

# CAPACITY BUILDING

## South Africa completes comprehensive tracer study on the country's PhD graduates

*A survey of doctoral graduates from South African universities for the period 2000–2018 has yielded important demographic data, as well as useful insights on PhD financing and subsequent employment. Article by Sue Matthews.*



For those of us with a biological or environmental science background, some of the findings of South Africa's first comprehensive National Tracer Study of Doctoral Graduates may come as a surprise. We've seen how students in these fields typically progress straight from undergraduate to postgraduate degrees, perhaps taking a gap year for overseas travel (pre-pandemic) before they embark on an MSc, but also often upgrading the MSc to a PhD to have earned the title 'Doctor' by their late twenties. Their studies have generally been funded by the National Research Foundation (NRF) bursary scheme, sometimes with top-up from supervisors' research grants, generous parents, or piecemeal work on- or off-campus.

By contrast, the Tracer Study found that the average age of

doctoral graduates from a range of disciplines over the past two decades was around 40, the majority (61%) studied part-time, and were funded through either self-financing (33%) – including bank loans and financial support from family members – or assistance from their university (30%). Only 22% relied on bursaries and scholarships from national funding agencies.

The Tracer Study was funded by the Department of Science and Innovation (DSI), managed by the Water Research Commission (WRC), and executed by a project team from Stellenbosch University's DSI-NRF Centre of Excellence in Scientometrics and Science, Technology and Innovation Policy, under the leadership of Prof Johann Mouton.

"The number of PhD students graduating from South Africa's public university system has more than doubled from around 1 400 PhDs in 2010 to about 3 400 PhDs in 2019, but what has not been certainly established are the career pathways, mobility and impact of the cohorts of these PhD graduates, both South African and foreign," says Bheki Hadebe, DSI Director: Research Development. "The study was therefore commissioned by the DSI to explore the above question with a view to inform policymakers, funders and the public about the benefits of continued investments in doctoral education."

But how did the WRC come to manage this cross-disciplinary study? John Dini, Research Manager: Water Governance, explains: "The idea for a national tracer study of all PhDs from South African universities was born in another project funded by the WRC, focusing on water PhDs. This project examined the paths taken by students graduating with water-related PhDs between 2013 and 2017 (**WRC Report no. 2851/1/20**). The DSI was part of the reference group for this project, and after its completion was curious as to whether the water sector results were indicative of PhDs across all sectors and disciplines. As a result, DSI decided to fund such a study and asked the WRC to manage it on their behalf"

The earlier water-focused study identified 112 doctoral graduates in the water and sanitation field and received questionnaire responses back from 48 of them. For the more recent, broader study, over 15 000 doctoral graduates were emailed the link to a Survey Monkey questionnaire, and almost 6 500 responses were received. In addition, the project team conducted 113 in-depth interviews with respondents drawn mainly from the water sector.

The vast majority of the doctoral graduates indicated satisfaction with their decision to do a PhD, but extracts of questionnaire and interview responses contained in the report reveal a range of perspectives and experiences. Some were positive, with respondents highlighting the advantages of their PhD.

"It's opened up new doors. I would not have had the job opportunities that I've had, and the learning experiences that I've had, if I hadn't done it. It's definitely been a gateway for me," said a senior research fellow at a university.

"It also gives you a level of confidence in how you approach issues," according to a science council manager. "And believe it or not, it helps gain a little bit of respect and cooperation because your team members, whether they're older or younger than you, are comfortable that you know what you're talking about."

But some were clearly disappointed that all their hard work had limited their options somewhat.

"It's not easy to get employment because you find that other companies, like private companies that deal with water, rarely hire people who have reached the level of PhD. They rather hire people who have attained their diplomas or degrees and then they train them for the job," said one senior lecturer.

"I embarked on a PhD late in life as a 'bucket list' item, something that I did to satisfy myself and I achieved that. What I did not anticipate was that once I became 'Dr' I became immediately

unemployable. Despite my broad industry experience, academia appears only interested in published articles and teaching experience, while industry appears unwilling to pay the extra dollar for a PhD," said another survey respondent.

Although only 2–3% of respondents indicated that they could not find employment within a year of completing their doctoral degree, nearly one in five could not find a position related to their field of expertise. Further analysis of the data showed that this has been more of a problem for those who received their doctoral degrees in the past five years, compared to 15 years ago, and that social science and humanities graduates were more affected than STEM graduates.

"These results are interesting and pose challenges to policy," note the project team. "Even though South African doctoral graduates are successful in finding employment, they are increasingly indicating that the employment is not what they expected or wanted."

More than 50% of the respondents had found employment in academia, but most had already been employed in the sector while doing their PhD, and typically just remained with the same employer. Many of the rest (about 20% of all respondents) had accepted a postdoctoral fellowship, and one in three became "serial postdocs", something that the project team points out is a symptom of a saturated system. Graduates in the biological and environmental sciences, and those aspiring to find a permanent position in academia, are particularly affected.

"Although our results show that such fellowships carry benefits, other results lead us to conclude that the South African science system is reaching capacity in its ability to absorb increasingly younger graduates, whose lack of full-time employment options lead them to apply, often repeatedly, for a finite number of postdoctoral fellowship positions."

About 70% of respondents indicated that a doctoral degree is a requirement of their current employment position, but this applied more to those in the higher education sector (83%) than the government sector (53%). When asked to rank the application and utilisation of five different aspects of their doctoral studies in their current employment, the general knowledge they acquired – such as critical thinking and academic writing abilities – came out tops, closely followed by research skills and expertise. Not surprisingly, their own PhD findings ranked lowest, more so for those who had completed their degree many years ago. Just over half of the respondents indicated that their jobs involve substantial managerial responsibilities.

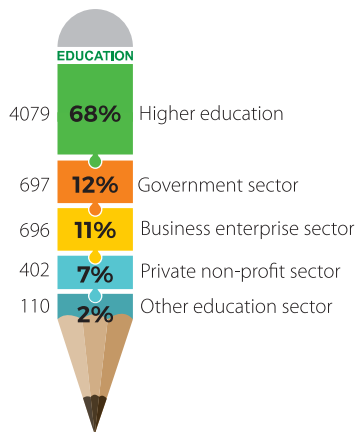
As for concerns about "brain drain" from South Africa, the study found that South Africa has, in fact, benefitted from the inward flow of doctoral students.

"Of the 3 770 graduates in our sample who were born in South Africa, 372 or 9.2% left the country after graduation. At the same time, of the 1 812 graduates in our study who came from outside the country, 633 (or 35%) remained in the country. This translates into a net brain gain of 261 graduates or 4.6% of our sample," note the project team. "If we average this out over the past twenty years, it means that South Africa has a net gain of 1 400 doctoral

graduates from other countries who remained in the country after subtracting those South African nationals who left the country.”

The project team explore the data in greater detail in the research report, providing considerable insight into gender- and race-based differences, among other things. They conclude with a number of recommendations for further research and dialogue, and also make a strong case for a policy review, pointing out that South Africa currently has (a) too few full-time doctoral students who are (b) properly funded and (c) able to commence and complete their doctoral studies at a much earlier age.

“From a policy point of view, these facts call into question some of the rules of the most recent NRF funding policy that focuses exclusively on students who study full-time (the minority in the system), who are not older than 32 at commencement of studies (again the minority of students across all disciplines) and also to ignore (for all practical purposes) the huge contribution that non-South African students (more than 30% of all doctoral students are from the rest of Africa) have made to our higher education and science system,” they note. “We therefore strongly recommend that the NRF revisits and revises their current policy to take these facts into account.”



Where are PhD graduates employed? Nearly two thirds of study respondents were employed in the higher education sector at the time of the survey and have remained in the sector.



South Africa has benefitted significantly from the inward flow of doctoral students to the country. While 9.2% of South African PhD graduates had left South Africa, 35% of graduates from other countries had remained.

### Water sector findings

In an appendix to the research report, the project team provide a separate analysis relating to doctoral graduates in the water and water-related sector, which made up 220 of the almost 6 500 respondents. Of these 220, two-thirds were male, with females in the water sector being slightly underrepresented compared to the main sample. This finding was not unexpected as the same trend is evident for STEM disciplines as a whole.

“This, however, sends a signal to the WRC that it could play a stronger role, through its support to postgraduate students, in bringing about gender parity in disciplines that remain male-dominated,” says WRC Research Manager John Dini.

The analysis also revealed that water graduates are, on average, four years younger at the time of completing their doctoral degrees when compared to the total sample, probably because they are more likely to study full time. There are higher percentages of international students, especially African students, suggesting that the water sector is providing training and skills in a strategic area of specialisation.

The findings showed water graduates are more likely to accept a postdoctoral position on completion of their doctoral studies, and many do more than one. An analysis of the type of employment held by water graduates revealed that they are more likely to be involved in technology development, innovation or entrepreneurial activities. As for the utility of skills obtained during the doctorate, water graduates considered the findings of their PhD to be less useful in their current employment compared to other graduates. Generally, however, the trends observed in the employability of graduates in the water sector are comparable to that of the overall sample.

“The study is of benefit to the WRC in a number of ways,” says Dini. “It shows that the investment by WRC in building capacity, in the form of supporting postgraduate students (PhDs in this case), has delivered returns. This is reflected in the high rate of employment of PhD graduates generally, and water PhDs specifically, their low rate of migration out of the water sector and the net brain gain within the country. The findings do, however, suggest that some water PhD graduates may struggle more to find work related to their field of study than graduates in other disciplines. There are signs that the market has reached saturation for certain types of skills.”