



SA-EU OPEN SCIENCE DIALOGUE REPORT

29 October 2018

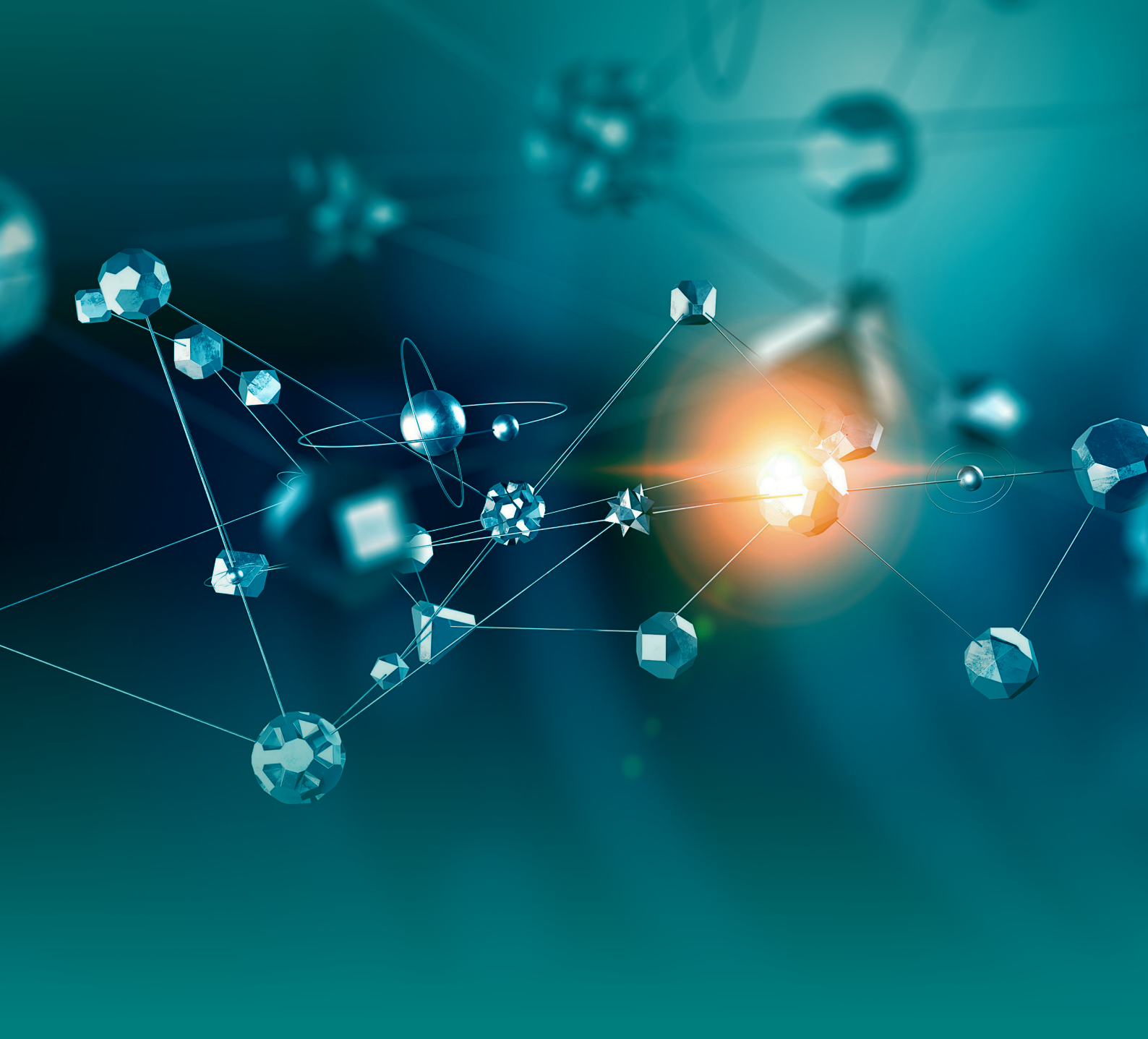


science
& technology

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA



SA-EU STRATEGIC PARTNERSHIP



SA-EU OPEN SCIENCE DIALOGUE REPORT

Prepared by

The SA-EU Open Science Dialogue:

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Final Version

29 October 2018

¹ See Table 1, page 9 of this document for the names and affiliations of the steering committee members.

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The nature of science is changing from a closed system to an open and sharing one. It affects virtually all components of doing science and research, and shifts in particular the focus from 'publishing as fast as possible' to 'sharing knowledge as early as possible'.

Open science is good for: (i) science itself: it improves efficiency and the verifiability of science, it brings transparency, and it allows inter-disciplinarity; (ii) the economy: with wider access to, and increased re-use of scientific information by all, and in particular, by industry and innovative companies; and (iii) society: it brings broader, faster, transparent and equal access for citizens, and contributes to increased societal impact of science and research.

The *raison d'être* for developing an Open Science Framework for South Africa is the recognition by the Department of Science and Technology (DST) that Open Science is a game changer for South Africa insofar as it seeks to create an ecosystem in which scientific research is more cumulative, better supported by data, more transparent with faster and more universal access to results, and underpinned by a greater focus on scientific integrity and the public's trust in science. By making knowledge accessible to all, Open Science holds great potential for research, education, the economy and society, particularly important at a time when the South African government has reaffirmed the goal to boost total research and development (R&D) spending from 0.8% to 1.5% of gross domestic product (GDP) in the next decade.

However, a key challenge facing Open Science in South Africa is the issue of fragmentation, and absence of a common sense of direction. Hence, the decision to develop an overarching national framework on Open Science. The Open Science Framework for South Africa articulates a set of guidelines and principles for publicly funded open science and open data for the South African context. The Open Science Framework also includes action points for key stakeholders such as relevant government departments, universities, science councils, civil society and industry. Mainstreaming science that is open to all and that is integrated across disciplines will enable South Africa to take advantage of the benefits of collaborative, transdisciplinary approaches to knowledge development and sharing.

The need for greater openness and collaboration in research is echoed in successive reviews of the South African National System of Innovation (NSI). In addition, the need for a national Open Science Framework is strongly supported by the draft 2018 Science, Technology and Innovation (STI) White Paper which was launched on 10 September 2018 by the Minister of Science and Technology for public consultation. One of the key policy shifts introduced by the draft White Paper is the endorsement of Open Data, Open Science and Open Innovation approaches. For the DST, Open Science represents a significant opportunity for growing STI output and impact. Mainstreaming Open Science will allow South African universities, science councils, government, industry and civil society to take advantage of the benefits of collaborative, transdisciplinary approaches to knowledge development and sharing.

Open Science is defined as research and development (R&D) that is collaborative, transparent and reproducible and whose outputs are publicly available (European Open Science Policy Platform, 2018). Although applicable to all R&D, it covers mainly public-funded (R&D), where its aim is to improve the quality of research, reduce the cost of R&D, boost collaboration, speed up the research process, make the assessment of R&D more transparent, involve more people in research through co-design and transdisciplinary research, promote public access to scientific results as well as introduce more people to academic research, thereby re-asserting science as a global public good (European Open Science Policy Platform, 2018).

Open science is more than open access to publications or data; it includes many aspects and stages of research processes. It is important to remember that open science is a broader concept that also includes the interoperability of scientific infrastructure, open and shared research methodologies (such as open applications and informatics code), and machine-friendly tools allowing, for example, text and data mining.

Executive Summary (Continued)

The three pillars of Open Science - open access to scientific information, open data and open engagement with society (including firms) - all require changes to traditional scientific processes and behaviours that need to be supported by policy mandates and appropriate incentive, monitoring and reward systems. Global experience has demonstrated convincingly that access to data leads to breakthroughs in scientific understanding as well as to economic and public good, in addition to several benefits to civil society. There is a growing appreciation by South African scientists that Open Science as scholarly research has great potential insofar as it is collaborative, transparent and reproducible and whose outputs are publicly available. Through Open Science researchers can enhance the quality of curiosity-driven research, maximise the value and potential impact of their work to create new avenues of knowledge, and drive scientific progress and innovation within South Africa, Africa and beyond.

02

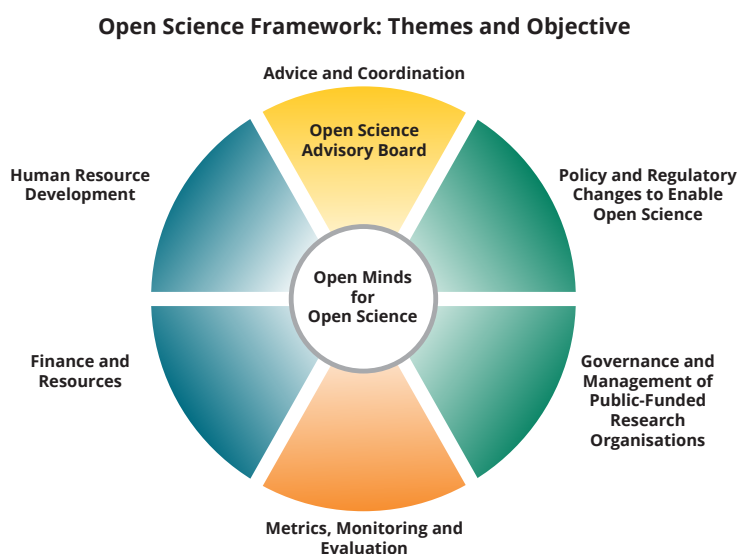
In South Africa, Open Science also has tremendous potential for creating a more inclusive society. An important aspect of Open Science relates to how the public is taking a more active role in science – what is referred to in the literature as ‘citizen science’. Open Science can create unprecedented connections between researchers and the public, allowing for a vibrant citizen science movement, poised to have transformative effects on how research is executed.

Open Science holds great promise in strengthening the competitiveness of the overall South African science and research system. It has the potential to speed up knowledge transfer among scientists and scientific disciplines, to foster the growth of new types of scientific cooperation and to stimulate collaborative research.

In this document, an Open Science Framework is presented. The intention of the framework is to support the DST in the formulation of an Open Science policy and more broadly, to assist all actors involved in the R&D process with the adoption of Open Science practices and principles. The document covers the process which was followed in developing the framework, the proposed rationale for Open Science in South Africa, the policy and technology context, the objectives for its adoption, normative principles and guidelines and finally a set of policy recommendations.

This objective could be achieved through the implementation of a set of policy recommendations, acting within the Open Science guidelines, where the latter have been defined in the framework as a set of broad normative principles that cover the ground rules of Open Science globally. For instance, Open Science is a cultural and behavioural phenomenon which must become embedded at every level and in every aspect of the scientific endeavour. It will require a systemic shift in current practices to bring transparency across the system, to ensure ongoing sustainability for the associated social and physical infrastructures, and to foster greater public trust in science. More importantly, perhaps, details of ‘Open Science in practice’ are still evolving; although the initial steps are clear, exactly what needs to change over the longer term has not yet been fully articulated.

The proposed policy recommendations have been clustered into six themes, which are indicated clearly in the figure below and cover the areas of new structures (the Open Science Advisory Board), changes to policy and regulations, human resource development, financing, governance and metrics.



The main recommendations from each theme are as follows:

- **Advice and Coordination:** the Open Science Advisory Board (OSAB) should be constituted as an independent entity reporting directly to the DST Executive or the Minister of Science and Technology, and performing advisory, coordination and monitoring functions. Its core mandate will be to drive and champion the development of an Open Science Policy, based on this framework and for implementation across Government, and to shape South Africa's longer-term response to the Open Science agenda. The establishment and operationalisation of the OSAB is the most significant recommendation of this framework.
- **Policy and Regulatory Changes:** six policy actions have been proposed including the development of an Open Science policy based on this framework. The other recommendations include the adaptation to the local context of three international frameworks, namely Fair, Reasonable and Non-Discriminatory (FRAND), Findable, Accessible, Interoperable and Reusable (FAIR) and the principle 'as open as possible, as closed as necessary'; and a review of legislation to ensure consistency with the principles of Open Science.
- **Human Resource Development (HRD):** as noted, Open Science implies a new approach to R&D whose implementation must be supported by system wide HRD. The core aspects for such training programmes, which are outlined in this theme, include the development of an Open Science e-learning platform for all levels in the education system, programmes for data scientists, support staff and librarians, and courses for managers of research infrastructure.
- **Financing and Resources:** given the present fiscal constraints, this framework has avoided recommendations whose implementation will require substantial new funding and other resources. Instead, the proposals in this section are based on the repurposing of existing budgets which are already in existence and used to support, for instance, R&D and innovation. Although there is a need for Open Science action across the whole of the National System of Innovation, the priority actions in this framework are to develop financial instruments to support Open Innovation (mainly at firm-level); to modify existing funding schemes in the R&D sector, through agencies such as the National Research Foundation, in order to ensure that public-funded research adopts the policy framework; and to ensure sufficient allocation to research data infrastructure which will be necessary to implement open and FAIR data for Open Science.
- **Governance and Management of Public-Funded Research Organisations (PFROs):** these organisations are at the core of R&D performance in South Africa and their ap-

Executive Summary (Continued)

appropriate management will be critical to the successful implementation of Open Science. The framework's most important proposal in this theme is to redesign metrics and career pathways such that Open Science, Open Innovation, Open Data and international collaboration are incentivised as behaviours at both individual and institutional level. Possible changes include the adoption of a more diverse set of research outputs (other than publications) in performance management systems, greater recognition of collaborative work, and active encouragement for Citizen Science projects.

- **Metrics, Monitoring and Evaluation:** in the last theme, the framework considers at a high level what needs to change, to what extent it must change over what time period, and how the change can be measured. A set of metrics has been proposed, and, although the metrics should be considered as 'work-in-progress', the indicators do provide a basis from which a more comprehensive set could be developed in the subsequent policy itself. The indicators include proportion of Open Access publications, the number of Citizen Science projects, the extent of international collaboration and the availability of research data.

In summary, this policy framework has been prepared as a basis from which a more detailed Open Science policy could be prepared, and as a guide to the overall process of implementing Open Science in South Africa. Six policy categories or themes have been defined and explicit recommendations developed within each theme. Given the opportunity presented by Open Science and Open Innovation, and the leading role that South Africa could play in both areas, the implementation of this framework will be of considerable benefit to its innovation system and, ultimately, to the people of South Africa.

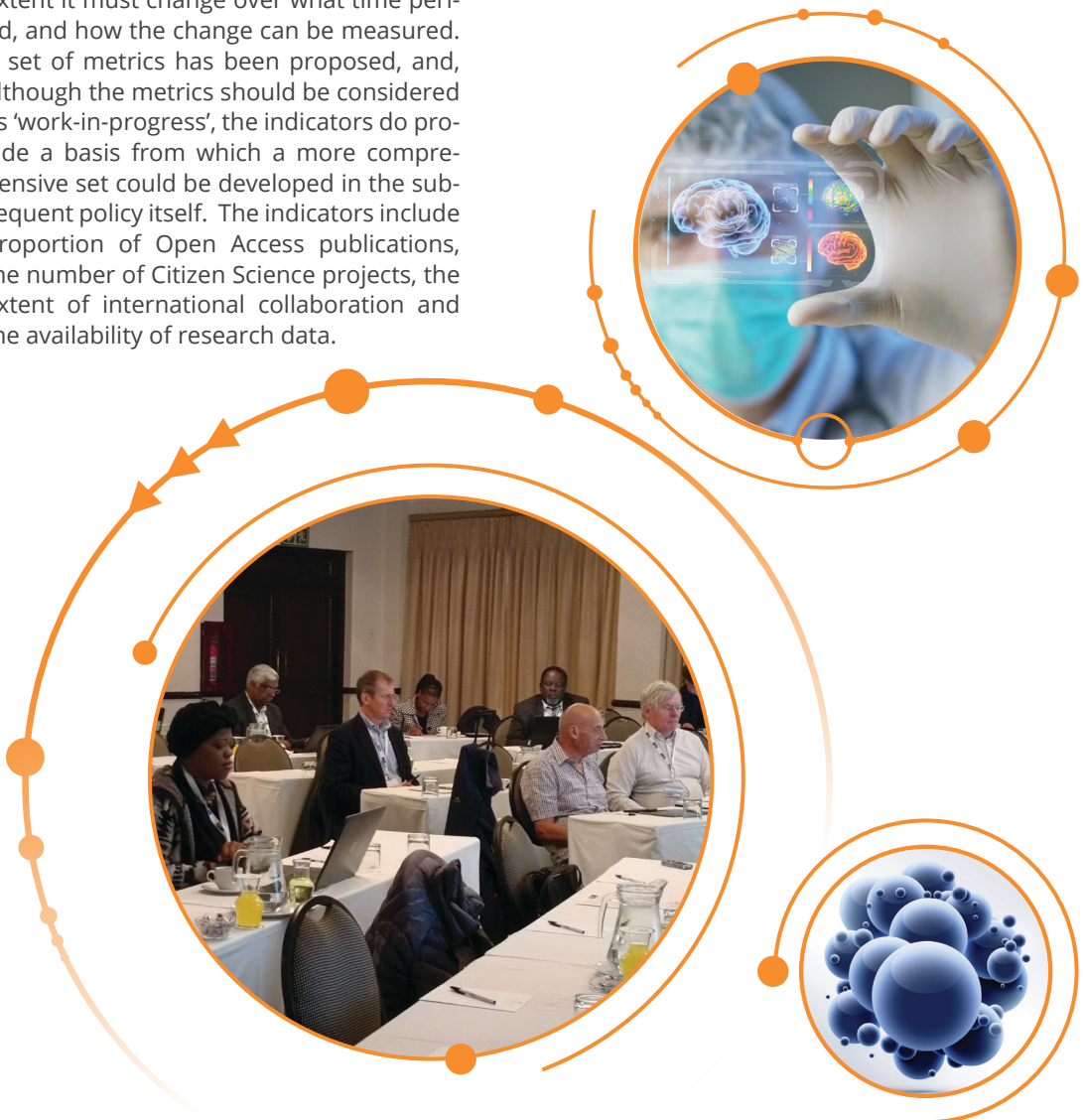


Table of Contents

1. Introduction	07
2. Process Details and Expected Outcomes	08
2.1 Process Steps	08
2.2 Outcome of the Process	08
2.3 Members of the Expert Task Group and the Steering Committee	09
2.4 Stakeholders	09
3. Defining Open Science and Related Concepts	10
4. Rationale and Context for Open Science	11
4.1 Rationale	11
4.2 Policy and Technology Environment	11
4.3 The International Experience of Open Science	12
4.4 South Africa's Prior Participation in Open Science	13
5. Summary of the Workshops	14
5.1 Initial Workshop on Broad Principles and Need for Open Science	14
5.2 Second Workshop on the Draft Framework	14
6. Framework for Open Science	15
6.1 Objective	15
6.2 Guidelines and Normative Principles	15
7. Policy Recommendations	16
7.1 Theme 1: Open Science Advisory Board	16
7.2 Theme 2: Policy and Regulatory Changes	17
7.3 Theme 3: Human Resource Development and Training	19
7.4 Theme 4: Financing and Resources	20
7.5 Theme 5: Governance and Management of Public-Funded Research Organisations	20
7.6 Theme 6: Metrics, Monitoring and Evaluation	21
References	22
Appendices	24
Appendix A. Discussions of the First Consultative Workshop	24
Open Data	24
Open Science and Open Innovation	24
Open Science Governance and Regulations	24
Skills and Training	24
Infrastructure	24
Funding	25
Metrics and Incentives	25
Citizen Science	25
Intellectual Property Rights	25
Appendix B. Bibliography	26

List of Tables

Table 1.	Members of the Expert Task Group and Steering Committee	9
Table 2.	Urgent policy actions to enable Open Science	18
Table 3.	Urgent HRD actions to support Open Science in South Africa	19
Table 4.	Possible financial instruments and resource requirements for Open Science	20
Table 5.	Important changes to governance systems for PFROs	21
Table 6.	Recommended metrics to support the implementation of Open Science	21

List of Figures

Figure 1.	The six themes of the proposed Open Science Framework	16
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Abbreviations

ASSAf	Academy of Science of South Africa
CHET	Centre for Higher Education Transformation
CREST	Centre for Research on Evaluation, Science and Technology
DHET	Department of Higher Education and Training
DIRISA	Data Intensive Research Initiative of South Africa
DST	Department of Science and Technology
FRAND	Fair, Reasonable and Non-Discriminatory
FTE	Full time equivalent
FAIR	Findable, Accessible, Interoperable and Reusable
HEI	Higher Education Institution
IBSS	International Bibliography of the Social Sciences
NIPMO	National Intellectual Property Management Office
PFRo	Public-funded research organisation
PRHEIs	Public research and higher education institutions (defined collectively)
PU	Publication unit
WoS	Web of Science

Acknowledgement

The authors acknowledge the valuable inputs of the Steering Committee and all the participants of the two workshops that were held during this project. The contributions of the European Commission, as the funders of the work, and the Department of Science and Technology in South Africa, as the initiator and champion, are also gratefully acknowledged.

1. Introduction

Open Science is a disruptive phenomenon that is emerging around the world. Open Science brings about socio-cultural and technological change, based on openness and connectivity, on how research is designed, performed, captured, and assessed.

However, there is a lack of awareness about what Open Science is in South Africa, mainly due to the fact that there is no formal definition of Open Science that has been shared and developed through collaborative networks - to help the scientific community, the business world, political actors, and citizens to have a common and clear understanding about what Open Science is. The development of this Open Science Framework for South Africa should be seen as a commitment by the South African government to drive scientific progress and to making publicly funded scientific research results open to all researchers, companies and citizens.

Open Science is more than open access and open data, it is about science being responsible and engaged with and for our society. Open Science is changing the way research is produced, accessed and utilised, and new and diversified ways of scientific exchange and cooperation are emerging. This movement is paving the way to enhanced cross-fertilisation of interdisciplinary research activities, which is critical to tackle complex research issues and societal challenges.

It is becoming clearly apparent that science can be a public enterprise which represents a stepwise change in thinking. The Open Science Framework will guide and steer South African scientists and other critical stakeholders in:

- Shaping the open science landscape in South Africa by pursuing the vision of 'science for the future' and Open Data and Open Science in a Big Data world;
- Opening access to publications, making data freely available to the fullest extent possible and optimally using and reusing research data that is financed from public funding. The key principles here is "as open as possible, as closed as necessary";
- Adapting evaluation and reward systems to bring them into line with the objectives of open science;

- Doing data-intensive research at the cutting edge of contemporary science;
- Applying themselves to major South African and African challenges;
- Enabling them to collaborate on an equal footing with colleagues from other parts of the world on global challenges; and
- Facilitating the participation of citizenry in mainstream science through research collaboration between scientists and members of the public, and providing access to scientific information for community members to answer real-world questions.

It should be clear that Open Science is transforming the way in which research is conducted and used, the diversity of people engaged in knowledge production, and the opportunities to enhance the socioeconomic benefits of research. Open Science can move South Africa from being an aspirational international follower to being a frontrunner in embracing an open and collaborative research system in order to better position itself for undertaking complex science (transdisciplinarity, big data, etc.) to address local needs.

Open Science makes research more transparent, rigorous and efficient; stimulates innovation; and promotes public engagement. Progress in the transition to Open Science is best achieved by working collaboratively and in coordination with all stakeholder communities associated with scholarly communication, and to tackle challenges with a shared purpose.

Open Science has become a global movement that is transforming, for the better, the practice of research and development (R&D), and particularly public-funded R&D. It offers the opportunity to make R&D more efficient, more economical, inclusive, accessible and transparent. In response to its perceived opportunity and its potential contribution to the improvement of the performance and management of public-funded R&D, the Department of Science

and Technology (DST) requested the development of a policy framework (referred to henceforth as the Open Science Framework) with the intention of using the document as a guide in the development of a subsequent and more formal policy document, and, in time, to facilitate the adoption of Open Science as a new paradigm acting to the benefit of the South Africa's National System of Innovation.

The initiative was established as a project within the South Africa-European Union Dialogue and funded by the European Union. It was undertaken by an Expert Group, appointed by the DST and supported by an Open Science Steering Committee in consultation with the Open Science community and stakeholders.

This document is the final report of the project; it is the Open Science Framework. It begins with the definitions of Open Science, Open Innovation and other key terms (what is Open Science and why is it an emerging trend in science?). It then describes the rationale for adopting Open Science within South Africa (how could it benefit the country?), the overall objectives of a system and policy response to this potential (what are the guiding principles of such a response?), and the detailed recommendations (what are the specific actions which are recommended by the stakeholders and the Expert Committee?). The report also provides a description of the process which was followed in the development of the recommendations and a summary of the two consultative workshops.

2. Process Details and Expected Outcomes

2.1 Process Steps

The Open Science Framework was developed through a process as specified by the project's terms of reference, as follows:

- The appointment of the Expert Task Group to drive the process and the development of the framework.
- The establishment of a multi-stakeholder Open Science Steering Committee to guide the process and ensure the quality and representativity of the final framework.
- The facilitation of an initial consultative workshop to discuss the core issues for Open Science in South Africa and specifically to engage key stakeholders on the necessary aspects of the framework.
- The development of a report from the discussions of the first consultative workshop for review by a second workshop.
- Review of the draft report by the second workshop attended by the stakeholder community.

- Translation of the key inputs received from participants of the second workshop into a draft document for consideration by the Steering Committee.
- Following input from the Steering Committee, the finalisation of the proposed Open Science Framework.

The process was designed so as to be guided by expert advice, through the steering committee, and broadly consultative, through the two workshops. Given that the adoption of Open Science will require a cultural as well as a regulatory shift, the approach was highly relevant to the kind of participative intervention which will be necessary if Open Science is to succeed. The combination of expert opinion and consultation ensures a level of legitimacy in this document which would not otherwise have been achieved, through for instance, a consultant acting in isolation of affected stakeholders such as researchers, administrators, policy makers and managers within the system.

2.2 Outcome of the Process

The main outcomes from the process were as follows:

- Report on the first workshop including details of the discussions
- Synthesis report from the second workshop
- Open Science Framework, where the latter was defined as "a set of principles and guidelines intended to support the formulation of an Open Science policy, and to assist all actors involved in the research process".

2.3 Members of the Expert Task Group and the Steering Committee

The members of the Expert Task Group and the Steering Committee are given in Table 1.

Table 1. Members of the Expert Task Group and Steering Committee

Expert Task Group	Steering Committee
Dr Simon Hodson	Dr Daniel Adams, DST
Prof David Walwyn	Dr Sagren Moodley, DST
Prof Colin Wright	Ms Thandeka Halles, DST
Prof John Wood (Chairperson)	Dr Mahlubi Mabizela, DHET
	Ms Susan Veldsman, ASSAf
	Prof Martin Wittenberg, UCT
	Prof Julius Athlhopeng, University of Botswana
	Mr Lazarus Matizirofa, NRF
	Ms Tugela Matubatuba, DST
	Prof Ahmed Bawa, USAf
	Mr Jean-Claude Burgelman, European Commission
	Ms Melanie Rondreux, EU Delegation to SA
	Mr Massimo De Luca, EU Delegation to SA
	Dr Anwar Vahed, DIRISA
	Prof Julian Kinderlerer, UCT
	Dr Adrian Tiplady, SKA
	Dr Kerry Faul, NIPMO

09

2.4 Stakeholders

Given that a meaningful Open Science transformation will require a system, rather than an ad-hoc, approach, this project was careful to ensure representation from, and consultation with, a range of stakeholders, including representatives from Government departments, research funding organisations, universities and research performing organisations, scientific

societies and, academies, citizen science and public engagement organisations, professional researchers, citizen scientists, research and cyber/e-Infrastructures, research libraries, museums and publishers. These representatives participated in the two project workshops, the details of which are given in Section 5.

3. Defining Open Science and Related Concepts

Open Science is defined as “scholarly research that is collaborative, transparent and reproducible and whose outputs are publicly available” (European Open Science Policy Platform, 2018). Its aim is to improve the quality of research, boost collaboration, speed up the research process, make the assessment of research more transparent, involve more people in research through co-design and transdisciplinary research, promote public access to scientific results as well as introduce more people to academic research (European Open Science Policy Platform, 2018).

It relies upon the sharing of knowledge and supporting tools, such as publications, research data, software, educational resources and infrastructures, across institutional, disciplinary and national boundaries, and promotes open access to scientific publications, to research data and materials, to research methodological and algorithmic methodologies, to digital applications and source code, thereby re-asserting science as a **global public good** (International Science Council, 2018; European Commission, 2016). In this context, Open Science includes and covers all the dimensions of science, including the technological, social, political and cultural aspects or components.

Open Innovation is “a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization’s business model” (Chesbrough and Bogers, 2014). Open innovation has evolved as a response to an increasingly complex world in which knowledge is highly distributed and it is no longer either practical or efficient for firms to operate as closed entities from which knowledge is not dissipated and within which knowledge from elsewhere is not absorbed. Instead, innovation in new products and services is considered to be a highly interactive process in which a wide range of alternatives, derived from a broad range of sources, are assessed in conjunction with suppliers, customers and other stakeholders.

Whereas Open Science is more applicable in public research institutions, including universities, science councils, and in-house government R&D departments (the latter referred to as intramural R&D entities), Open Innovation is more likely to be found within business enterprises, both public and private, and specifically private firms. It is often considered that the latter are at the centre of both incremental and radical innovation (Lundvall, 2010) although this view has been challenged by other authors (Mazzucato, 2013), who have argued that the state itself is the critical role player in radical innovation and high risk R&D. In this document, we refer to all research institutions whose R&D expenses are funded to a significant extent (>25%) through public funds as public-funded research performance organisations (PFROs).

10



4. Rationale and Context for Open Science

4.1 Rationale

Although there are a multitude of claims for the benefits of Open Science, the four compelling reasons for its adoption in South Africa are its positive impact on system transparency, knowledge accessibility, economic spillover and citizen engagement.

Transparency is a democratic principle applied to the management of public funds and more broadly to the overall activities of the state as a means of ensuring both accountability and integrity. In 2014/15, the South African R&D system received R14.4 billion from the fiscus (National Treasury), representing 45% of the total funding for R&D and exceeding the funding levels from all other actors (Department of Science and Technology, 2018b). It is in the interests of citizens, researchers, civil servants and politicians to understand how this money is spent and what has been achieved as a consequence of the R&D which it has supported. Answering these two questions is at the core of the transparency principle.

The second and equally compelling justification for Open Science is **Accessibility**, which can be broadly understood as a capability principle. Following the work of (Sen, 1999), it is argued that development is the consequence of learning and innovation. Although both activities are critical processes, they depend on access to knowledge. The latter is, therefore, the single most important resource in a developing state; access to knowledge must be supported and enabled by the state as a fundamental public good (Lundvall, 2016; Walwyn et al., 2015) and from which all citizens can derive benefit.

Spillover is an economic term which describes the general phenomenon whereby the benefits

of new knowledge, generated through a process of public-funded R&D, exceed its direct or intended outcomes (Hall et al., 2010). Typically, these effects are larger in developing, as opposed to developed, countries (Ntuli et al., 2015). Since the marginal cost of implementing a piece of knowledge is minimal and once the knowledge exists there is no need to re-invent it, knowledge can continue to produce additional value for its users, who can then derive further benefit. This unique and highly attractive property of public knowledge (its ability to generate spillovers) makes investment in public R&D an attractive option and ensures that the social return on R&D always exceeds its private return. Spillovers raise the efficiency or rate of return from R&D and are the most important economic reason for the adoption of Open Science, since only knowledge in the public domain can be exploited in this way.

Citizen engagement is the broader principle of public participation and collaboration in scientific research, through which people share and contribute to data collection and monitoring, mostly on a voluntary basis. It is also referred to as citizen science or community science and involves the inclusion of the public in science and the science policy processes. Working in partnership with professional scientists, participants provide experimental data and facilities for researchers, raise new questions and co-create a new scientific culture. It may be performed by individuals, teams, or networks of volunteers. Large volunteer networks often allow scientists to accomplish tasks that would be too expensive or time consuming to accomplish through other means (Socientize Consortium, 2013).

11

4.2 Policy and Technology Environment

The imperative for Open Science is clear. Fortunately, many recent technological advances have taken place and can enable the implementation of Open Science, including technology for collaboration, sharing of data, virtual networking and more generally information and communication technologies. However, the policy and technology environment are

complex and there could be a number of challenges to its implementation such as:

- Political: political commitment is needed to promote Open Science and integrate it into the national agenda. Policies need to be formulated and developed into clear implementable strategies.

- Socio-cultural: the lack of awareness by researchers of the benefits and importance of opening up their research.
- Technological: although current information and communication technologies have rapidly improved, and research cyber-infrastructures have grown both in quality and quantity, features essential to supporting Open Science and Open Access have not yet been embraced by all governance, funding and operating structures.
- Organisational: as research usually takes place within an institutional framework, the organisation as a whole has to smooth the transition towards an open research culture.
- Economic: even if one of the main arguments for Open Science is a higher efficiency of research that will result in a better use of resources and foster spill overs in the scientific and innovation systems, significant initial investments are required to develop the technical, political and organisational ecosystem of Open Science.
- Legal: a clear legislation framework must be developed that sets rules for disclosure of data and other inputs and outputs of research, while protecting those rights not to be waived as privacy, personal information, commercial interests, safety and national security, and promotes open innovation.

4.3 The International Experience of Open Science

Internationally, the concept of Open Science is spreading rapidly. The European Union (EU) has played a leading role through policies and implementation initiatives. With long roots in the Open Access movement, Open Data policies and the development of Research Infrastructures, this activity has accelerated since 2013. For instance, the EU is now developing the European Open Science Cloud and has appointed the European Open Science Policy Platform to advise the commission on how to develop Open Science policy (EU Open Science Policy Platform, 2016). In April 2018, the platform published a consolidated set of development and implementation recommendations (EU Open Science Policy Platform, 2018).

Examples of other developed countries which are active in the area of Open Science include the United States of America (National Academies of Sciences Engineering and Medicine, 2018), Japan, Canada and Australia. In Australia it was estimated that the value of research data was “at least \$1.9 billion and possibly up to \$6 billion a year at current levels of expenditure and activity” (Houghton and Gruen, 2014). Activity in Australia has been effectively coordinated through the work of the Australian National Data Service (ANDS) and now the Australian Research Data Commons which brings together the policy and capacity building work of ANDS with the network, storage and compute infrastructure provided by Nectar and Research Data Services². In Japan, the Japan Science and Technology Agency published

its “Implementation Guidelines: JST Policy on Open Access to Research Publications and Research Data Management”, which was aimed at improving the research environment and promoting Open Science in Japan (Japan Science and Technology Agency, 2017). Canada is also active in Open Science and Open Data: for example, an Open Science Act was passed by the Canadian Parliament in 2016.

Amongst the Brazil, Russia, India, China and South Africa (BRICS) countries, Brazil, India and Russia have adopted Open Science practices. For instance, in India the National Data Sharing and Accessibility Policy emphasises the importance of sharing government data as well as data from scientific and research and development institutions, a policy initiative which has led to the formation of a government portal that facilitates open access data sharing (National Spatial Data Infrastructure, 2010). In China, actions relating to open data and open access have been taken since 2010, including the establishment of the National Science and Technology Report System and pilot projects involving open data in two research areas, namely health and agriculture. In March 2018, the China State Council released a notice on ‘Measures for Managing Scientific Data’ which among other things contains measures for ‘improving the level of open sharing, and better supporting innovation in national science and technology, economic and social development’ (translation by Lili Zhang, CNIC and Ciesin, for CODATA Data Policy Committee).

² See <https://www.ands.org.au/about-us/ands-nectar-rds>

In Africa, a number of agreements to promote Open Science have been signed, including the Dakar Declaration on Open Science in Africa (2016); the Cape Town Declaration on Open Access (2010); the Cape Town Open Education Declaration (2008); and the Kigali Declaration on the Development of an Equitable Information Society in Africa (2009) (see also Section 4.4).

Apart from government initiatives, there are many non-governmental organisations which are working in the area of Open Science, including the Research Data Alliance (RDA) and the International Science Council's Committee on Data (CODATA) and World Data System (WDS), each of which are well-established international organisations which promote Open Science and its related activities such as Open Data and Open Access.

4.4 South Africa's Prior Participation in Open Science

South Africa has already participated in a number of international Open Science initiatives including the following:

- The Berlin Convention (Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities international statement on open access and access to knowledge, 2003) has been endorsed and signed by National Research Foundation (NRF), the Academy of Science of South Africa, the Library and Information Association of SA and many universities.
 - South Africa was an early signatory to the G8 Open Data Declaration.
 - 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.
 - The DST has established two Research Infrastructures of relevance, namely the South African Research Infrastructure Roadmap, which is an initiative to develop national, sustainable and open research infrastructures in research domains of particular relevance; and the National Integrated Cyber-Infrastructure System, which brings into a single entity the previously stand-alone South African Research Network, the Centre for High Performance Computing and Data Intensive Research Initiative for South Africa (DIRISA).
 - Under the aegis of the DST, the Academy of Science of South Africa hosts the Africa Open Science Platform (AOSP), which is funded by the DST via the NRF.
 - The DST is also in the process of developing a new Strategy on Science, Technology and Innovation, which contains specific Open Science sections.
- The NRF has adopted an Open Access mandate which covers all NRF funded R&D and includes “be deposited in a public access compliant repository designated by the NRF; be managed to ensure long-term preservation; be available for download, reading and analysis free of charge not later than 12 months after initial publication, and be reported in the Annual Progress Report.
 - Many South African scientists and others working in data driven domains have already joined the Research Data Alliance and/or CODATA. One South African data repository and stewardship service (DataFirst) is a member of ISC-WDS.
 - Examples of a few selected existing SA Open data initiatives:
 - The complexity of Cape Town's South Africa's taxi system is being tackled with open data by the “WhereIsMyTransport” platform via a mobile device app.
 - Eyes in the sky are helping improve fruit production in the Western Cape. By using the latest technology, farmers are increasing yields while reducing water consumption. eLEAF is a Dutch based company pioneering a satellite-based service that extracts open data to help improve irrigation and water management.
 - Open Data Durban is a non-profit civic technology lab that implements and advocates for open data, open government, and civic technology through projects, events, workshops, and data-quests (hackathons for everyone, especially non-techies). This organisation works with civic society, the media, government and interested and engaged citizens to democratise knowledge and enable informed decision making and evidence-based planning in all sectors of society.

- Several active Citizen Science projects are in existence—a few examples:
 - South African National Biodiversity Institute is currently involved in several citizen science initiatives through iNaturalist and virtual museum projects such as the South African Bird Atlas Project.
 - Cape Citizen Science is a project that of-

fers many opportunities to participate in scientific research

- The Natures Valley Trust is a proponent of citizen science, where ordinary every day South Africans and visitors can collect useful scientific data. Several citizen science programs collect data valuable to research programs, while at the same time contributing to larger program datasets.

5. Summary of the Workshops

The process required that two workshops with Open Science stakeholders should be held. In the following sections, a high-level summary of both workshops is presented.

5.1 Initial Workshop on Broad Principles and Need for Open Science

An initial workshop was held over the period 30th November to 1st December 2017 in order to discuss the necessary elements of an Open Science framework for South Africa (SA-EU Dialogue on Open Science, 2017). The event was attended by over 100 Open Science stakeholders and representatives. Following an initial overview of global, European and finally African activities in Open Science, discussions were held in ten simultaneous breakout sessions, each guided by an Open Science expert, and designed as structured engagements with each of the themes. Following the discussions, the facilitators synthesised the recommendations from their respective groups into con-

crete recommendations and reported these to the final plenary session held on the second day of the workshop.

Details of the breakout groups are attached in Appendix A. The workshop highlighted the wide diversity of experience in Open Science issues as witnessed by the details in the recommendations. Some of the main issues that were raised included the establishment of an Advisory Body, the importance of international alignment and participation, the need for a broad ranging cultural change to R&D practice, the importance of advocacy and the need for training or human resource development.

5.2 Second Workshop on the Draft Framework

A second workshop, focussed on refining the specific recommendations from the first workshop, was held in Pretoria over the period 15th to 16th May 2018 (SA-EU Dialogue on Open Science, 2018). The workshop was attended by about 30 key people and the delegates discussed the following topics: Open Data; Citizen Science; Open Science and Open Innovation; Funding, Infrastructure, Skills and Training;

Metrics and Incentives; Open Science, Governance and Regulation; Intellectual Property Rights; Africa and SADC.

Full details of the discussions are available in a separate report (Department of Science and Technology, 2018a). The main recommendations from this workshop were used as key inputs to this framework.

6. Framework for Open Science

6.1 Objective

The overall objective of Open Science is to establish a new approach to R&D which will result in the adoption of Open Science practice across the National System of Innovation in South Africa, where it can be appropriately justified, where it is relevant, and where it is necessary for the benefit of the overall system and the people of South Africa.

This objective will be achieved through the implementation of a set of policy recommendations, acting within the Open Science guidelines, as specified in Section 6.2. Suggestions as to how progress towards the attainment of an Open Science culture within the system (what must change and to what extent this change can be achieved) are made in Section 7.6.

6.2 Guidelines and Normative Principles

For Open Science to succeed, it needs to follow a set of general guidelines, referred to as the Open Science Normative Principles, as described below:

- Open Science is a cultural and behavioural phenomenon; it must become embedded at every level and in every aspect of the scientific endeavour, and not be perceived as separate from (or even in competition with) current research practice.
- All stakeholders in research and its communication need to take responsibility for supporting Open Science activities, which includes appropriate financial and administrative support to ensure its long-term sustainability and minimize the bureaucratic burden on researchers.
- All stakeholders, Government Departments, University and Research performing organisations and Research Funding Organisations must actively promote Open Science amongst their respective communities, and regularly and openly monitor and report on progress.
- Open Science will require a systemic shift in current practices to bring transparency across the system, to ensure ongoing sustainability for the associated social and physical infrastructures, and to foster greater public trust in Science.
- The details of 'Open Science in practice' are still evolving; although the initial steps are clear exactly what needs to change over the longer term has not yet been fully articulated.

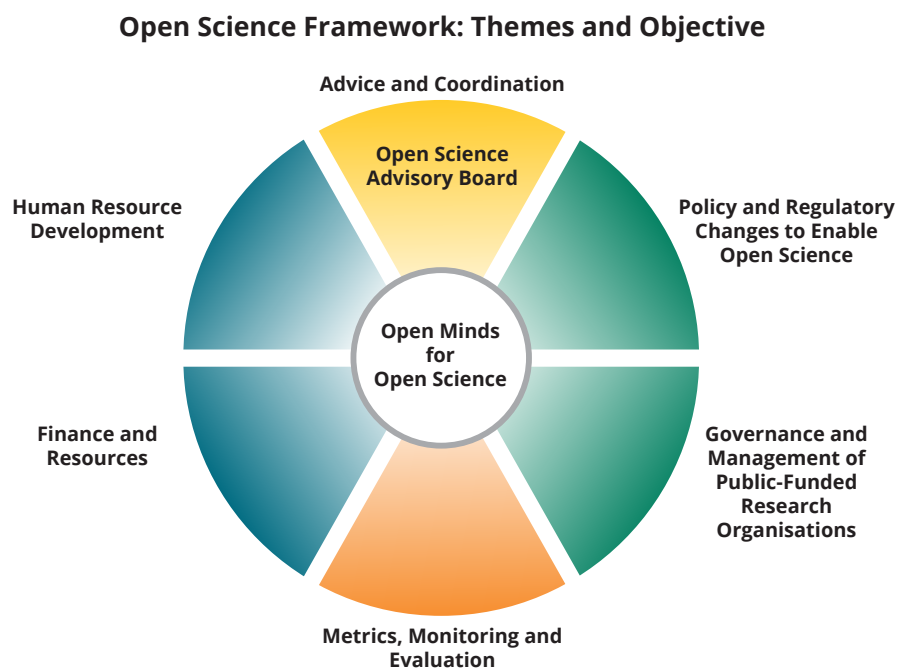
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7. Policy Recommendations

The policy recommendations, arising from the various consultations with stakeholders and in the light of international developments around Open Science, have been formulated into six themes (see Figure 1).

Figure 1. The six themes of the proposed Open Science Framework



16

7.1 Theme 1: Open Science Advisory Board

As a critical part of Open Science implementation, it is proposed that the DST should establish the **Open Science Advisory Board** (OSAB) to provide ongoing foresight, advice, guidance and oversight covering the implementation of the Open Science Policy Framework.

The OSAB should take responsibility for the following tasks:

- Complete the development of the South African Open Science Policy, aligned across all stakeholders so as to ensure the coordinated and targeted action which will be required in order to achieve tangible change.
- Develop a national plan for the implementation of Open Science and Open Innovation, including details of actions and funding.
- Support policy implementation, contributing to reviewing best practices, drawing policy guidelines and encouraging their active uptake by stakeholders.
- Continue to advise the DST on how to further develop and practically implement Open Science policy, in line with the Open Science Policies, Principles and Strategies as adopted by DST, to radically improve the quality and impact of South African science;
- Build awareness amongst senior stakeholder bodies through advocacy and policy.
- Foster Open Science by raising awareness amongst stakeholders, reinforcing stakeholders' ownership and trust, supporting better knowledge circulation within science and society, and enabling more efficient and

responsive science by allowing data verification, the sharing of resources and more focus on important societal issues.

- Maintain oversight of Open Science and initiate regular reviews of Open Science implementation, progress and structures.
- Oversee the development of research infrastructures and research data infrastructures in support of Open Science to improve data hosting, access and governance; and implementing data-sharing principles.
- Embed Open Science in society, whereby Open Science will increasingly become instrumental in making science more responsive to societal and economic expectations, notably by addressing the grand societal challenges, fostering a stronger relation between science and society as well as science and business actors to accelerate innovation, and promoting Citizen Science.
- Create an Open Innovation forum for regional innovation platforms to share best practice.
- Foster collaboration with international Open Science initiatives.

The OSAB should function as an independent, dynamic, stakeholder-driven mechanism for raising and addressing issues of concern for the South African science and research community in relation to national and international Open Science developments. It should be able to participate as a full partner in international Open Science initiatives.

It is critical that the DST appoints one full time person, referred to as the Open Science Com-

missioner, who will have the authority and resources to ensure the necessary continuity in the implementation of the Board's decisions, and to coordinate these actions across government. In addition, it is proposed that the OSAB and the Commissioner should be supported by a dedicated secretariat, consisting of one to two people who will be responsible for arranging meetings and undertaking other administrative activities. In general, it is proposed that neither the Board nor the Commissioner should have governance or management responsibilities; instead the OSAB and the Commissioner should report directly to the DST Executive (or the Minister of Science and Technology), who already have the designated authority to turn the recommendations into enforceable national policies.

Membership of this OSAB should be comprised of up to 15 senior, committed and insightful individuals appointed by the Minister from key stakeholder groups. The latter should include government departments, universities, research organisations, academies of sciences, research funding bodies, professional societies, citizen science organisations, scientific publisher associations, private or public Open Science platforms and intermediaries, and (research) library organisations. It should meet on a regular basis (quarterly) to discuss the general orientations and the documents that will be provided by the DST based on national STI developments and needs and taking account of international developments. Details of its meetings such as agendas, minutes and participants' submissions, should be made public as far as is possible and in the spirit of Open Science.

7.2 Theme 2: Policy and Regulatory Changes

A list of important and urgent policy recommendations is given in Table 2. Of this list, the most necessary is the development of a South African Open Science policy which will guide all public entities, including government departments, universities and public research institutions, in their adoption of Open Science. It is proposed that the OSAB be assigned the initial task of revising this framework, once it has been accepted by the DST, as a formal policy document for consideration across all of government.

Other policy actions, such as the development of an ethical code for all public-funded researchers and the definition of a framework for data equity, could form part of the broader policy document and need not be separate initiatives. It is advisable that all the policy statements which link to similar or related international initiatives such as FRAND, FAIR and GO-FAIR (see Table 2 and its footnote for a description of these terms) should be aligned with the international standard. With this approach, possible duplication and confusion will be avoided, and international collaboration will be enhanced.

Table 2. Urgent policy actions to enable Open Science

Policy Action	Responsible Party	Budget Implication	Comments
1. Develop South African Open Science policy	Lead by DST but all ministries and agencies involved	Low	Primary task of the OSAB
2. Mandate Open Science policies for all researchers and ensure robust e-governance to support implementation	Government in line with Open Data Charter (particularly DHET)	Low	Based on GO-FAIR principles and African Open Science Platform ³
3. Articulate “open as possible, closed as necessary” principles in relevant public policy, particularly legislation relating to intellectual property	National Intellectual Property Management Office (NIPMO)	Low	Requires consistency across ministries
4. Develop ethical code for all public-funded researchers in PFROs	ASSAf, USAf, and Data Intensive Research Initiative of South Africa (DIRISA) ⁴	Low	To cover all researchers involved in Open Science and Open Innovation
5. Create a declaration and framework for data equity which is aligned with international frameworks	Government, DST and international science bodies	Medium	Ensure consistency between South Africa and other countries
6. Determine policies and practice for curating confidential information	NRF, Universities, ASSAf	Low	
7. Undertake a review of IP policies and practices in South Africa to support Open Science consistent with Fair, Reasonable and Non-Discriminatory (FRAND) principles.	NIPMO	Low	
8. Recognise open science in assessments of researchers and institutions.	NRF	Low	
9. Reward researchers for sharing data and shared, citable datasets should be counted on an almost equal scale with cited publications.	NRF	Medium	Greater elaboration on how funding agencies, universities and other bodies assess researchers in the future is critically important.

With respect to the legislation on intellectual property, it is noted that the conceptualisation of, and the discourse on, Open Science

in opposition to Intellectual Property (Rights) is neither accurate nor helpful to the practice of both approaches. It is not valid to consider

³ SGO (Global Open) FAIR is a ‘bottom up’ initiative that aims at making fragmented and unlinked (research) data Findable, Accessible, Interoperable and thus Reusable (FAIR).

⁴ The Data Intensive Research Initiative of South Africa is a DST-funded organisation specifically tasked with offering a full range of data services.

that the two approaches are mutually exclusive; both practices act in synergy and relate to alternative impact pathways for public-funded R&D. This aspect is an important part of the training needs (as discussed in Section 7.3) and

will need to be addressed in this manner. It is not considered that this aspect will require revision to the Intellectual Property legislation in South Africa.

7.3 Theme 3: Human Resource Development and Training

Human resource development (HRD) will be essential to support Open Science in South Africa and **Table 3** lists some of the urgent actions which will be required. In broad terms, the HRD strategy should reflect the principles required to effectively embed a culture of Open Science at institutional and national levels, including issues such as research integrity, researcher evaluation and the public availability of research outputs.

The fostering of Open Science literacy will also be essential to South Africa achieving meaningful competitiveness at continental and global levels, together with other digital and information competencies. Secure support will be required for the development of an accredited curriculum covering Open Science skills training that fosters behaviours such as information technology and data literacy from primary school through the whole educational system.

Table 3. Urgent HRD actions to support Open Science in South Africa

Policy Action	Responsible Party	Budget Implication	Comments
1. Develop national HRD strategy for promotion of Open Science skills	DST and Education ministries with universities and academies	Low	
2. Develop e-learning platform and training programme for all levels of education (from cradle to grave)	Education ministries, HEIs, schools, and science academies	Medium	
3. Set targets and implementation plans including funding to train critical number of data scientists for South Africa	DST and universities	Medium	
4. Design training programme for research infrastructure management	DST and NRF	Low	
5. Create training programme for policy advisers on the benefits of OS and potential initiatives to support it in the future	Government and agencies	Low	
6. DIRISA to play a key role in advocacy of Open Science ⁵	DIRISA	Low	Advocacy is important for the success of Open Science
7. Create a training programme for all researchers about the intentions of the IP legislation and how these can be met alongside Open Science objectives.	DST	Low	Critical to resolve perceived tension between IP and Open Science

⁵ Together with the OSAB, DIRISA should implement a coordinated campaign to raise awareness and communicate the benefits of Open Science among decision makers, research and education bodies, professional societies, private sector, industrial and citizen organisations. It should also attempt to involve the public media by informing them about professional research and citizen science being undertaken.

7.4 Theme 4: Financing and Resources

Although the initial policy development will not require dedicated and additional financial resources, there will be a need to re-allocate some existing funding to support the development of infrastructure and dedicated programmes.

Moreover, it will be important to ensure that all publicly-funded research infrastructures and cyber-Infrastructures (including research data Infrastructures) are open and interoperable to enable simple and open sharing of metadata between systems, disciplines and

research collaborators and partners locally and internationally. Whatever standards and infrastructures are developed should be capable of adapting to further innovations in Open Knowledge practices.

Table 4 lists some of the possible financial instruments and infrastructure requirements which will be associated with the implementation of Open Science and Open Innovation. It is noted that this table is not complete; further work on the financial implications for the adoption of Open Data in particular will be required.

Table 4. Possible financial instruments and resource requirements for Open Science

Policy Action	Responsible Party	Budget Implication	Comments
1. Explore novel financial instruments to support Open Innovation based on Open Science including public-private initiatives	Finance ministry, DST, Venture Funds and Investment Banks	High	
2. Maximise initiatives such as the SARChI and SARIR programmes to deliver Open Science and to provide demonstrators	NRF and other funding agencies	Low	
3. Ensure ongoing funding for research data infrastructures, technical support infrastructures and determine responsibilities for long term curation	DST	Medium	
4. DIRISA should be re-sourced and empowered to provide the required support and enabling services to OSAB	DST	Medium	Further work is required on this part of the plan
5. The costs and resources required for good data sharing through proper curation of metadata is often not budgeted for, so it is important that these line items are included in research budgets.	NRF	Medium	The funding agencies should be responsible for requiring these activities and resources to be described before they can fund a project.

7.5 Theme 5: Governance and Management of Public-Funded Research Organisations

The universities, science councils and intra-mural organisations are key role players in the implementation of Open Science. As a result, a number of specific recommendations are

made in connection with changes to the governance and management of these organisations, as listed in Table 5.

Table 5. Important changes to governance systems for PFROs

Policy Action	Responsible Party	Budget Implication	Comments
1. Establish metrics and career pathways for researchers that encourage Open Science, Open Innovation, Open Data, international collaboration and the place of data scientists	DHET, DST and NRF	Low	The new metrics must be introduced by 2020
2. Create innovation centres at universities and science councils to foster Open Innovation	HEIs and science councils	Medium	

7.6 Theme 6: Metrics, Monitoring and Evaluation

In the previous sub-sections, a number of recommendations covering specific categories within which policy action is required, have been presented. These recommendations have been made without any indication of how the path towards Open Science will be measured and the extent to which changes will be required over what time periods. Such de-

tails are important from a policy perspective; unless certain key metrics can be defined and monitored, it will not be possible to determine whether the system is making progress towards the objective as specified in Section 6.1.

In this section, more information is provided on what needs to change and how quickly (see Table 6).

Table 6. Recommended metrics to support the implementation of Open Science

Policy Action	Responsible Party	Target ⁶
1. Accessibility of the outputs from South African research	DST/DHET/ NRF/ Universities	At least 50% of research publications with South African authors should be open access by 2025
2. Collaboration in South African science	DHET/ASSAf/ Universities	At least 50% of research publications should have more than two co-authors
3. Availability of research data (Open Data)	DST/NRF/ Universities	All universities and science councils to have a dedicated research data archive by 2025
4. Policy framework	DST	The OSAB to complete the Open Science Policy by 2020.
5. International collaboration	DHET	At least 25% of research outputs to be co-authored with international authors by 2025. International collaboration is excellent for pursuing high quality, collaborative science, but this needs to be an equitable collaboration, ensuring that publications on South African data should be led by South African scientists.
6. Availability of data code	DHET/ASSAf/ Universities	All universities and science councils to have a dedicated open access research code archive by 2025
7. HRD	AOSB/DST	50% of South Africa public sector researchers to have received training on Open Science by 2025
8. Citizen Science	DST/ NRF	At least 10% of the total public-funded R&D budget to be allocated to projects with a Citizen Science component by 2025

⁶ All values in this table are indicative only; the Terms of Reference for this framework have not included any detailed work of developing the scorecard for Open Science adoption.

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Appendix A. Discussions of the First Consultative Workshop

Open Data

Preamble: South Africa was an early signatory to the G8 declaration on Open Data. What lessons have been learnt since then, what are the main blockages to implementation and how can they be overcome? What is the mapping of researchers in Africa to take advantage of open sharing of publicly funded research outputs. Are there existing policies or other blockages that have hindered exploitation and what new policies and funding opportunities could encourage these developments to take hold?

Discussions and Recommendations: Leave no one behind. International alignment. The establishment of an Open Data Advisory Forum. There is a need to apply and mainstream open data policy across all government ministries, statutory bodies, and state-owned entities.

Open Science and Open Innovation

Preamble: Open Innovation encourages new innovations to develop quickly in a very fast market place. Are there examples in Africa that would act as demonstrators? Are there tax incentives, business practices etc., that would encourage further investment? How can the link between Open Science and Open Innovation be encouraged in both the public and private sectors?

Recommendations: Organise open innovation in a challenge based, contextual way. Stimulate innovation at all levels so as to foster a culture of co-creation in policy, then embed innovation in university courses. Use fiscal policy to incentive actors who want to go forward.

Open Science Governance and Regulations

Preamble: researchers need confidence if they are to share their information openly and be rewarded for taking part. What international governance models could be adopted in order that Open Science (South) Africa will be welcomed by other regions of the world? Other issues should include the nature of an African Open Science Cloud. What steps should be taken such as Go-FAIR principles.

Discussions: the human rights of individuals, and how their data are used, must be explicitly stated and Constitutionally protected.

The question of how to involve multiple actors at all stages of the Open Science policy-making process must be addressed. Wealthier actors should not be enabled to gain at the expense of the poorer or OS may turn out to be another form of exploitation. 'Data' must be defined as including all its forms, including plant and tissue material. Owners and providers of data, including research institutions and governments, should be sensitised to the potential benefits of OS if properly managed. Data and science are global products: they must therefore be globally managed and used (while taking account of the governance and other issues arising in the above discussion). Individual researchers must experience benefits from OS or they will not contribute.

Skills and Training

Preamble: the immediate need is for both general researchers who need to know about Open Science and the impact on their research through to specialists who look after repositories and those that practice open research. Then there is the long-term objective that Open Science is embedded in cradle to the grave education. Which are most important skills for Africa and who can deliver them? How are business leaders to be trained to take advantage of opportunities?

Discussions: National overarching policy to drive Open Science / open research / open data / open access / open innovation. Greater coordination and less fragmentation. Create awareness of Open Science / open research (that is; market it), and sensitise policy makers, politicians, decision makers, politicians, management, to Open Science (national and institutional). Upskilling interventions across domains: Educators, Academics, Researchers, Technical Universities, Industry and Commerce, Schools. Collaboration and partnerships. A move away from a silo approach in research, higher education broadly, TVETs, industry. Incorporation of citizen science and democratisation. Develop a national e-learning platform (national policy and implementation plan).

Infrastructure

Preamble: Is the concept of an African Research Cloud aided by CODATA a reality and how will it

be maintained? How will international linkages be fostered? Can the SKA or other similar projects aid the bringing forward of Open Science or will they be dedicated to their own project? Are any international agreements needed and if so, how will they be initiated?

Discussions: Improve visibility and accessibility of current infrastructure. Improve sustainability of existing research infrastructures. Improve Governance. Involve SKA. Improve Skills and training pertinent to supporting and managing research infrastructure.

Funding

Preamble: What funds are needed to advance Open Science? How much should be publicly funded and how much from private channels. What is the incentive for private investors? What are the set-up costs and what will be the annual operating costs? Are there non-African agencies and foundations that can be approached? Which ministries should be involved and what is the role of NRF?

Discussions: Funding should cover: infrastructure, HR, publishing, repositories, maintaining the network, other costs, with government playing a major role. It should be mandatory for NRF funding application documentation to include sections dealing with the cost of securely storing the data and making it available.

The large number of data scientists required by the OS approach need to be developed. Review the current publishing model, including the failure to support local publishing and the skills that it requires/could develop; examine the effect of the current policy of financially rewarding publishing in international journals more than domestic ones.

Metrics and Incentives

Preamble: Open Science is all about collaboration especially towards the grand challenges facing society. To what extent do things like the NRF individual classification mitigate against this approach. How can the contribution of an individual be assessed without it becoming just a tick box exercise? How will promotions within universities be determined especially if the academic is running a citizen science project or managing a large collaboration? Are there specific discipline needs and what role do the humanities etc. have in Open Science?

Discussions: The whole system of metrics and incentives must be re-considered. The current system is contra-collaboration and does not promote Open Science; instead it encourages competition among South African universities and researchers. The NRF should look at its

research funding measure(s) in the next cycle. There should be a review of cost (fees) of PhDs in South Africa (relative to master's degrees). Consistent application of the international fees rate rule for non-SADC students from the continent. The (potential) contribution of the private sector to Open Science and open innovation has been under-acknowledged within the Open Science debate. There is a need for the incentives system to place more attention on leveraging the private sector's contribution to Open Science. There should be an increased emphasis on peer review within South African research, and among South African researchers would respond to concerns about the quality of South African journals.

Citizen Science

Preamble: A major impact of Open Science is that the data and publications are open to all citizens around the globe. While all accept that personal and security data should not be made available, where are the boundaries as countries enforce data protection policies? What legal restraints can be used to protect misuse of information for political or other reasons? Are there policies that could assist in bringing African cultures nearer to each other?

Discussions: Need for a policy framework. Create an independent Centre/Institute for Citizenship Science. Include Citizenship Science in Basic Education. Audit Invested Funds in Citizen Science Projects. Align the objectives of OS with relevant SDGs and in particular with SDG 17. Transformation in education is critical to being able to take OS forward. Develop country road maps, based on the priorities and policies of each; these should feed into those of SADC and the AU. Make maximum use of bilateral and multilateral alliances, and influence them so that, for example, they include OS in their calls. Establish a regional OS research group, including a Chair of Open Data.

Intellectual Property Rights

Preamble: With the speed of innovation, some companies are ceasing to protect innovations while others are seeking to put up barriers to sharing. There are often incentives within universities to protect ideas although there is little evidence internationally that this is worth pursuing and perhaps there are other incentives for universities to share knowledge more readily. Is there a need for a common concordat that is agreed internationally? What can be done as Africa? How can the lessons learnt in South Africa and beyond be cascaded out to other countries without it seeming to be imposed? Can the African Academy of Sciences, ICSU etc. be mobilised, if not already involved?

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SA-EU Strategic Partnership

South Africa has enjoyed a successful, productive and mutually beneficial relationship since the European Commission's Special Programme for Victims of Apartheid was created in 1985, and subsequently with the advent of the first democratically elected Government in 1994. South Africa and the EU signed a Trade, Development and Cooperation Agreement (TDCA) in 1999, which came into force in 2004 and was amended in 2009.

In 2007 SA and the EU established a Strategic Partnership (SP), and following the acceptance of a Joint Action Plan (JAP) in 2007, that facilitates co-operation between South Africa and the EU. South Africa has become one of the European Union's 10 Strategic Partners and the only one in Africa. The JAP promotes a programme of "dialogues" by means of which experience is shared in areas of common interest and strategies are developed to overcome shared challenges across a wide range of fields (social, economic, cultural, etc.).

The Dialogue Facility project is an instrument supporting the Strategic Partnership by giving it a human face through people-to-people dialogues and other related interventions, including communication, visibility and awareness-raising activities.

The Dialogue Facility (DF) has since 2011 to date, facilitated more than 56 dialogues in sectors such as: trade, economics, education, health, science and technology culture, etc.

The Dialogue Facility will provide support such as technical assistance, logistics (conferences, workshops, seminars, and events), support to study tours, research, mentoring, Twinning, etc.

The Dialogue Facility is strategically guided in a partnership between European Union and the government of South Africa. A Programme Management Unit deals with day-to-day administration.

For further information refer to www.dialoguefacility.org

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