5.6.1 Open Science and Open Innovation

The OECD estimates that 30% of innovation in Europe is open in the sense of being shared. For example, the Philips Research Campus in Eindhoven invites industry participation with a view to facilitating collaboration between publicly funded and privately funded research. The Bill & Melinda Gates Foundation malaria project is also using data from a number of resources, because open innovation means that the disease can be addressed more quickly. It must be remembered, however, that open innovation does not mean "free". Patents and intellectual property rights still apply, but only at the end of the innovation process.

The DST is actively examining the transition to open science and open innovation. This will call for appropriate regulatory frameworks and data skills development, as discussed below.

Incentives for open science will be fostered through education programmes and career development programmes for researchers. A focus on citizen science will also be introduced. Barriers to open science will be evaluated and where necessary removed, ensuring that legislation and practice support, rather than thwart, the principles of open and collaborative science. Government will therefore review these, taking into account certain aspects of intellectual property rights from publicly funded research and accepting that open science, open innovation and intellectual property, and the associated rights, are not mutually exclusive. Government will also review the policies and institutions governing access to research data and research publications.

As a general principle, publicly funded research and research data may, after a careful analysis, be made available (with some exceptions including data that can compromise sovereign security and which is of a confidential nature). Government will encourage researchers to deposit data arising from research in publicly accessible repositories, and to support open journal publishing and data sharing, providing access to data and other research outputs arising from publicly funded research. In this manner, research will be made more transparent, rigorous and efficient in stimulating innovation and promoting public engagement.

South Africa does not have formal protection for databases. Government will identify a licence system for depositing data and for the use of open data. What is in the public domain, what is not, or when it becomes available are pressing issues that need to be dealt with. Ensuring the needs and wants of the data provider are respected, and determining who can use the data, and under what conditions (research use, teaching and commercial use) are also important considerations. The Creative Commons licence is a good example for starting to draft specific licence types for different types of open data.

Contemporary open science and open innovation requires data to be findable, accessible, interoperable and reusable (FAIR) in the long-term, and these objectives are rapidly becoming expectations of funding agencies and publishers. The current Intellectual Property Rights from Publicly Funded Research and Development Act will be reconsidered to ensure that it supports the FAIR guiding principles for scientific data management and storage.

National data storage is a further matter that needs to be addressed. The DST will develop a long-term sustainable business model for a South African research data cloud. Institutional data repositories will be encouraged. More support is also needed for the harmonisation of repositories, which can take place through the Data Intensive Research Initiative of South Africa (DIRISA).

The DST, in consultation with Department of Telecommunications and Postal Services and DHET, will produce a national open science (and data) framework consisting of principles and guidelines for the adoption of open science in South Africa. The framework will be used as a vehicle for awareness raising and training on good practice.

The DST will work with the higher education sector and the relevant government departments to ensure data-related skills development for making efficient use of new scientific datasets, tools and methods.

Digital technologies are making the conduct of science and innovation more collaborative, international and open to citizens. In the next decade, as connectivity becomes ubiquitous, the shift to more distributed, networked and open organisational models will become commonplace. Those unable to make the change will be left behind.[23, 24] Therefore, government will prioritise funding for the provision of digital resources to the communities and institutions that need them the most.

As part of its commitment to African STI cooperation, South Africa will also work to advance the open science agenda elsewhere on the continent and within regional frameworks. The strategic role of the African Open Science Platform, hosted by the Academy of Science of South Africa, which promotes African-wide development and coordination of data policies, data training and data infrastructure, will be leveraged with the support of the DST and the National Research Foundation (NRF). In addition, South Africa is one of the founding members of the global Open Government Partnership, and took over the chair in 2015. As one of the signatories of this partnership, South Africa is committed to developing an open data policy framework and action plan.

5.6.2 Diversity of knowledge fields

Public investment in science and research (both fundamental and applied) is an investment in the nation's future, ensuring that South Africa has a productive economy and a healthy society, and contributes to a sustainable world. To this end, a general shift in focus towards innovation is required in the South African STI landscape. However, this does not imply an NSI overly focused on investment in experimental and/or applied research. Instead, a dynamic balance is needed, determined on the basis of, among other considerations, the status of the field of knowledge in question, perceived innovation opportunities, and the research intensity and structure of the industries involved.

Studies on the state of health of the different knowledge fields in South Africa will be intensified to allow the DST and other funding institutions to deploy research funding strategically and sustainably. However, support to all academic disciplines, that is, the arts (performing arts and visual arts), humanities (such as languages, literature and philosophy), social sciences (including economics, law, psychology and sociology), natural sciences (physics, chemistry, biology and so on), and applied sciences (engineering and technology, medicine, health sciences, agricultural sciences and computer science) must continue. Government policies need to recognise the importance of language, particularly in the home language of children, as the carrier of scientific meaning and information.

Many of the challenges facing humans in the near future, particularly in developing countries, will be solved by the engineering sciences (for example, infrastructure for rapidly growing cities and improved transport and logistics, water and energy infrastructure, and satellites to ensure information security for the state). Given the present shortage of skilled engineers in the country,[xxxiv] government will need to increase support for engineering science and research.

Regardless of the type of research being conducted, two requirements will remain important, namely, whether the research is aligned to the country's needs and delivering the required impact, and whether the research is of a consistently high standard (which to some extent overlaps with the first requirement). Government will therefore implement a framework for research evaluation and impact assessment, supported by a responsible research and innovation framework for the South African context.

Finally, the decolonisation of knowledge is an essential academic project that will inform institutional development and open up ways of rethinking the university curriculum to make the research enterprise more inclusive.