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Taking stock of climate change science and technology in South Africa: Insights, recommendations and missed opportunities

The formal publication of the *Second Biennial Report on the State of Climate Science and Technology in South Africa*[1] by the Academy of Science of South Africa (ASSAf) in early August 2021 comes ahead of the Conference of Parties (COP) meeting to be held in Glasgow in November 2021. The 26th COP meeting is where world leaders, scientists and representatives of business and civil society will gather to find bold solutions and limit the risks of climate change.

Faced with these imperatives, an assessment of the state of South Africa's research and development activities relating to climate change adaptation and mitigation is timely and vital to understanding our country's readiness to respond to this global challenge.

The second biennial report builds on the first report that was completed at the end of 2016 and covered the period 2005–2015. The second report utilises data from the period 2016 to 2017. Although the report was finalised in 2019, it has taken almost 2 years for government to approve its release into the public domain.

The report presents statistics on key indicators such as the production of master's and PhD graduates, publication outputs and investment into climate-related science and technology (S&T). Such metrics allow for the determination and analysis of trends – one of the most critical contributions of a status report. If they are to be useful, status reports must be produced regularly on an on-going basis. A 2-year interval may be too demanding, given some of the data collection complexities; in the future, a 5-year interval might be more manageable and affordable.

Over and above the presentation of data on key indicators mentioned above, in this second biennial report there was a specific focus on sources and levels of investment into climate change S&T. ASSAf commissioned two studies to survey sources and levels of investment accessed through climate change international finance instruments and from the private sector. This information was complemented with information from annual reports of companies and state-owned enterprises, as well as key informant interviews, to compile a more comprehensive funding source evaluation. As a result, there was an upward revision of investment into climate-related S&T between the first and second biennial reports, with estimates increasing from ZAR400 million per annum (p.a.) to ZAR900 million p.a. Additional funding came predominantly from 'green funds' mobilised by the private sector and support from international financial instruments. It is possible that ZAR900 million p.a is still an underestimate and the ASSAf report calls for more systematic collection of information on investment and finance by the private sector.

The decision to combine reporting on a standard set of indicators with an in-depth analysis of one aspect – in this case, finance – is a good model that should be replicated in the future. For example, there is a need for a more nuanced and in-depth analysis of human capacity development. While it is good to know the numbers of master's and PhD graduates in climate change that South Africa is producing, it would be useful to know whether there are subject area gaps that need to be addressed, what the graduates' employment uptake is, whether their skills set matches the needs of the market, and how many are engaged actively in research and development.

A striking, rather sensitive, finding that is not given prominence in the Executive Summary is the dominance of universities in accounting for climate change related research outputs compared with the non-university sector. Universities account for 85% of research outputs. Government-funded research councils trail far behind, with the highest ranked, the Council for Scientific and Industrial Research, only coming in at 10th position in terms of ranking and producing only a quarter of the output of the highest ranked university. This is cause for concern given the additional teaching responsibilities of university staff and signals an area where improvements can be made.

One of the greatest challenges of producing a status report is demarcating the boundaries of climate change S&T. Unfortunately, there is no right or wrong answer here. It cannot be that the term 'climate change' must appear in the project title or even in the abstract, for climate change has such a far-reaching impact. Climate change can act as justification for research, innovation and investment into renewable energy, and at the same time be relevant for research into drought-resistant crops. What is important, however, is clarity on the approach adopted, specification of the keywords used and consistency in reporting over time. This is certainly the case here. The report utilised hundreds of keywords based on international best practice and tended towards a broad, inclusive approach that is probably advisable given the cross-cutting nature of climate change.

The in-depth analysis of finance instruments was revealing. Of the 37 international instruments identified to fund investments for climate change mitigation and adaptation, South Africa managed to access funding from only 16. There is a missed opportunity here that led to the recommendation that government should publish a register of international funding instruments and disseminate it to research institutions. It was also revealing that South Africa dominated the funding pattern for the entire sub-Saharan Africa, accessing more than one-third (36.9%) of funds approved. However, rather than congratulating ourselves for dominating over other less-advantaged African countries, the overriding message should be the underutilisation of global funding opportunities.

Two interesting recommendations are made, both of which relate to South Africa's strategic positioning in low-carbon energy technologies. The first is the identification of concentrated solar power as a technology that is ideally suited to South African conditions and skills. South Africa could become a global player according to

the report. A similar recommendation was made in a previous report on *The State of Energy Research in South Africa*[2]. It is estimated that 60% of concentrated solar power systems could be manufactured locally. A second opportunity relates to the local manufacture of fuel cells, particularly where they require platinum-group metals, given South Africa's vast reserves. These are clear attempts to provide direction to future government investments that will leverage local advantage.

This second biennial report on climate change S&T is a useful addition to the South African climate change literature. It allows one to take stock and provides an evidence base for improvements. It is sincerely hoped that the South African Department of Science and Innovation will continue this tradition, but more importantly, that the recommendations made will be carefully considered and implemented where possible.

Competing interests

I have no competing interests to declare. I was a member of the ASSAf panel responsible for the *Second Biennial Report on the State of Climate Science and Technology in South Africa*.

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