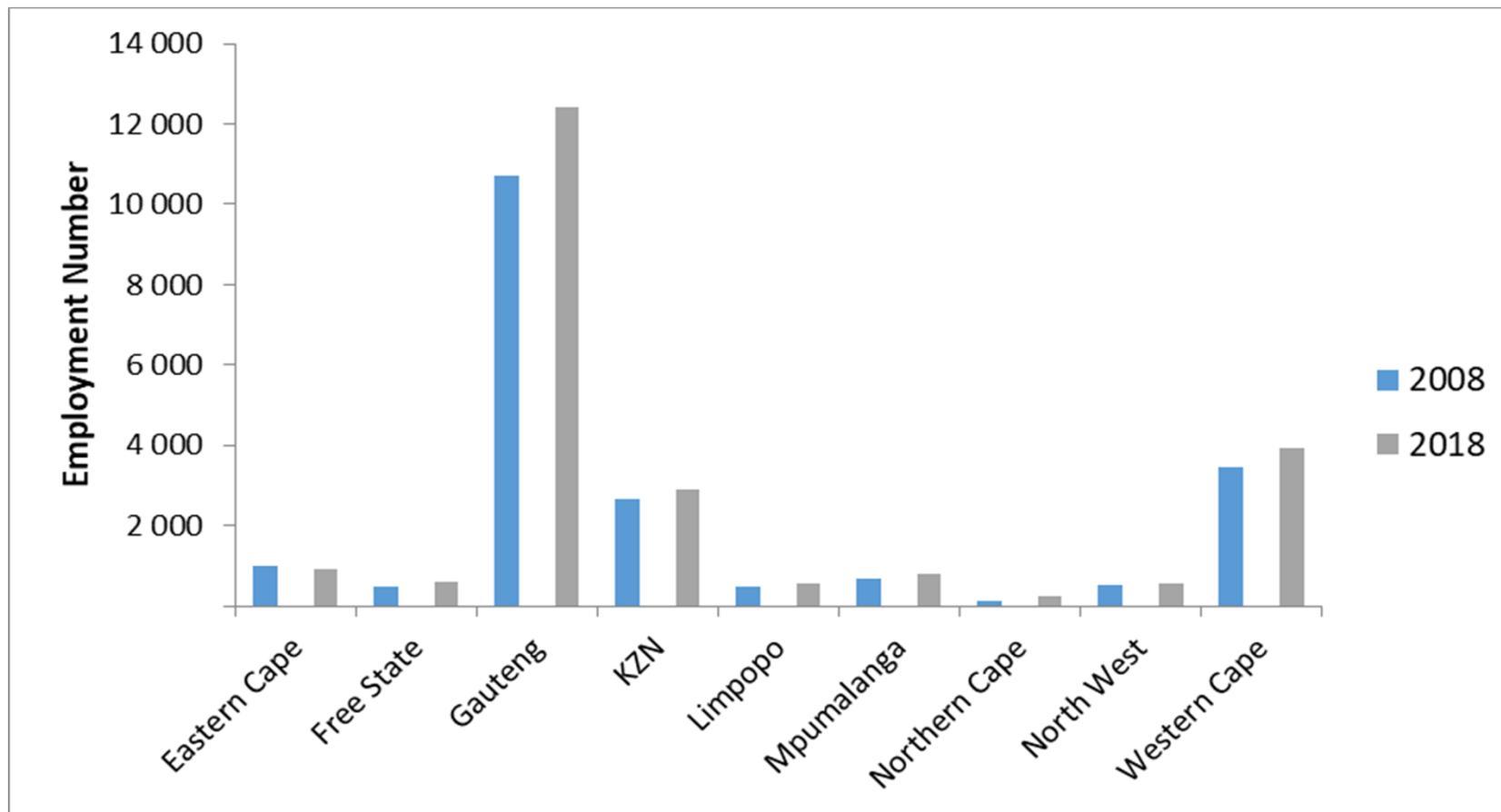
Technology balance of payments

Country	Current US\$ billion
South Africa	1.7
Australia	3.6
Brazil	5.1
Canada	11.8
China	35.7
India	7.9
Republic of Korea	9.8
Malaysia	2.0
Russia	6.2

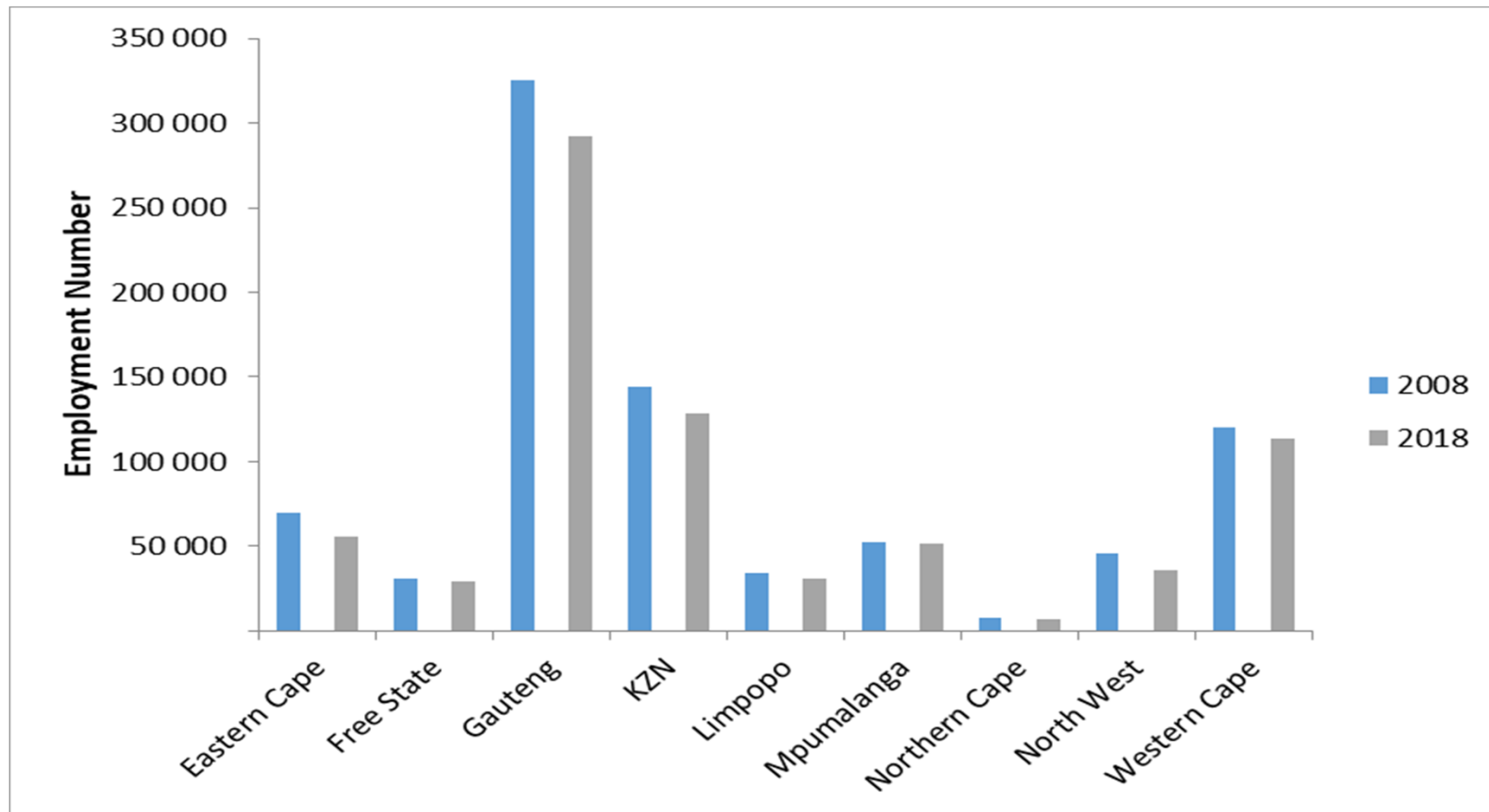
Provincial distribution of innovation support organisations

Province	Science parks	Technology stations	Fab Labs	Living labs
Eastern Cape	1	3	0	3
Free State	1	1	1	0
Gauteng	2	6	2	0
KwaZulu-Natal	0	2	0	1
Limpopo	0	1	1	1
Mpumalanga	0	0	0	0
Northern Cape	0	1	1	0
North West	0	0	1	1
Western Cape	1	3	1	1

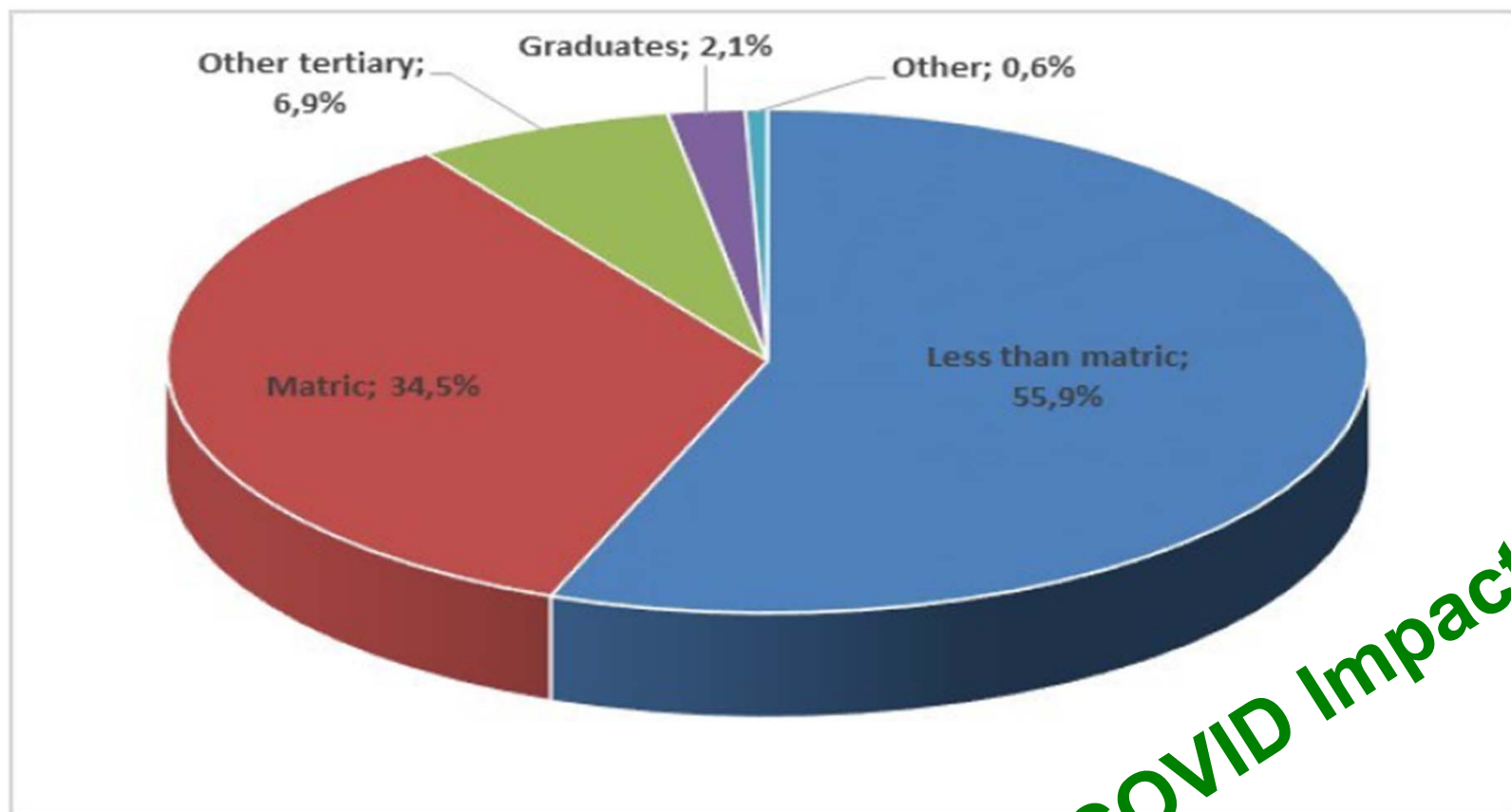
Employment in high-technology manufacturing sectors



Employment in medium-technology manufacturing sectors



Proportion of the unemployed by education level



COVID Impact!!!

Key Discussion Points

- This is a pre-COVID 19 Report.
- We have a data challenge – Global Acceleration Framework priority.
- SA STI has been highly responsive in the COVID Response, is there sufficient robustness to have a STI driven post-COVID Recovery [other side of the Portal]

Key Discussion Points

- GERD and BERD trends are cause for concern – Lessons from 2008 Crisis.
- Technology Balance of Payments – Trade Balance – Economic Growth Relationship : A vital discussion!
- Serious effort required to secure demographic dividend.



Thank you

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