SCIENCE GRANTING COUNCILS INITIATIVE SGCI IOSRS INITIATIVE DES ORGANISMES SUBVENTIONNAIRES DE LA RECHERCHE SCIENTIFIQUE

RESEARCH MANAGEMENT PROJECT

RESEARCH EXCELLENCE

Rakeshnie Ramoutar-Prieschl

ASSOCIATION OF AFRICAN UNIVERSITIES
ASSOCIATION DES UNIVERSITES AFRICAINES
اتحاد الجامعات الأفريقية

The African Academy of Sciences

ACRONYMS

ARUA	African Research Universities Alliance
ARC	Australian Research Council
CARE	Course in Assessing Research Excellence
CoE	Centres of excellence
CoG	Conditions of grant
CoS	Centres of specialisation
DFID	Department for International Development
DFG	German Research Foundation
DSI	Department of Science and Innovation
ERA	Excellence in Research for Australia
EU	European Union
GRC	Global Research Council
HEI	Higher education institution
IDRC	International Development Research Centre
IP	Intellectual property
IPR	Intellectual property rights
IT	Information Technology
JRC	Joint Research Centre
KET	key enabling technologies
M&E	monitoring and evaluating
MEL	Monitoring, evaluation and learning
NACOSTI	National Commission for Science, Technology and Innovation
NRF	National Research Foundation
NSI	National System of Innovation
OA	Open access
OS	Open science
R&D	Research and Development
RE	Research excellence
REF	Research excellence framework
RI	Research infrastructure
RQ+	Research Quality Plus
SAASTA	South African Agency for Science and Technology Advancement
SARChI	South African Research Chairs Initiative
SGC	science granting council
SGCI	Science Granting Councils Initiative
SIDA	Swedish International Development Agency
SKA	Square Kilometre Array
STI	Science, technology and innovation
THE	Times Higher Education
UK	United Kingdom
URC	University Research Chairs
WoS	Web of Science

EXECUTIVE SUMMARY

I. Purpose

The purpose of this framework is to present approaches to shape ideas, understanding and application of Research Excellence (RE) among Science Granting Councils (SGCs) s in sub-Saharan Africa. The principles presented in this framework take account of regional and national views, perspectives, and dynamics, without losing the context within which research is conducted across the globe. The framework is informed by a comprehensive literature review, case studies, survey findings, and outcomes from a consultation meeting with SGCI stakeholders in southern, eastern, and western Africa.

II. Context

Public research funding entities or SGCs play a vital role in the research enterprise and in society. Among others, they are responsible for identifying, supporting, and funding research with the intent to advance knowledge and innovation systems and contribute to socio-economic challenges and opportunities. In addition, research funders are responsible for evaluating research, ensuring scientific rigour, excellence, and relevance [1]. With limited resources, increased demand for accountability and impact from government and society, the research enterprise is increasingly becoming competitive. Research funders are now more than ever, adhering to strict values, funding criteria, decision-making processes and shifting from institutional core funding to project funding. This has resulted in increased competition among institutions, researchers and other stakeholders who depend on funding from these institutions.

RE is one of the core ideas in the decision-making process for funders to competitively select and support research that is high quality, relevant to national priorities and promotes outstanding research. Several scholars [1-4], note that excellence is one of the core values within the research enterprise. However, there is no consensus, standard definition, or common understanding of RE's meaning and how it differs from research quality. It is therefore important to steer toward a common understanding of RE that can be used objectively and fairly. Such a definition will help identify measures that advance RE, without losing the context within which research is conducted across the globe and on the African continent. In an increasingly under-resourced environment, it is especially important to contextualise RE that takes into account both the local contexts and dynamics, without losing the global globe perspective.

III. Overview of RE understanding among SGCI partners

A survey was conducted to better understand the status quo of RE in African countries; and identify challenges, opportunities and approaches that could be adopted to effectively design, implement, and monitor RE in SGCI country partners. About 42% of respondents highlighted that the RE definition was well understood across their respective institutions; while 23% indicated that the definition was unclear. Most respondents (74%) indicated that RE should be underpinned by research quality and must directly address national, continental, and global priorities. This view highlighted the increasing role of the research ecosystem in responding to socio-economic and environmental challenges beyond knowledge advancement and publications. About 74% of respondents indicated that RE should be linked to research quality. The survey further highlighted the need for an additional indicator that should be considered when defining RE, especially for the African context, including infrastructure and facilities.

IV. Principles for defining RE in SGCI countries

This framework acknowledges the multidimensional and complex nature of RE taking into account regional and national views, perspectives, as well as local dynamics, without losing the context of RE from a globe viewpoint. This framework proposes the following principles to inform the definition of RE in SGCI partner countries in Africa, and takes into consideration the following:

- Research has measurable knowledge impact.
- Research is locally and globally relevant and has broader societal and/or economic impact.
- Research is demand-driven (e.g. industry and society driven).
- Research promotes collaboration.
- Research promotes broader stakeholder engagement and involvement across the research life cycle.

At a high level, these principles are informed by the following core elements of RE.

a) Good science

RE is underpinned on scientific excellence. RE's meaning and implementation in research practice and management is influenced by political considerations and the varied social, cultural, and organisational environments in which researchers and scholars operate. Perceptions of what constitutes 'good science' shapes the progress of knowledge creation and knowledge-based innovation. What is called 'excellent', steers and influences the behaviour of individual researchers, research teams, research organisations and research funders and in turn affects and impacts society at large.

b) Research relevance

The notion of excellence is the basis by which research institutions differentiate themselves from one another. For example, university ranking and global reputation development at Higher Education Institutions (HEIs) is driven by RE which is measured by the quality and quantity of research outputs. Other dimensions include teaching, international outlook, industry income, reputation, international profile, etc. The ranking becomes equated with the reputation and branding of the university. A growing number of HEIs worldwide aspire to RE in order to attain their research-intensive ambitions. How RE is defined, achieved, and measured remains an open question. Furthermore, the idea often presumes the exclusion of multi-stakeholder collaboration for the common good.

c) Research impact

Assessing RE involves asking whether the results are useful and contributes to broader aims and knowledge and societal impact. In essence, this is not just about knowledge impact (e.g., quality and quantity of research publications), but how research influences policy and impacts society. The GRC notes [5] that '*no research is impact-free'* but that its impact can have different forms and degrees, and these can come at different points in time. Also, they vary in their predictability and measurability.

V. SMART indicators for measuring RE in the SGCI countries

The proposed short-term indicators (for a period spanning up to 5 years) for measuring RE among SGCI partners as listed below. These indicators are adapted from the European Commission Joint Research Centre initiative. Detailed indicators are provided in section 6 of this document.

- Number of engagements with research actors: knowledge production and impact.
- Number of engagements with research actors: Institutional arrangements, interaction schemes including openness.
- Number of engagements with industrial innovation actors: knowledge production and impact.
- Number of engagements with societal, economic and political actors: knowledge production and impact.
- Number of engagements with civil society & transforming the science-society engagement.
- World class peer review and Monitoring, Evaluation and Learning (MEL) systems & processes in place.
- Number of projects, policies and frameworks, practical implementation of open science.

The proposed long-term indicators (for a period spanning up to 10 years) for measuring RE among SGCI partners as listed below. Detailed indicators are provided in section 6 of this document.

- Number of engagements with industrial innovation actors: institutional arrangements, interaction schemes including openness.
- Interventions in support of establishing and accessing world class research infrastructures.
- Number of innovation outputs.

1

INTRODUCTION

1.1 Overview

Public research funding entities or SGCs play a vital role in the research enterprise and in society. Among others, they are responsible for identifying, supporting, and funding research with the intent to advance knowledge and innovation systems and contribute to socio-economic challenges and opportunities. In addition, research funders are responsible for evaluating research, ensuring scientific rigour, excellence, and relevance [1]. With limited resources, increased demand for accountability and impact from government and society, the research enterprise is increasingly becoming competitive. Research funders are now more than ever, adhering to strict values, funding criteria, decision-making processes and shifting from institutional core funding to project funding. This has resulted in increased competition among institutions, researchers and other stakeholders who depend on funding from these institutions.

In this context, RE is one of the core ideas in the decision-making process for funders to competitively select and support research that is high quality, relevant to national priorities and promotes outstanding research. Several scholars [1-4], note that excellence is one of the core values within the research enterprise. However, there is no consensus, standard definition, or common understanding of RE's meaning and how it differs from research quality. Also, across institutions and funding agencies the notion varies on what is regarded as or constitutes RE. Canada's IDRC alludes to the multiple views on RE. Further, several studies [2-4] highlight that RE's meaning and implementation in research practice and management is influenced by the political, social, cultural, and organisational contexts in which researchers and scholars operate. RE has gained considerable support from stakeholders in terms of increasing accountability and transparency, as well as promoting rigorous standards. Also, it has sparked criticism in the scientific community. Scholars [2-3,6] have highlighted that RE is problematic because of flawed assessments, evaluation methodologies, contested quality criteria and performance indicators associated with RE. Others contest that there is an undervaluing of the unique context-related scientific endeavours from the Global South.

1.2 Study purpose

Due to unique research dynamic, a need has emerged to empower SGCI members to consider developing localised RE definitions, principles, and approaches. It is important for SGC's in the region to steer toward a common regional understanding of RE that can be used objectively and fairly. Such a definition will help identify measures that advance RE, without losing the context within which research is conducted across the globe and on the African continent.

The SGCI is a multi-funder initiative that aims to strengthen the capacities of 15 SGCs in sub-Saharan Africa to support research- and evidence-based policies that will contribute to economic and social development. It is supported by Canada's IDRC, the UK's DFID, SA's NRF, SIDA, DFG and African science funders. It is guided by the priorities of the 15 granting agencies who, in 2016, sought to explore the notion of RE in greater depth.

This document's purpose is to shape ideas, understanding and application of RE among SGCs in sub-Saharan Africa. The framework is informed by a comprehensive literature review, case studies, survey, and outcomes from a consultation meeting with SGCI stakeholders in southern, eastern, and western Africa. Annexure 1 presents detailed information on the demographics of participants in the survey.

1.3 Principles for defining RE in SGCI countries

RE is a multidimensional concept. For this framework, RE is defined using the following principles:

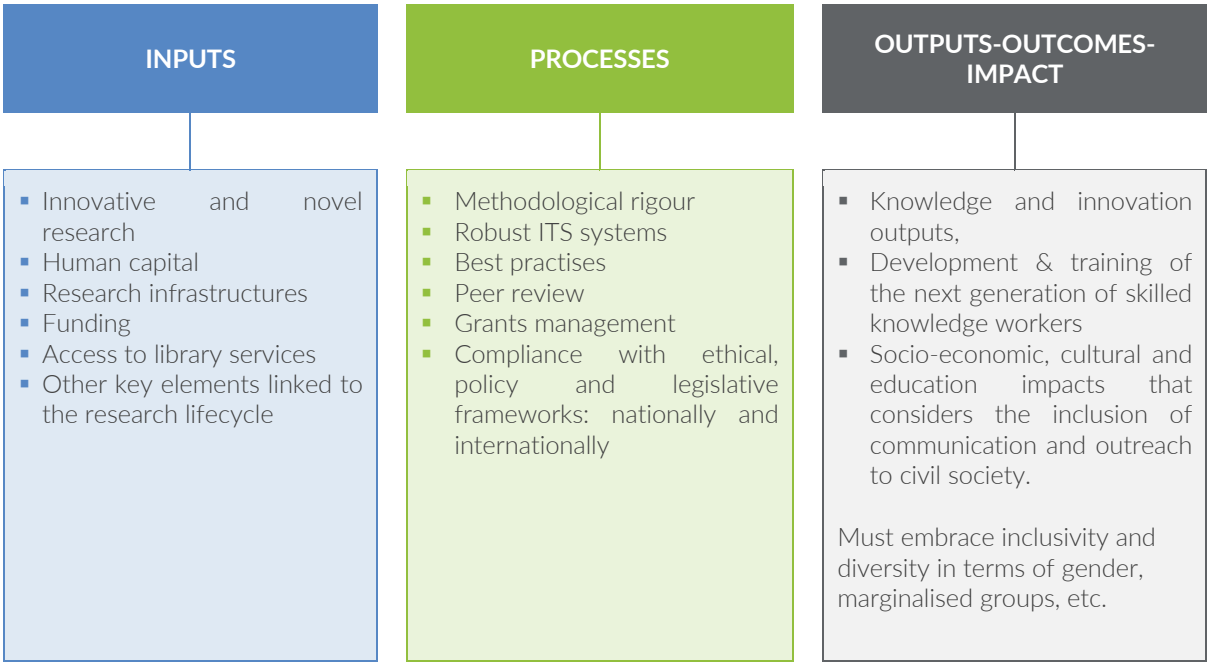
- Research that has measurable knowledge impact. Example of measure: High quality and high impact publications as measured by the publication citation index.
- Research that is locally and globally relevant and has broader societal impact such as policy and socio-economic benefits. Example of measure: Society can either directly or indirectly attribute improvements in programmes, policy, understanding or day to day livelihood to research outcomes.
- Research that is demand-driven (e.g. industry and society driven). Example of measure: Level of industry participation in research projects across HEIs in a specific SGCI partner country.
- Research that promotes collaboration. Example of measure: Level of effective and mutually beneficial collaborations with other academic and industry partners. This can be formalised through Memoranda of Agreements or Understanding.
- Research that promotes broader stakeholder engagement and involvement across the research life cycle. Example of measure: Level of stakeholder engagement, partnerships, communication and outreach.

For the SGCI, RE will be guided by the traditional log frame model, where the:

- Input dimension links to innovative and novel research, human capital, RIs, funding, access to library services and other key elements linked to the research lifecycle.
- Processes are linked to methodological rigour, robust IT systems, best practises, peer review, grants management and compliance with ethical, policy and legislative frameworks both nationally and internationally.
- Outputs-outcomes-impacts link to internationally recognised knowledge and innovation outputs. This develops the next generation of skilled knowledge workers. It translates these outputs into outcomes and impacts that extend beyond the scholarly dimension to include socio-economic, cultural, educational impacts as well as communication and outreach to civil society. This embraces the idea of inclusivity and diversity, in terms of gender, marginalised groups, etc.

This RE log frame is summarised in Figure 1 below.

Figure 1: RE log frame

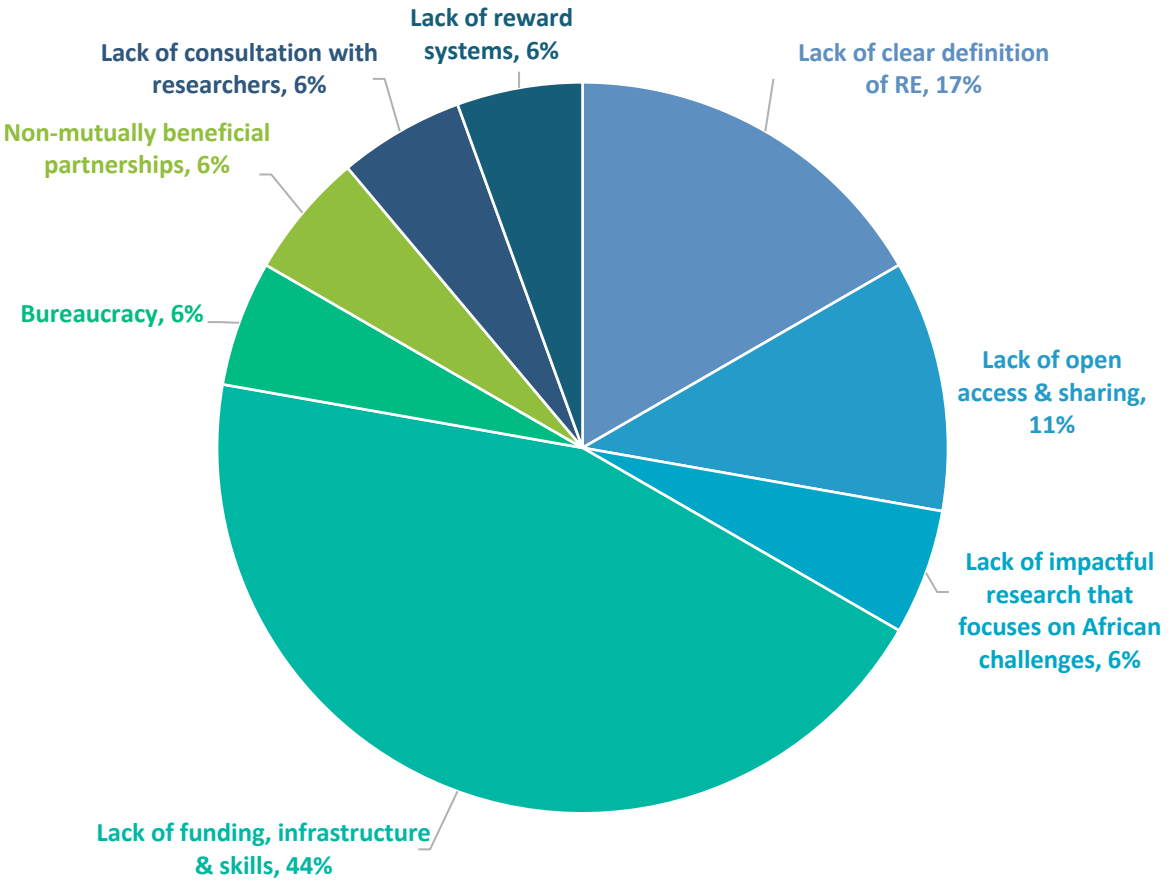


2

RE THROUGH A FUNDERS' LENS

Africa is a region with limited resources regarding research funding, research infrastructure (RI) and human capital. Applying RE needs to be fit for purpose and aligned with the need for socially relevant research. Therefore, RE is critical for the African continent to address pressing local and regional development issues. To better understand the status quo of RE in African countries, the survey asked respondents to highlight challenges at their institutions or in their countries. They highlighted the lack of funding, RI and skills as major barriers to effectively adopt RE practices (see Figure 2).

Figure 2: Identifying challenges influencing effective adoption of RE practices at institutional or national level



To effectively anchor RE at all levels of the research and innovation value chain requires developing and applying RE models that are locally relevant and globally admissible. Also, this approach should respond to discipline-specific themes and transdisciplinary research, the latter is essential to addressing complex societal problems. Below, we highlight some schools of thought aligned to RE.

2.1 Good science

RE has become a common policy-relevant idea in the world of science funding and assessment. RE's meaning and implementation in research practice and management is influenced by political considerations and the varied social, cultural, and organisational environments in which researchers and scholars operate. Also, scientific performance is affected by economic conditions and the availability of skilled human resources. Globally (specifically in Africa), there has been increasing interest in pursuing RE. This is often geared toward creating an enabling environment that grooms and attracts high-quality research [5]. Perceptions of what constitutes 'good science' shape the progress of knowledge creation and knowledge-based innovation. As such, peer review is underpinned on scientific excellence – globally, 'good science' affects decisions about what is funded and what is not. It dictates who is rewarded and encouraged to pursue research. It promotes certain disciplinary traditions, but discounts and discourages others. However, in the ever-competitive world of science and research, 'good' may not be good enough anymore. 'Excellent' science and associated prestige is increasingly seen as more valuable [6-8]. What is called 'excellent', steers and influences the behaviour of individual researchers, research teams, research organisations and research funders and affects society at large.

2.2 Research relevance

Thus, the notion of excellence is the basis by which research institutions differentiate themselves from one another. For example, university ranking and global reputation development at HEIs is driven by RE which is measured by the quality and quantity of research outputs. The ranking becomes equated with the reputation and branding of the university. A growing number of HEIs worldwide aspire to RE in order to attain their research-intensive ambitions. How RE is defined, achieved and measured remains an open question. The idea often presumes the exclusion of multi-stakeholder collaboration for the common good. This view is enforced by recognised global ranking systems of HEIs (Quacquarelli Symonds, Academic Ranking of World Universities of Shanghai Jiao Tong University, THE rankings, UniRank, etc). Although softer indicators (peer and employer reputation) are sometimes included in the rankings, it is indisputable that all top-ranked universities hold their positions due to their measured research outputs and citations [9-11]. Other dimensions linked to university rankings include: teaching, international outlook, industry income, reputation, international profile, etc.

2.3 Research impact

Assessing RE involves asking whether the results are useful and contributes to broader aims and societal impact. This is not just about knowledge impact (e.g., quality and quantity of research publications), but how research influences policy and impacts society. In mapping impact pathways, RE must be recognised as a core component. The GRC notes [5] that '*no research is impact-free'* but that its impact can have different forms and degrees and these can come at different points in time. Also, they vary in their predictability and measurability.

3

REVIEW OF RE DEFINITIONS

As Section 1 indicated, there is no universally agreed RE definition. Though the term is widely used, it has varying definitions. The notion of excellence implies 'outstanding', 'above average' or of 'superior standards'. However, it remains unclear how standards of superiority should be set, on which account and by whom. Therefore, the notion of 'excellence' remains debated and contested [7]. Some examples of institutional RE definitions are given below.

In the UK, the Research Excellence Framework (REF), positions excellence as scientific productivity judged in terms of research publications and/or grant income. By adopting the REF, the UK provides performance-based funding to universities and promotes high-quality research through an explicit competitive scheme. REF is a process of expert review comprising senior academics, international members and research users. Each application is assessed across three elements [5]:

1. Quality of outputs;
2. Impact beyond academia; and
3. The environment that supports research.

South Africa's National Research Foundation's Research Excellence Framework advances a holistic interpretation of excellence, where RE is at the heart, or intersection of international competitiveness, knowledge advancement, societal benefit, sustainability, and transformation. The NRF's strategic aims over the next decade are geared towards [12]:

- Shaping, influencing and impacting the national research system.
- Establishing itself as a thought leader and source of knowledge within the science sector.
- Creating a clear, causal relationship between research and national development.
- Transforming the national research enterprise as well as the relationship between science and society.
- Enabling, initiating, facilitating and performing excellent research with direct and indirect impact, whether immediate or long-term, which extend the frontiers of knowledge, addresses national challenges and defines a sense of place for SA within the global knowledge enterprise.

The Australian Research Council (ARC) administers Excellence in Research for Australia (ERA) [13-14], which aims to promote excellence across the full spectrum of research activity, including discovery, experimental and applied research within Australian HEIs [14].

The International Development Research Centre (IDRC) operates not as a research institution but as a funder of research with a grants-plus philosophy. In its corporate strategy, the IDRC mentions that it strives for excellence in research which it defines as methodologically sound, evidence-based and scientifically valid [15]. According to [4], this is consistent with the IDRC's mission that promotes research that is:

- Problem-focused;
- Solution-oriented;
- Innovative;
- Policy relevant;
- Collaborative;
- Team-based; and
- Multi- and interdisciplinary.

Based on the above, RE is context-specific; however, common threads that appear among the sampled definitions include:

- "[RE] must mean pushing the frontiers of new knowledge and at the same time also making social and/or economic impact in order to touch and change people's life because people do not care how much you know until they know that you care".
- "Research quality and RE are not the same. Excellence has to involve the whole process from research conceptualization through research management, publication and use. Quality refers to research that pushes the knowledge boundaries in a given field."
- "Any system that promotes [RE] must be based on transparency of systems, processes, across the research lifecycle – by implication it must be premised on clear and open processes through which decisions are made, e.g., grant funding, types of research supported, robust assessment processes, etc."

DEFINITION FOR RE: RE is highly contextual and marked by the pursuit of scientific excellence through research that is demand-driven and multi-disciplinary. RE aims to influence policy imperatives and advance the priorities of the country, region, continent and global community through collaborative partnerships and networks. RE embraces inclusivity, open access and adheres to the highest level of responsible and ethical research that accrues socio-economic, human capital, new knowledge and innovation dividends. The establishment and access to state-of-the-art research infrastructures and facilities, is a critical enabler for realising the potential of RE.

The provisions of the statements presented and the benchmarking with other institutions, reflect that the definition proposed herein, is one that succinctly captures the multi-dimensional and contextual nature of RE.

4

RE IN SGCI COUNTRIES

The SGCs within their national contexts need to display competence to assess RE, determining contributions of different projects in their portfolio and ascertain the impact thereof on national science systems. This requirement motivated the development of a Course in Assessing Research Excellence (CARE) by the SGCI. Thus, improving the quality of research has become a central objective of STI policies in many African countries. Like elsewhere in the world, African research outputs are expected to comply with accepted quality criteria such as being convincing, competent, relevant, rigorous, and applicable with socio-economic impact.

Accordingly, SGCs across Africa are under increasing pressure to identify high-quality proposals to make decisions on allocating and distributing the scarce funding available for research on the continent. Nonetheless, to gain better insight and deeper understanding of RE in Africa, it is important to [5]:

- consider the practical challenges faced by researchers and research funding agencies;
- reconcile socio-economic interests with international notions of excellence and associated research performance indicators.

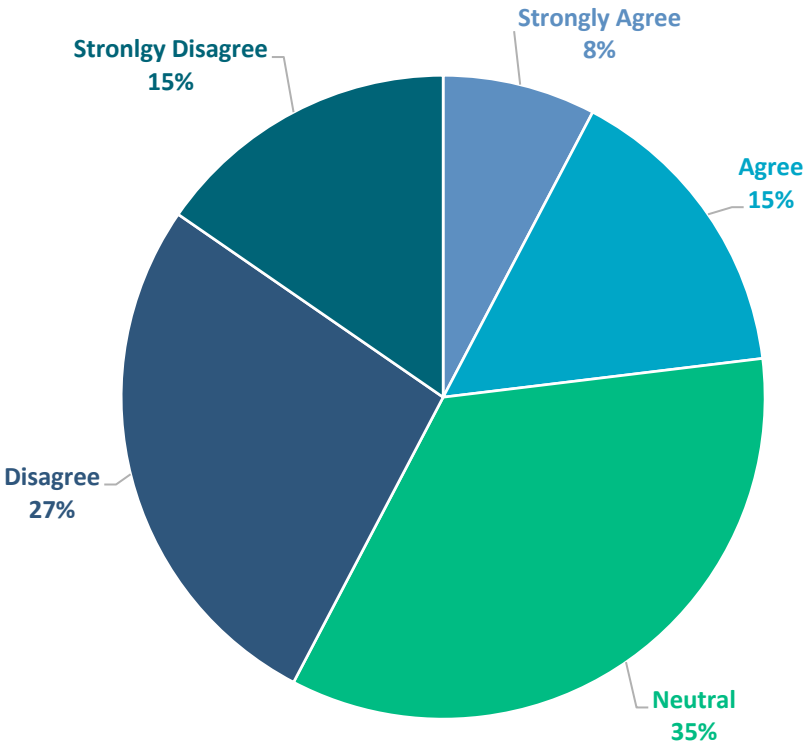
Thus, RE in Africa should be customised and contextualised to respond to African needs and circumstances. Unfortunately, the exact meaning of the word 'excellence' remains undefined within most African policy initiatives [5]. Unconditionally, it can be perceived as striving for the highest possible quality given the circumstances. Thus, none of the assessments or evaluations of research quality in Africa is done in an institutional or political vacuum. Nor is it completed without implicit and/or explicit notions or perceptions of what quality or excellence entails within the SGCI and among other SGCs. To promote efficiency and innovation, countries have developed policies and initiatives to advance RE and encourage research by providing large-scale, long-term funding to organisations with capacity to engage in high quality research [16].

4.1 Status of RE in SGCI countries

The following section reviews specific measures aimed at promoting RE among SGCI members.

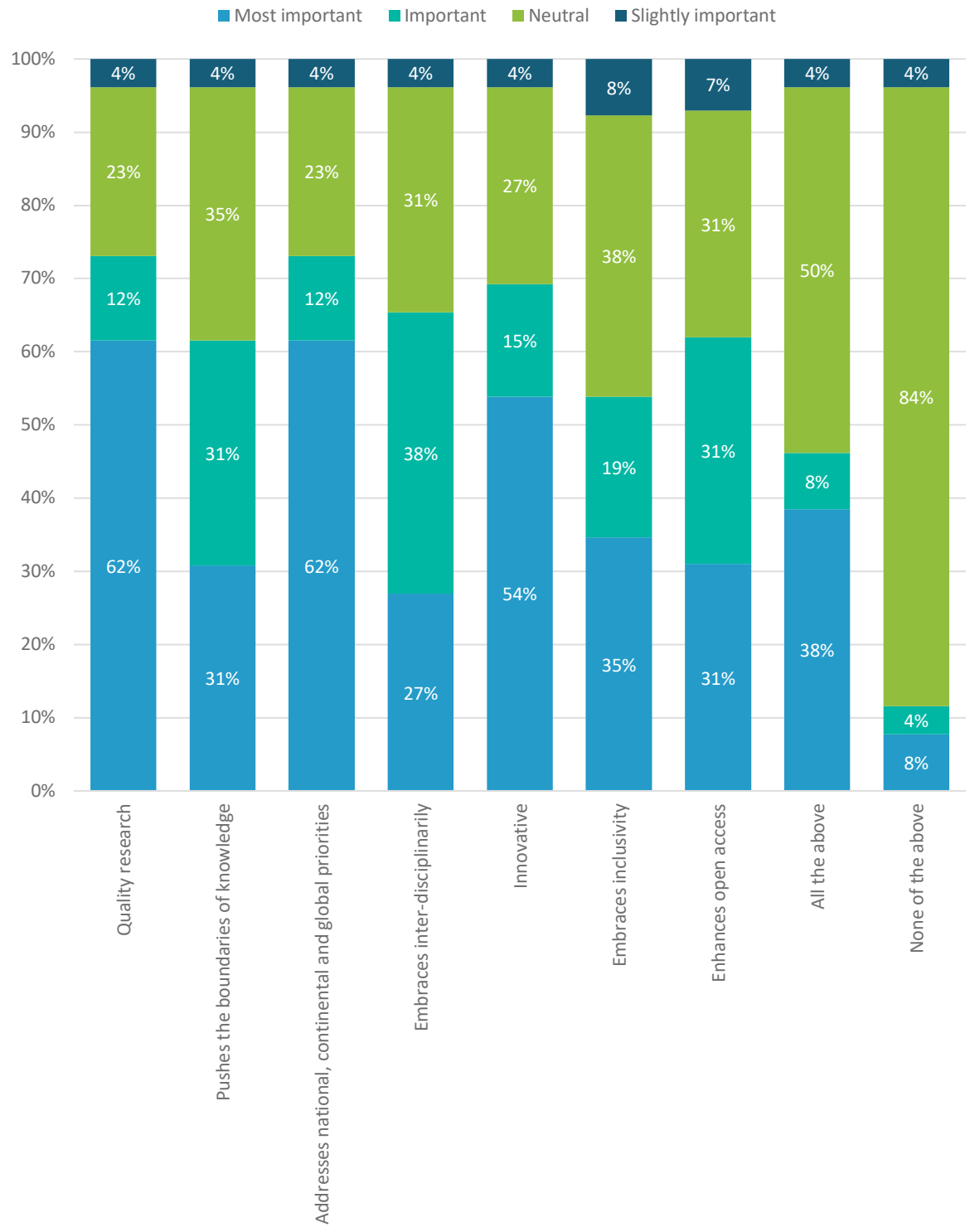
Using the survey, the study sought to obtain insights on the understanding of RE in selected SGCI participating countries (see Annex 1). Figure 3 shows that 42% of respondents highlighted that the RE definition was well understood across their respective institutions; while 23% indicated that there was the definition was unclear. This view presents a good base on progress made by African-based institutions to increase understanding of RE.

Figure 3: Level of clarity on defining RE



Most respondents (74%) indicated that RE should be underpinned by the research quality and must directly address national, continental, and global priorities (see Figure 4). This view highlighted the increasing role of the research ecosystem in responding to socio-economic and environmental challenges beyond knowledge advancement and publications. The innovation element is critical in resource-constrained environments where the research ecosystem must continually prove their relevance for increased funding from the public and private sectors. In line with the survey, several studies, as presented in Section 3, support the sentiments highlighted in the survey.

Figure 4: *Key elements that best describe RE*



5

EXAMPLE OF RE TOOLS FOR CONSIDERATIONS BY SGCI

5.1 Knowledge of RQ+ Framework

In 2012, the IDRC launched an effort to develop a new approach to evaluating the quality of the research it funds. The IDRC developed the Research Quality Plus (RQ+) Assessment Framework underpinned by two key issues:

1. Reflecting on the fact that scientific merit is necessary but an insufficient condition for judging research quality.
2. Determining research effectiveness is not solely in the hands of the researchers nor the research funders or research project managers.

Scientific expertise, while highly valued, is not the only expertise that matters.

The RQ+ is a flexible and holistic approach to evaluate the research quality through the development and provision of concrete and practical guidelines. This tool can be adapted and used to assess the quality of the research funded by the SGCs, when designing research programmes. In addition, RQ+ provides a holistic approach to evaluating research, by providing a range of evidence that supports planning, managing, and learning processes of a research project, program or grant portfolio. When considering the use of RE+, SGCs must be guided by three main steps of RQ+ presented below:

1. Selecting the research projects from the complete list of SGC-funded research projects, which will be selected for closer examination.
2. Contextualising each project according to the field of research and the overall research environment (social, economic, political).
3. Rating the quality of research in each project according to four dimensions (scientific rigour, research legitimacy, research importance and positioning for use).

Assessing the quality of research is hardly a new or novel idea. Researchers have long debated the best criteria and means for determining scientific rigor and significance of empirical studies, in the natural, social, and behavioural sciences. The concern with research quality has taken on renewed meaning for academic institutions, governments, foundations, non-profit agencies as well as non- and inter-governmental organisations through:

- Considering the intersecting global interests in quality standards;
- Measuring performance measurement;
- Accountability;
- Evidence-based policy and practice; and
- The value for money in research investments.

Interest and debate about research quality and use, as well as the relationship of research undertakings to social goals and values, have been particularly intense in the field of internationally funded research on developing priorities of low-to-middle-income countries.

In addition, assessment must consider whether research is perceived as salient and legitimate in the eyes of multiple stakeholders and potential users. Further, it must attend to questions of the effectiveness of the research in terms of its relevance, use and impact. The latter relies on the expertise of relevant stakeholders in judging the legitimacy and relevance of the research undertaking. Matters of research use, influence and impact are not necessarily within their immediate sphere of control. However, these play a significant role in learning about and establishing those conditions that might enhance users' interest in and use of the research. Therefore, it is reasonable to hold researchers, research managers and research funders responsible or accountable for the extent to the research is positioned for use by society.

RQ+ has three main components:

1. Key influences;
2. Research quality dimensions and subdimensions; and
3. Evaluative rubrics.

These are expanded below, by describing key influencing factors:

1. Key influences on research quality are:

i. **MATURITY OF RESEARCH FIELD:** The extent to which well-established theoretical and conceptual frameworks exist and from which well-defined hypotheses have been developed and subjected to testing, as well as a substantial body of conceptual and empirical research in the research field.
ii. **RESEARCH CAPACITY STRENGTHENING:** The extent to which the research endeavour or project focuses on strengthening research capacities through providing financial and technical support to enhance capacities to identify and analyse development challenges; and to conceive, conduct, manage and communicate research that can address these challenges.
iii. **RESEARCH ENVIRONMENT RISK:** Extent to which the organisational context in which the research team works is supportive of the research, in terms of institutional priorities, incentives and infrastructure.
iv. **POLITICAL ENVIRONMENT RISK:** External risk related to potential adverse factors that could arise because of political and governance challenges could affect the conduct of the research or it is positioning for use. These range from electoral uncertainty and policy instability to more fundamental political destabilisation, violent conflict, or humanitarian crises.
v. **DATA ENVIRONMENT RISK:** Extent to which instruments and measures for data collection and analysis are agreed upon and available, and whether the research environment is data rich or data poor.

2. Key influences of research quality dimensions:

i. **RESEARCH INTEGRITY:** Considers the research design and execution's technical quality, appropriateness, and rigor in terms of accepted standards. These accepted standards are the research design, methodological rigor, literature review, systematic work and relationship between evidence gathered and conclusions reached and/or claims made. Peer review processes underpins itself on integrity throughout this process.
ii. **RESEARCH LEGITIMACY:** Extent to which research results have been produced by a process that considered relevant stakeholders' concerns and insights. Also, whether the results were procedurally fair and based on the audience's values, concerns, and perspectives. Legitimacy deals with: (i) who did and did not participate; (ii) the decision-making process; (iii) how information was produced, vetted, and disseminated; and (iv) how well knowledge was localised and if it respected local traditions and knowledge systems. Also, this dimension includes subdimensions. For example, assessors must consider the potential negative consequences and outcomes for populations

affected by the research, gender-responsiveness, inclusiveness of vulnerable populations and engagement with local knowledge.

iii. **RESEARCH IMPORTANCE:** Considers the importance and value of the knowledge and understanding generated by the research to intended key users. Specifically, the perceived relevance of research processes and products to the needs and priorities of potential users as well as the research's contribution to theory and/or practice. Subdimensions include the originality and research relevance.

iv. **POSITIONING FOR USE:** Extent to which the research process has been managed and research outputs prepared so that the probability of use, influence and impact is enhanced. The uptake of research is inherently a political process. Therefore, preparing for it requires attention to user contexts, accessibility of products and 'fit for purpose' engagement and dissemination strategies. Also, it requires establishment of strong relationships with actors (before and/or during the research). Subdimensions include knowledge accessibility, sharing, implementability and timeliness.

3. Key influences evaluation rubrics

The evaluation rubrics set out characterisations for each key influence and performance levels for quality dimensions and subdimensions based on customisable assessment rubrics that make use of both qualitative and quantitative measures. The rubrics describe the key influences in such a way that assessors will be guided to identify characteristics or features present (in varying degrees) that pose a particular risk or factor to the context. For the quality dimensions and subdimensions, the rubrics set out criteria for judging and clarifying how performance is measured.

5.2 Partnerships

Excellent research is facilitated and supported by collaborating with others and learning from their experience in a community of knowledge and practice. **Forging formal relations through mutually agreed to agreements with SGC partners on the continent, and beyond are encouraged so as to support mobility, exchanges, and access to infrastructures and funding.**

Building collaborative relationships at individual and organisational level are key for developing shared grounds on RE. SGCs therefore must proactively pursue formal agreements with the: (i) local United Nations office; and (ii) partner institutions on the continent and beyond.

Enhanced North-South, South-South and triangular regional and international cooperation[1] must be considered with the objective of:

- Access to science, technology and innovation infrastructures that enhance knowledge sharing and exchanges on mutually agreed terms.
- Implementing effective and targeted capability and capacity building initiatives in developing countries to support the implementation of national and continental plans and strategies that link to the sustainable development goals. This can be achieved through benchmarking exercises with partner SGC institutions within the SGCI and beyond.

Research collaborations within the SGCI should be promoted focused on co-developing, managing and evaluating programmes.

Some examples, include:

- Alliance for African Partnership (AAP) which was founded by Michigan State University in 2016 in collaboration with African colleagues, the is a consortium of MSU, ten leading African universities, and

a distinguished network for African research institutes. AAP members are committed to working in equitable partnership to transform lives and address global challenges. The AAP builds on MSU's long-term engagement in Africa, building on the foundation laid by the African Studies Center and evolving models of engagement in line with AAP's guiding principles of accountability, equity, inclusivity, sustainability and transparency2.

- The Africa-EU Partnership is a multi-actor partnership guided by the EU and African Union (AU) Member States along with several non-state and civil society organisations, youth bodies, economic and social actors, and the private sector. The renewed partnership is grounded in an ongoing dialogue with the EU's African partners that is taken forward at the 6th EU-AU Summit in Brussels in February 20223.

5.3 Recognition and reward systems for pursuing RE

The survey respondents indicated that one of the reasons for the brain drain in Africa is due to a lack of incentives and reward systems. If incentives, recognition and reward systems were in place, it could transform the quality of research emanating from research institutions in Africa. An example is the rating system in place at South Africa's National Research Foundation. This rating system was designed as a tool for benchmarking the quality of South African researchers against the best in the world. A similar revised platform could be considered as an enabler to promote RE within the SGCI.

Other incentives, reward and recognition systems for researchers generating high quality and high impact research outputs may include, but is not limited to: (i) monetary rewards; (ii) paid sabbaticals (i.e. researchers continue to be paid their monthly salary whilst on sabbatical, which can extend to a period of six months; (iii) travel opportunities abroad to collaborating partner institutions, which can be subsidized or sponsored by partner institutions, particularly those in the Global North.

5.4 Long term strategic collaborative programmes

The survey respondents highlighted the need for more targeted investments in big strategic projects, which will contribute to strengthening the research ecosystem in Africa.

Some of the examples of programmes are provided below.

5.4.1 SARChI and CoE

The South African Research Chairs Initiative (SARChI) is a strategic intervention of the South African government designed to attract and retain highly skilled researchers that advance the national RE agenda as well as boost the innovation capacity and capabilities at South African public universities, research councils and national research facilities. SARChI is aimed at increasing scientific research capacity through developing human capacity and stimulating the generation of new knowledge. Also, SARChI is intended to support and advance transformation of South Africa's society in terms of demographics and the knowledge economy. This, so that there is equitable and inclusive participation in generating knowledge and that the knowledge translates into socio-economic benefits.

The SARChI funding instrument, as managed by the NRF drives and maintains quality, RE and innovation through its rigorous review process. It carefully selects suitable reviewers based on their academic and research expertise as well as their understanding of the South African higher education system and National System of Innovation. Quality reviewer reports add value to the peer review process by providing balanced reports with

[2] *https://aap.isp.msu.edu/about1/about/*
[3] *https://international-partnerships.ec.europa.eu/policies/africa-eu-partnership_en*

clear comments and recommendations, justifying overall rankings, as well as providing constructive criticism and feedback to applicants.

Another funding instrument, the Centres of Excellence (CoE) can be defined as an "institution which has demonstrated a high quality of R&D capability in a specific field of research", with an aim to achieve a regional spread and balance. South Africa's NRF defines a CoE as:

> *physical or virtual entities of research which concentrate existing capacity and resources to enable researchers to collaborate across disciplines and institutions on long term projects that are locally relevant and internationally competitive to enhance the pursuit of RE and capacity development.*

Whilst the SARChI and CoE funding instruments share similarities, such as supporting world-class research in a priority area, there are also many distinguishing features. Notably, SARChI recognises individual excellence, leadership and talent. Furthermore, it fosters prestige and visibility associated with an individual and catalyses organisational expertise in each area, through the training of high-quality postgraduates, and, broadly, contributes to strengthening a national research system. Research chairs are a means to developing a research group and training of the next generation and emerging researchers, while centring this contribution to an individual researcher. Over the past decade, the SARChI initiative has gained momentum, visibility, and presence in Africa. An example includes the OR Tambo Research Chairs, which was launched in 2017 and targets all participating SGCI countries. These Chairs aims to build on existing continental frameworks and interventions geared toward institutional capacity strengthening; developing high-end skills; recruiting and retaining excellent researchers; and providing incentives to support research that contributes to socio-economic and transformative development.

5.4.2 African Research Universities Alliance (ARUA)

Establishing CoEs, centres of competency and CoS advance research, research capacity development as well as provide a benchmark and framework for RE within the African continent. CoS focuses on regional training institutions to offer education and training programmes in critical and specialised areas toward increasing the stock of trained personnel in the region. The essence of a CoS is to be the hub of excellence and good reputation to facilitate leadership in a particular area and build capacity of other institutions in the region where necessary. Therefore, the institution is recognised as a regional institution in that area of discipline and it leverages to access funding from member states and other stakeholders. ARUA was inaugurated in Dakar in March 2015, bringing together 16 of the region's leading universities from different countries and historical backgrounds but with a common vision. ARUA's vision is to make African researchers and institutions globally competitive while generating knowledge for socio-economic transformation in Africa. Research universities are essential to transforming any economy. This initiative recognises that partnerships and networking have become essential arrangements for universities throughout the world to leverage their resources for greater impact. There are several examples of universities with similar ideals and complementary endowments working together to achieve greater outcomes (e.g., the UK's Russell Group and Norway's Research Council). ARUA has been well received in and outside Africa.

5.4.3 University Research Chairs (URC) programme

In 2015, Kenya's National Commission for Science, Technology and Innovation (NACOSTI) in collaboration with Canada's IDRC, launched the University Research Chairs (URC) programme. In addition to strengthening universities' role in public innovation systems, the programme aims to fund RE under the leadership of an eminent research scholar in maternal and child healthcare delivery. Also, the URC programme focusses on generating low-cost technologies, underpinned by RE.

5.5 Research Infrastructure

RIs form a central and integral part of the STI ecosystem. They play a key role in driving innovative research by attracting industry income and training highly skilled scientists [17]. Efficient RIs have the potential to enable the greatest discoveries in STI, attract researchers from around the globe, influence policy as well as bridge the divide between science and communities [18]. On the African continent, success in research depends on the availability, state and condition of research facilities, tools and services. RIs come in many shapes. Some are large like the SKA others are small like some national laboratories. Although African countries have invested in RI, evidence suggests a glaring deficit in most countries. Cooperation among countries of the region and between the continent and the international community could help build RI capacity [19]. Given the diverse and vital role that infrastructure plays in the research ecosystem as well as the associated high-cost implications, investing in infrastructure should be holistically planned and executed by considering strategic leveraging and sharing of resources among key stakeholders at national, regional, and international levels. It is therefore proposed that SGCs within SGCI, develop an African research infrastructure roadmap that supports capacity building; knowledge exchanges; ensuring access to world class infrastructures; and/or establishing research infrastructure platforms nationally. The African research infrastructure roadmap will outline the establishment of:

I. research infrastructures for equipping laboratories such as PCRs, centrifuges, sequencers, etc;
II. cutting edge research equipment for conducting novel research such as nuclear magnetic resonator, electron microscopes, etc; and
III. access to large scale research infrastructure facilities, which would include the consideration of a shared cost model for the investment in RIs or membership into global RI facilities such as CERN in Switzerland.

Indicators therefore can include:

- Participation in joint research infrastructure programmes such as: (i) PAERIP[4]: Promoting African-European Research Infrastructure Partnerships; (ii) the Joint Africa-European Union Strategy[5]; and (iii) CAAST-Net: Network for the Coordination and Advancement of Sub-Saharan Africa-EU S&T Cooperation[6], to name a few.
- Funding instruments in place that support the mobility and exchanges with research infrastructure platforms in partner SGCs and global partner institutions.
- Number of student and staff supported to access research infrastructure platforms in partner SGCs and global partner institutions.

5.6 Public engagement

Public engagement with science refers to activities, events or interactions characterised by mutual learning among people of varied backgrounds, scientific expertise and life experiences who articulate and discuss their perspectives, ideas, knowledge, and values [20]. Public engagement with science includes the upstream engagement of the broader public prior to the research work being undertaken and downstream engagement after or during the research work. Upstream engagement attempts to capture public involvement in setting the values and priorities that direct scientific research, often attempted in applied research areas. Downstream engagement enables the community to understand and use the research findings that culminate from a particular study or research field.

[4] *http://www.paerip.eu/*
[5] *https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/er/97496.pdf*
[6] *https://cordis.europa.eu/project/id/212625*

SGCs must develop a communication and outreach strategy which has the potential to shape local, national, and continental responses to national priorities, Agenda 2063, and the SDGs through cross-sectoral dialogues and partnerships.

The SGCI should invest in programmes that promote engagement between researchers and the public, using different platforms. The aim is to popularise science, engineering, technology and innovation as attractive, relevant and accessible with the aim of enhancing scientific literacy and awakening interest in relevant careers. These initiatives will fall into three broad categories: (i) science for the public, (ii) science for education support, and (iii) promoting careers in science. This can extend to support:

- Teacher training: are researchers engaging teachers on the latest developments in STEMI?
- Public awareness: What online or social media campaigns on "big science" is undertaken?
- Schools/learner outreach: what interventions are in place for students especially in rural areas to be able to access equipped laboratories?
- Science content made accessible, available and comprehensive to civil society through the translation of science content into native languages (e.g. coronavirus fact sheets).

5.7 Open Science

Open Science (OS) seeks to create platforms that promote engagement with other societal actors as knowledge partners in jointly framing questions and jointly seeking solutions. Over time, the Open Science movement has moved beyond the scientific community to encompass other key stakeholders in scientific knowledge including the private sector, civil society, policy makers and citizens. Open Science presents a great opportunity for the SGC STI landscape to further maximise the benefits of its investments through the adoption of Open Science practices. The global vision for Open Science is to enable scientific information, data and outputs to be more widely accessible in a way that enables all stakeholders to actively contribute to, and benefit from, scientific discourse and endeavours. The SGCI is also a key stakeholder in the Africa Open Science Platform (AOSP[7]), which aims to position African scientists at the cutting edge of data intensive science by stimulating interactivity and creating opportunity through the development of efficiencies of scale, building critical mass through shared capacities, and amplifying impact through a commonality of purpose and voice.

SGCs are urged to establish a national task team that aids the SGC with the development of a national open science strategy that forges strong linkages and partnerships with national, continental and global players in the Open Science discourse. These include:

- Participating in movements and adopting practices that aim to make multilingual scientific knowledge openly available, accessible and reusable for everyone. The aim is to increase scientific collaboration and sharing of information for the benefit of science and society, and to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community;
- Safeguarding of intellectual property in the journey towards subscribing to the principles of Open Science; and
- Develop new and nurture established partnerships with key role-players globally on the Open Science discourse, such as the Joint Research Centre; the UNESCO Recommendation on Open Science; the African Knowledge Platform; and the African Open Science Platform.

5.8 Effective peer review systems

Peer review is often held up as the gold standard for ensuring quality in academic research. Therefore, it is imperative that rigorous, reliable, accountable, accessible, and reproducible systems to promote RE are developed. The SGCI should develop joint peer review approaches to ensure that research outputs are of the highest standard, core evidence-based knowledge outputs must be peer reviewed. World class peer review processes in place that is underpinned on scientific excellence and rigor, where scientific merit is a non-negotiable. SGCs are therefore recommended to adopt policy guidelines to ensure that peer review processes adhere to the highest level of integrity and ethical practices.

[7] *https://aosp.org.za/*

5.9 Ethics: Ethical practices are at the heart of RE

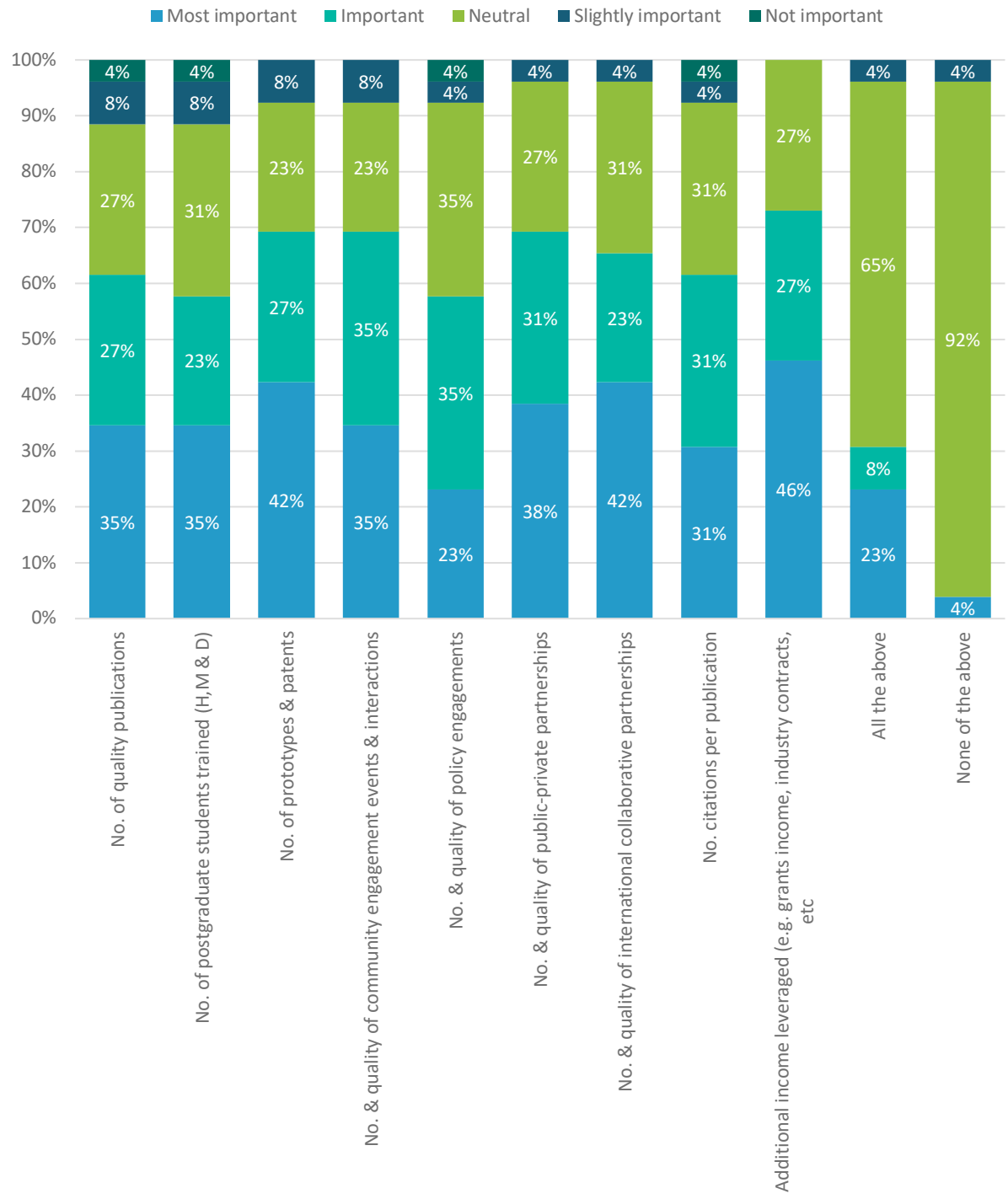
Programmes supported by SGCs must incorporate ethical considerations at every stage of the research process. This emphasises research participants' rights, independence, dignity, safety and equality within research relationships. Also, the idea of ethics threads itself to aspects of the research lifecycle from the project planning phase to close out and include elements such as plagiarism, data manipulation, confidentiality, etc. All SGC-funded research must subscribe, abide, and promote ethical research conduct and integrity in all research and related relationships; and develop procedures to guide decision-makers or persons who wish to raise concerns about questionable research practices. Examples of some of these guidelines are accessible under the "Research and Innovation Ethics Framework".

5.10 M&E programmes

Monitoring and evaluating projects, policies and strategies are a crucial part of managing grants. Sound academic principles must be adopted that measure the impact of research outputs linked to funded projects. Monitoring and evaluating (M&E) projects, policies and strategies are a crucial part of managing grants. Therefore, it is important for the research manager to understand the theory and basic principles of M&E. The essence of this endeavour is to choose meaningful indicators that reflect the progress of the plan towards the stated goal without it impacting negatively on the delivery during the measurement.

The SGCI should adopt approaches that promote robust M&E programmes for their projects. Figure 5 highlights some key performance indicators that survey respondents perceive as core to measuring RE in an African perspective. Most respondents (74%) indicated that RE performance should be linked to research quality. The survey highlighted the need for an additional indicator that should be considered when defining RE, especially for the African context, including infrastructure and facilities (see Figure 5). Refer to Section 6 for SMART RE indicators.

Figure 5: Performance indicators that best measure RE



In terms of ranking, the top indicators perceived as core to measuring RE in Africa include:

- Additional income leveraged as a feasible indicator of RE (73%);
- Number and quality of community engagements and interactions (70%);
- Number of patents and prototypes (69%);
- Number and quality of private-public partnerships (69%);
- Number and quality of international collaborative partnerships (65%); and
- Citations per publication (62%).

Figure 6 below presents a high-level illustration of RE indicators that need to be also included, when considering RE amongst SGCI partner countries. These include: (i) infrastructure and facilities; (ii_ field weighted citation index; (iii) demand driven research; and (iv) innovation outcomes.

Figure 6: Identifying additional performance indicators needed to measure RE

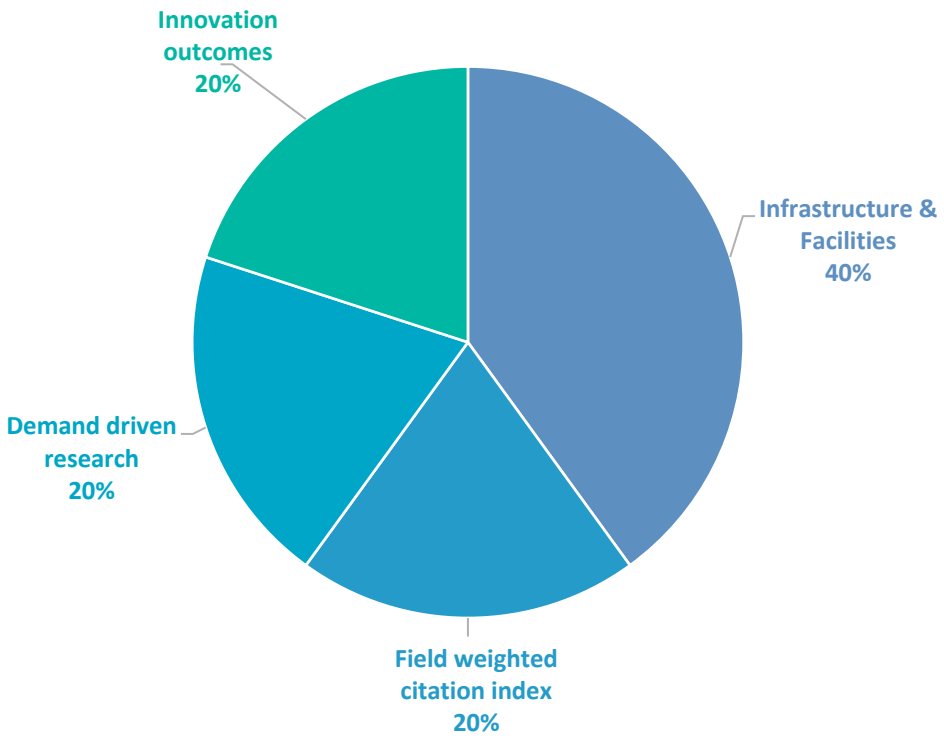
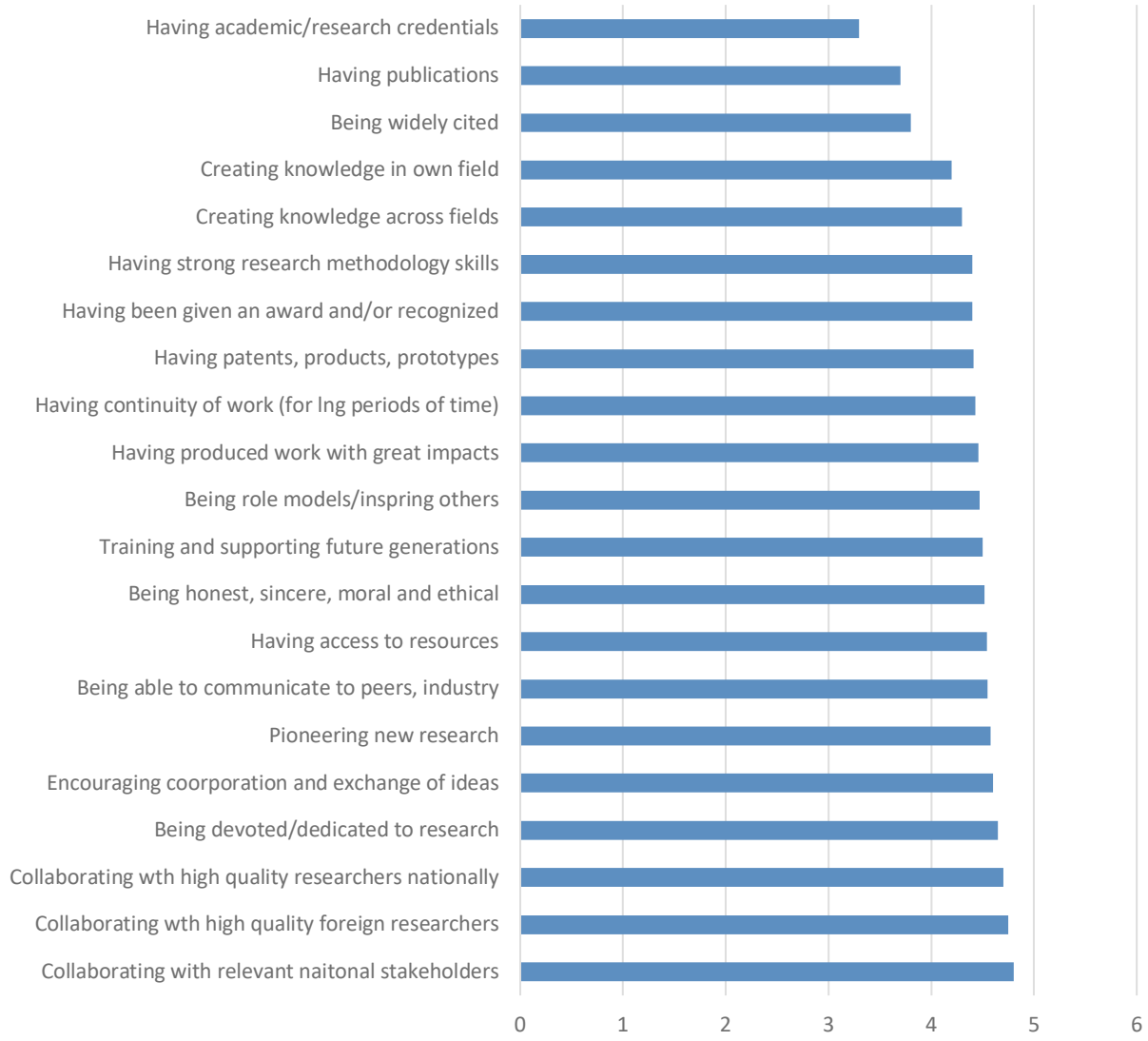


Figure 7 indicates responses from a previous study that describe the dimensions of RE as perceived as critical in SGCI members. The survey results suggest that there still remains work ahead in developing reliable ways of identifying and supporting the most-impactful research work [4]. However, publications in top international journals are acknowledged as a relevant indicator of quality of research outputs and impacts [4]. Lastly, the direct impact on the researcher or the research team, such as moving to more prestigious positions nationally and internationally or winning awards were noted as important criteria by the respondents [4] (see Figure 7).

Figure 7: Criteria and 21 dimensions of RE as perceived by SGCs in Africa [4]



6

DEFINING SMART INDICATORS TO MEASURE RE

The below proposition on indicators measure RE is adapted from the European Commission Joint Research Centre initiative. The EU model [24] is based on three contexts of engagement.

- Research: Engaging with actors in the academic context with issues of scientific relevance and scientific quality.
- Innovation: Engaging with actors in a socio-economic context with issues of socioeconomic relevance, related to firms or how efficiently to convert R&D investment into value.
- Society: Engaging with citizens, the public, stakeholders, concerned groups as well as political and public authorities, on issues of public policies, quality of life, sustainability with attention to issues of risks and ethics in the political context defining political relevance.

In each of these three contexts, knowledge production and the institutional arrangements and interaction schemes in which knowledge activities take place matter for excellence [24]. By focusing on the result of knowledge production and the mechanisms through which knowledge is produced we note the time lag between the activity and its impact [24]. In addition to measuring the existence and size of excellent research activities, further measures of excellence include impact, openness and attractiveness of the research and innovation system. Impact is associated with knowledge production, while openness and attractiveness are associated with institutional arrangements and interaction schemes.

The model proposes the use of six types of activities or dimensions (see Table 1) to measure RE.

Table 1: *Reliable composite indicators for assessing RE*

Dimension and context of engagement	Indicator (short term: < 5 years)
Engagement with research actors: knowledge production and impact	Publications per 1 000 researchers in public research
	% of Highly cited publications / % publications
	Average of relative citations (ARC)
	Specialization in publications in the fields of the Grand societal challenges (Agenda 2063 and SDGs 2030).
	Specialisation in publications in the fields of the key enabling technologies (KETs)
	Number of student and staff supported through mobility grants to access research infrastructure platforms in partner SGCs and/or global partner institutions.
Engagement with research actors: Institutional arrangements, interaction schemes including openness	Collaboration index (regional, continental and international)
	% Foreigners in national programmes
	% SGCI member participation in international collaborative projects
	% of joint research and education programmes with industry actors

Engagement with industrial innovation actors: knowledge production and impact	% industry funded internships programmes.
	Public – private co-publications per million population
	▪ Technology transfer office capacity development training. ▪ Patent applications by HEIs+ research institutions (per 1000 researchers)
Engagement with societal, economic and political actors: knowledge production and impact	Advocacy, Ministerial Advisory, Policy
Engagement with civil society & transforming the science-society engagement	▪ % researchers engaging teachers on STEMI? ▪ % SGC budget targeted towards public awareness and outreach to civil society on STEMI (e.g. coronavirus fact sheets). ▪ % public awareness and outreach activities eg. booklets and factsheets, translated into native languages.
World class peer review and MEL systems & processes	▪ Digital grants management system in place. ▪ World class peer review processes and platforms in place to support SGC. ▪ Review processes underpinned on scientific excellence and rigor.
	MEL processes and platforms in place to support SGCI.
Open science implementation	No. of enabling tools in place to promote open access principles eg. SGC Digital Space for uploading all outputs linked to SGC funded projects.
	% of institutions in SGCI countries using open science platforms.
	% researchers supported by the SGC that publish in open access journals (e.g. subsidising author processing charges).
	% of research institutions supported by SGCs in SGCI countries, with open science policies and frameworks in place.
Dimension and context of engagement	**Indicator (Long term: > 5 years)**
Engagement with industrial innovation actors: institutional arrangements, interaction schemes, including openness	Public – private co-publications per million population
	▪ % (national) HERD8+GOVERD9 financed by business. ▪ % R&D financed by business.
	% industry funded projects at HEIs + PROs
World class Research Infrastructures	Develop an African research infrastructure roadmap that supports capacity building; knowledge exchanges; ensuring access to world class infrastructures; and/or establishing research infrastructure platforms nationally.
Innovation outputs	No. of patent applications by HEIs+PROs (per 1000 researchers)
	Specialisation in patenting in the fields of grand social challenges (Agenda 2063 and SDGs 2030).
	Specialisation in patenting in the Key Enabling Technologies (KETs)

[8] Higher Education Expenditure on R&D
[9] Government Expenditure on R&D

7

CONCLUSION

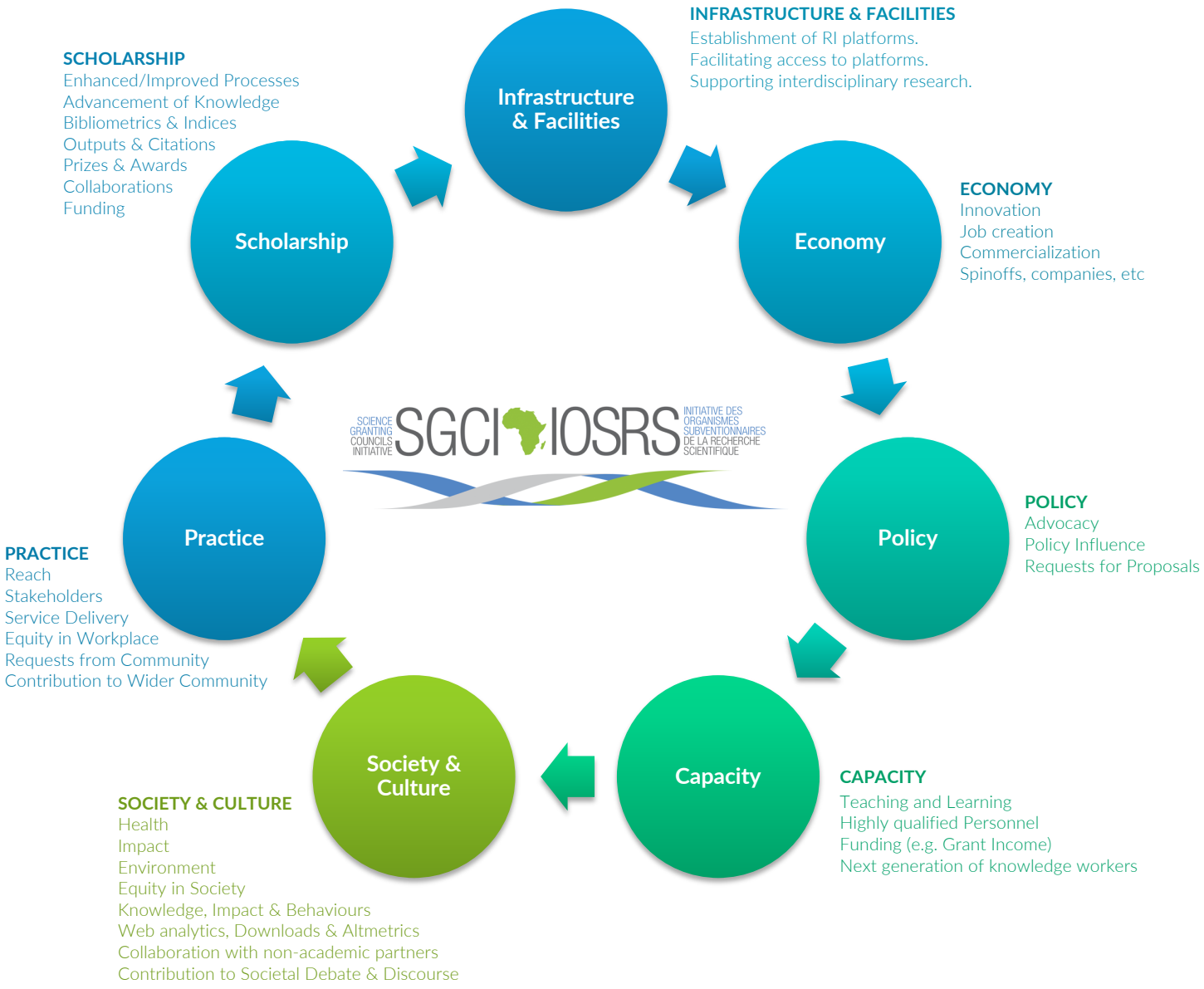
The advancement of human society is critically dependent on the creation of new knowledge through the conduct of research in universities, institutes, government agencies and industry. In our global future, the world's greatest problems will be tackled by teams of researchers from diverse cultures working across disciplinary, sectoral, and national boundaries. World-class universities will be at the heart of this endeavour in many ways. Academic staff in SGCI partner countries should be leading the immediate and long-term research effort and be involved in training the next generation of researchers through undergraduate, master's and doctoral level education and research supervision. The close integration of education of students (at every level) with research activity will continue to define the world's leading universities.

The recommendations proposed here is that a synergistic approach be considered for developing an RE model for SGCs. Informed by the survey and literature, two models that are the focal points for this approach include [21-22]:

1. The IDRC's RQ+ model (see Section 3), and
2. The future of humanities and social sciences.
3. SMART indicators

By synergising the two models, emphasis is afforded to RE and its impact beyond the pursuit of scholarly inquiry. This includes an impact and influence on capacity development, stakeholders, policy, economic, social, and cultural factors. Figure 8 summarises the REF.

Figure 8: *Proposed REF for SGCs (Adapted from [21-22])*



WORKS CITED AND ACKNOWLEDGED

[1] J. Chataway and C. Daniels, "The republic of science meets the republics of somewhere: Embedding scientific excellence in sub-Saharan Africa," in *Transforming Research Excellence: New Ideas from the Global South*, E. Kraemer-Mbula, R. Tijsen, M. L. Wallace, R. McLean, Eds. Cape Town: African Minds, 2021, pp. 39-58.

[2] E. Méndez, "Evaluating research excellence: Main debates," IDRC, Ottowa, 2012.

[3] Z. Ofir and T. Schwandt, "Understanding research excellence at IDRC: Final report Corporate Strategy and Evaluation Division," IDRC, Ottowa, 2012.

[4] R. Tijssen and E. Kraemer-Mbula, (2017). "Research excellence in Africa: Policies, perceptions, and performance". *Sci. Pub. Pol.,* vol .8, p1. Available: https://sgciafrica.org/wp-content/uploads/2022/03/Research-excellence-in-Africa-policies-perceptions-and-performance.pdf.

[5] GRC (2019). Statement of Principles Expectations of Societal and Economic Impact Accessible at: https://globalresearchcouncil.org/grc-publications/

[6] E. Kraemer-Mbula, R. Tijssen, M. L. Wallace, R. McLean, Eds. *Transforming Research Excellence: New Ideas from the Global South*. Cape Town: African Minds, 2020.

[7] S. Moss and B. Edmonds, (2005). "Towards good social science", *J. Artif. Soc. Soc. Simul.*, vol. 8, issue 4, p. 13. Available: https://www.jasss.org/8/4/13.html.

[8] T. Gibbon, R. Ryan, R. Bawa, A. Moteetee, A. Swart, "Strengthening the academic core for global reputation. Game changing strategies to grow reputation", in *Confr. Leadership Development Programme*, Johannesburg, 2014.

[9] N. Cloete, (2014). "The South African higher education system: Performance and policy," *Stud. High.*, vol. 39, issue 8, pp. 1355-1368. Available: http://dx.doi.org/10.1080/03075079.2014.949533.

[10] J. Mouton, "Measuring differentiation in knowledge production at South African universities", in *Confr. Differentiation Seminar*, Stellenbosch, 2014.

[11] REF (2020). Research excellence framework. Accessible at: https://www.ref.ac.uk/about/

[12] NRF (2020). NRF strategy 2020-2025. Accessible at: https://www.nrf.ac.za/sites/default/files/documents/NRF%20Strategic%20Plan%202020-2025.pdf

[13] ERA (2015). Excellence in research for Australia evaluation process. Accessible: https://www.arc.gov.au/sites/default/files/minisite/static/4551/ERA2015/downloads/ARC03966_ERA_ACCESS_151130.pdf.

[14] ERA (2018). State of Australian university research, 2018-2019. Accessible: https://dataportal.arc.gov.au/ERA/NationalReport/2018/.

[15] IDRC (2012). Understanding Research Excellence at IDRC: Final Report. Available: https://www.idrc.ca/sites/default/files/2021-04/RE-study-Understanding-RE-at-IDRC-full-report.pdf.

[16] OECD, 2014. Promoting Research Excellence: New Approaches to Funding. Accessible: https://www.oecd.org/science/promoting-research-excellence.htm

[17] R. Ramoutar-Prieschl and S. Hachigonta, (2020). Management of research infrastructures: A South African funding perspective. https://doi.org/10.1007/978-3-030-37281-1_2

[18] ESFRI (2021). Strategy report on research infrastructures. Accessible at: https://roadmap2021.esfri.eu/media/1295/esfri-roadmap-2021.pdf

[19] UNESCA (2017). Building research infrastructure capacity in Africa to achieve the SDGs. Accessible at: https://archive.uneca.org/sites/default/files/images/vers_6aug2017-draft_concept_note_egm_on_research_infrastructures_october_2.pdf

[20] DSI (2015). Science Engagement Strategy. Accessible: https://www.saasta.ac.za/saasta_wp/wp-content/uploads/2017/11/Science_Engagement_Strategy-11.pdf.

[21] W. Mijnhart, (2019). FHSS research impact framework for humanities and social sciences. Accessible at: https://twitter.com/wmijnhardt/status/1119161043106664448?lang=cs

[22] Federation of Humanities and Social Sciences, (2014). The impacts of humanities and social science research. Accessible at: https://www.federationhss.ca/sites/default/files/2014-10-03-impact-project-draft-report-english-version-final2.pdf

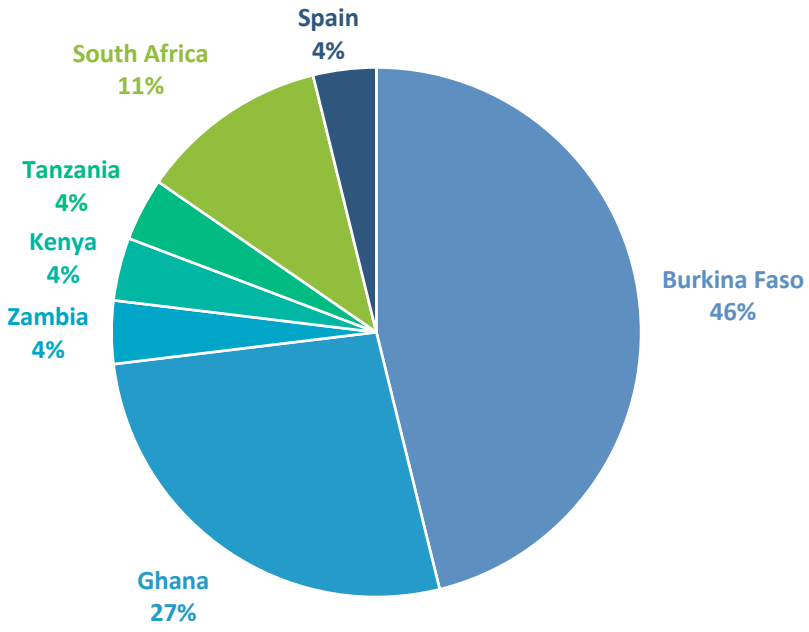
ANNEX 1: SURVEY DEMOGRAPHICS

The survey was developed using Google Forms and was opened for a month, spanning 7 April to 10 May 2022. The survey was translated in French by the Association of African Universities (AAU) for French speaking participants on the continent. The survey was circulated to key SGCI stakeholders including a select sample of active SGCI participating institutions in Southern, Eastern and Western Africa. Engaging with the SGCI was led by SA's NRF, the UK's University of Sussex and the AAU in Ghana. A total of 26 responses were received: 12 from French-speaking and 14 from English-speaking countries were received. This section summarises the key findings.

1. Participation by country

Responses were received from seven countries (see Figure A):

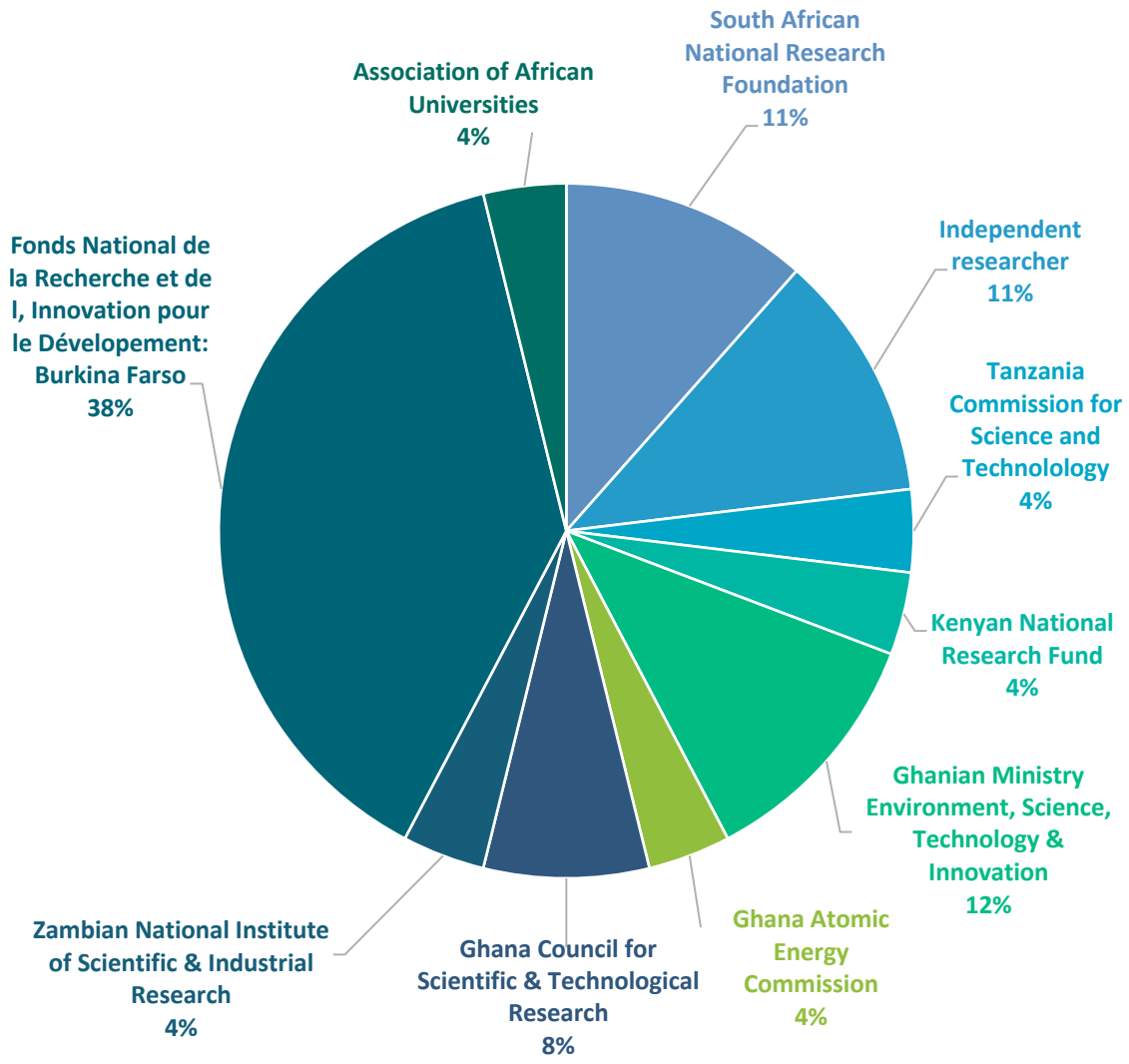
Figure A: Percentage participants per country



2. Institutional representativity across countries

Across the seven countries, the following institutions participated in the survey (see Figure B).

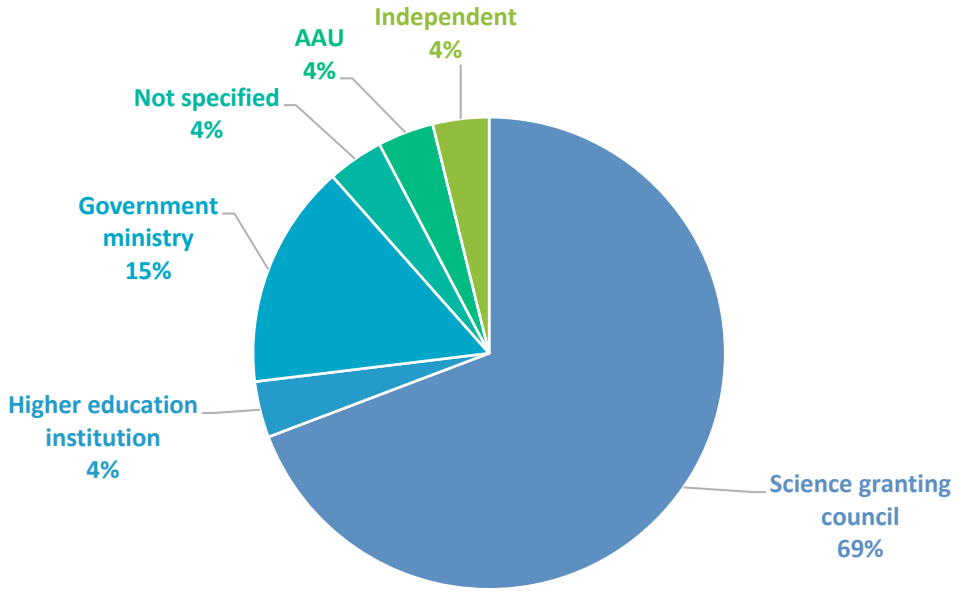
Figure B: Organisations participating in the survey



3. Organisations represented in survey

Furthermore, the survey participants represented the following six organisation types (see Figure C):

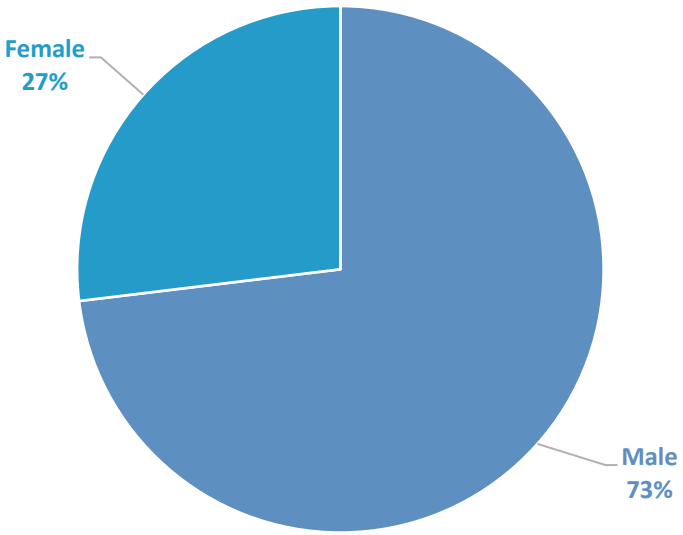
Figure C: Type of organisations represented by survey participants



4. Gender representation

There was about 73% of the participants of the survey being male and the remaining 27% female (Figure D).

Figure D: Gender representativity



5. Survey respondents' designations

Director-generals, computer scientists and agents made up 4% each of the survey participants. As Figure E shows, the largest designation groups that took part in the survey were:

Figure E: Survey participants' designations