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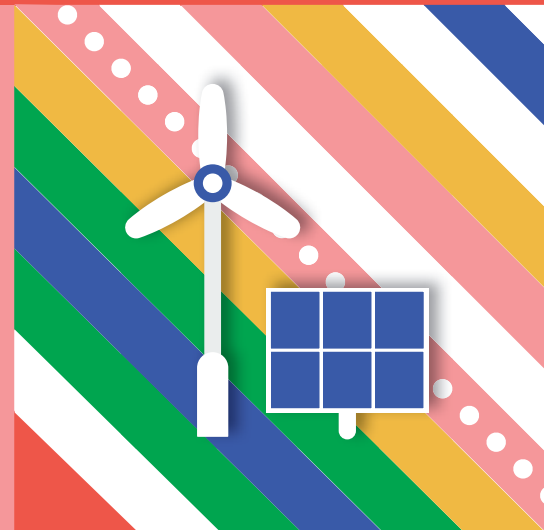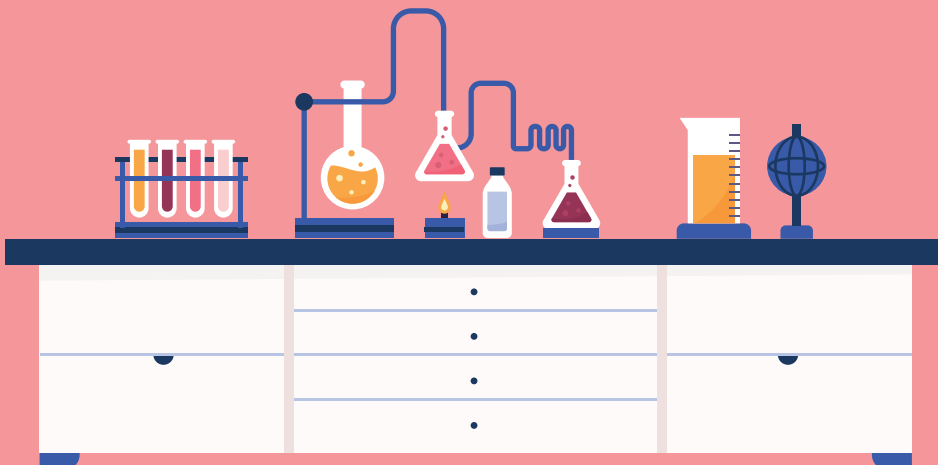
Lessons learned from
10 African programmes

Designing and implementing impactful post-PhD support programmes in Africa: Lessons learned from 10 African programmes. Mentz-Coetzee, Melody & Sienaert, Marilet. (2022).

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Designing and Implementing Impactful Post-PhD Support Programmes in Africa
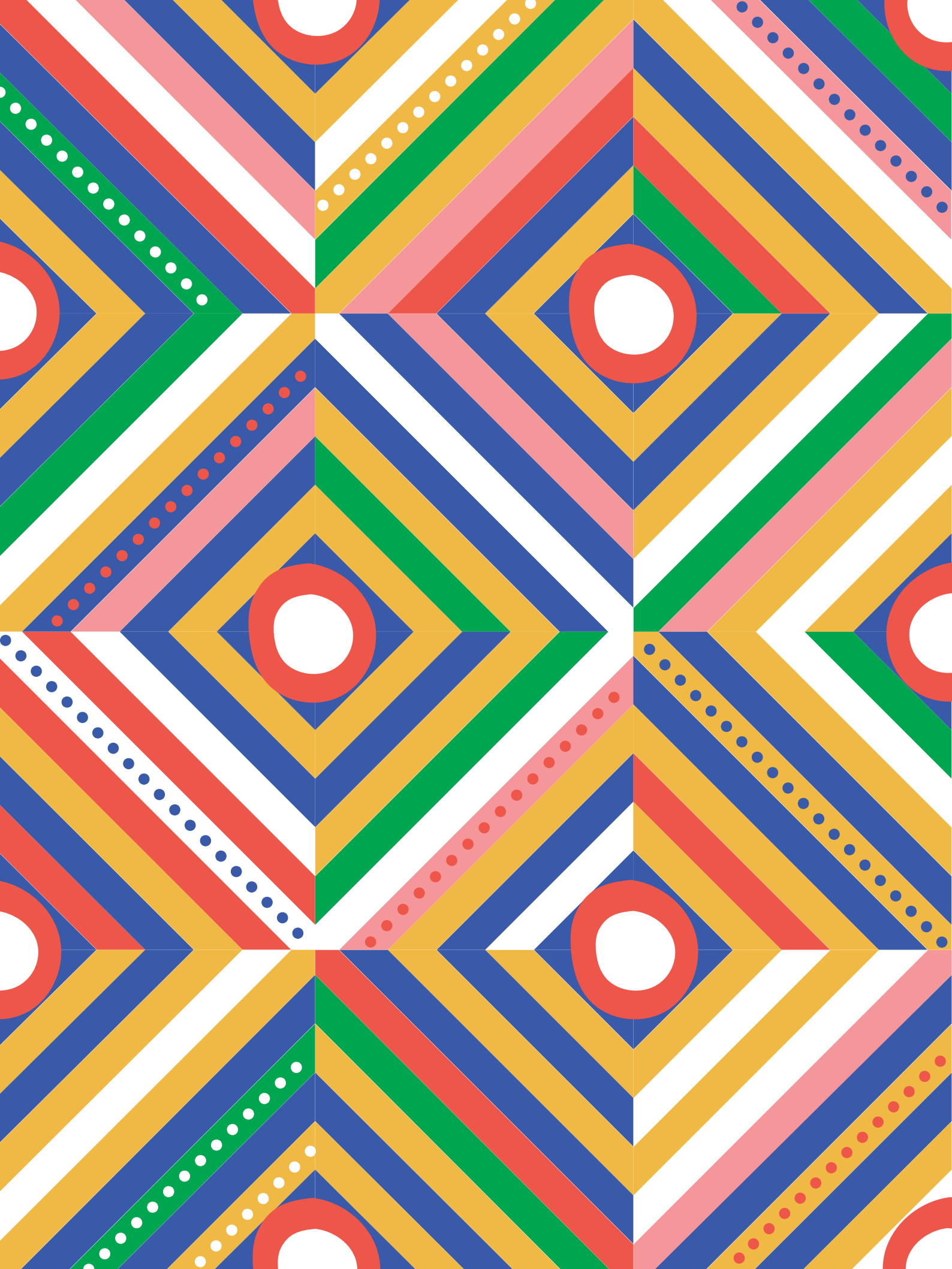
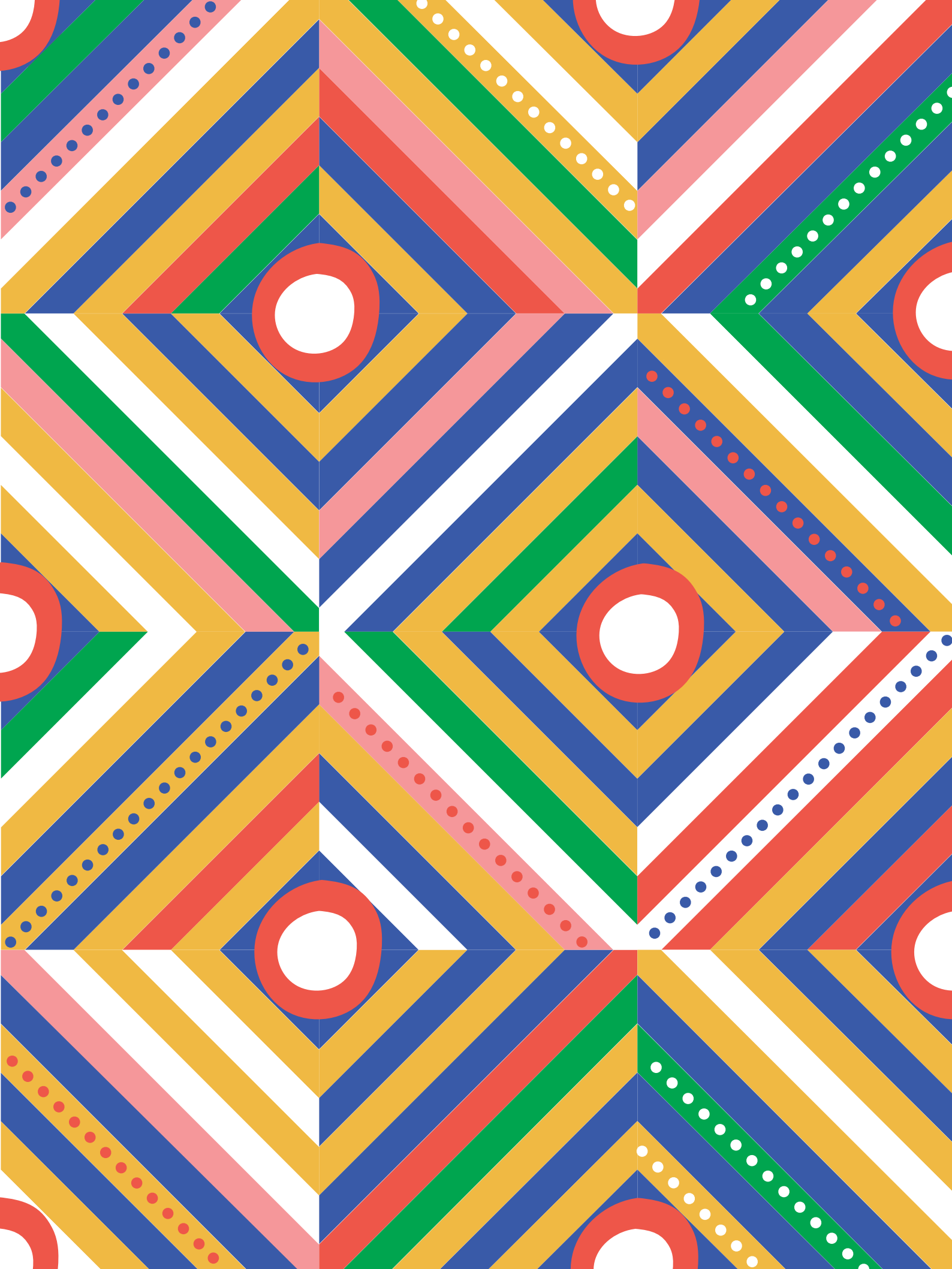## Lessons learned from 10 African programmes

Melody Mentz-Coetzee & Marilet Sienaert

2022

Foreword

With one of the youngest populations in the world, the African continent has significant potential to utilise its youthful population to advance society. While the role of researchers in advancing many critical areas of enquiry is well recognised, the education and science systems have not taken full advantage of this potential. This can in part be attributed to the relative difficulty of pursuing an academic career in Africa, influenced by limited and inadequate support structures, funding, and large-scale programmes for science and technology in the region. Early-career researchers are particularly affected.

Multi-dimensional and targeted interventions, partnerships, and support systems, such as the longstanding support from the Carnegie Corporation of New York (CCNY) to doctoral and post-PhD programming in Africa, will become increasingly critical to effectively grow the knowledge and innovation landscape in the region. Not only are the skills developed through these programmes valuable in accelerating career pathways for early-career researchers to become independent researchers, but they are also transferable to areas outside of academics, including industry.

The National Research Foundation (NRF) of South Africa is delighted by its strategic partnership with CCNY focusing on advancing and strengthening tertiary education and training systems in Africa. With the conclusion of the Peer-Learning for Emerging Researchers' Knowledge and Advancement (PERKA) project, the NRF and Carnegie are committed to continue developing and supporting targeted programmes for early-career researchers in Africa. We have no doubt that this intervention will not only accelerate careers for researchers but improve the academic rigour and competitiveness of the higher education system in Africa.

These guidelines are based on the lessons learned from 10 African post-PhD support programmes that ran concurrently over the past decade through CCNY's investment in post-PhD support programmes, as well as the African Research Universities Alliance (ARUA) Centres of Excellence. We are delighted by the partnership with the Centre for the Advancement of Scholarship at the University of Pretoria in directing the programme to the high standard and quality of engagement that resulted in the programme's findings. The strategic work of Dr Sepo Hachigonta, Director Resource Networks at the NRF, as the strategic manager of the programme, is gratefully acknowledged.

The guidelines are construed as a framework to serve multiple audiences and include recommendations for a wide range of stakeholders.

Dr Aldo Stroebel
Executive Director Strategic Partnerships
National Research Foundation, South Africa

Enabling a next generation of scientists, scholars, and thought leaders to flourish on the African continent and hold their own globally is of cardinal importance for the future of our planet. This is also a prime imperative for our universities, located as we are in a context of both wealth and deprivation, and for environmental diversity.

These guidelines for Designing and Implementing Impactful Post-PhD Support Programmes in Africa therefore, come at an opportune time and constitute a significant contribution towards achieving these goals. As an outcome of the PERKA project, the guidelines are based on the lessons learned from 10 African post-PhD support programmes and the African Research Universities Alliance (ARUA) Centre of Excellence that ran concurrently over the past decade.

We are gratified that the University of Pretoria, through the Centre for the Advancement of Scholarship, have been engaged by the National Research Foundation to implement this strategic project.

We highly acknowledge the Principal Investigator of the project, Prof. Frans Swanepoel, as well as the authors Dr Melody Mentz-Coetzee, Senior Researcher supported by Dr Marilet Sienaert, and the support team from the NRF. I further wish to recognise the postdoctoral fellows who have worked on various aspects of the project – Dr Farai Kapfudzaruwa and Dr Nadia Fouché – along with Ms Esley van der Berg.

The role of the programme leaders in identifying, analysing, and sharing the key lessons learned from the various networks are appreciated, as well as the work of the African Research Universities Alliance (ARUA) Centres of Excellence. The Centres were instrumental in validating the initial draft, and their experience and expertise in supporting a next generation of researchers contributed to the rigour with which the guidelines were devised.

Prof. Tawana Kupe
Vice-Chancellor and Principal,
University of Pretoria, South Africa

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ACRONYMS

AAS	African Academy of Sciences
ACLS	American Council of Learned Societies
ACU	Association of Commonwealth Universities
AESA	Accelerating Excellence of Science in Africa
AHP	African Humanities Project
APHRC	African Population and Health Research Centre
APTI	Africa Postdoctoral Training Initiative
ARUA	African Research Universities Alliance
AU	African Union
AWARD	African Women in Agricultural Research and Development
BRICS	Brazil, Russia, India, China, and South Africa
BMGF	Bill and Melinda Gates Foundation
BWH	Brigham and Women's Hospital
CARTA	Consortium for Advanced Research Training in Africa
CCNY	Carnegie Corporation of New York
CIRCLE	Climate Impacts Research Capacity and Leadership Enhancement
DEAL	Developing Emerging Academic Leaders
DFID	Department for International Development
ECRLF	Early-Career Research Leader Fellowship
ENPA	European Network of Postdoctoral Associations
ERC	European Research Council
GDP	gross domestic product
GERD	gross domestic expenditure on research and development
HR	human resources
ICT	information and communications technology
ISP	Insitutional Strengthening Programme
JHU	Johns Hopkins University
MoU	memorandum of understanding
NDP	National Development Plan
NGAA	Next Generation of Academics for Africa
NIH	National Institutes of Health
NNGAS	Nurturing the Next Generation of African Scientists
NPA	National Postdoctoral Association
NRF	National Research Foundation
PERKA	Peer-Learning for Emerging Researchers' Knowledge and Advancement
PI	Principal Investigator
QS	Quacquarelli Symonds
RISE	Regional Initiative in Science and Education
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture
SARIMA	Southern African Research and Innovation Management Association
STI	science, technology, and innovation
SU	Stellenbosch University
UCT	University of Cape Town
UK	United Kingdom
UKZN	University of KwaZulu-Natal
UP	University of Pretoria
US	United States
WARIMA	West African Research and Innovation Management Association

Summary ....

The purpose of this document is to present a framework for designing impactful post-PhD support programmes in Africa informed by best practices and past lessons from the region and beyond. The framework provides guidelines for and shares the experiences of African programmes in implementing such initiatives, describes partnership models for funding, and provides action points and recommendations for enhancing post-PhD support across the continent.

Construed as a set of guidelines, this framework aims to serve multiple audiences, including science funders, development partners, higher education institutions, and networks who wish to implement impactful early-career-researcher support programmes focused on the post-PhD phase, as well as the project teams responsible for implementing these programmes. Recommendations relevant to these specific stakeholders are flagged throughout the document using a series of icons as illustrated below.

Science funders, including science granting councils, ministries responsible for funding science, and other science-funding organisations.

Higher education institutions who may have (or intend to establish) their own or externally funded post-PhD support programmes.

Project teams, including persons, units, and teams responsible for implementing post-PhD support programmes.

Development partners, including international aid and philanthropy partners interested in funding science and capacity building in Africa.

There are 11 sections in this guideline document. An overview of these sections, including key topics discussed in each, is summarised below.

01 **About Peer-Learning for Emerging Researchers' Knowledge and Advancement (PERKA)**

Section 1 delineates the Peer-Learning for Emerging Researchers' Knowledge and Advancement (PERKA) project based on 10 African post-PhD support programmes and the methods used to glean the information that informs the framework.

02 **Why focus on post-PhD support in Africa?**

The need for effective post-PhD support programmes in Africa is evident from mega-trends globally and are discussed in Section 2. These trends include the demand for higher-level skills in the context of an expanding and increasingly competitive knowledge economy as well as the obvious link with sustainable development.

In Africa, post-PhD support contributes at the level of early-career researchers themselves, the level of the host institution's research productivity, as well as at the macro level through strengthening of the entire science system.

03 **Clarifying definitions and terminology**

As described in Section 3, Africa faces a severe shortage of qualified academics, with most not yet having completed their doctoral degrees. As a result, the terms early-career researcher/scientist/academic are adopted to describe those who hold either a master's or PhD degree, as well as to refer to post-

PhD researchers who are not yet fully independent. To encapsulate all of these phases, this framework uses the term early-career researcher to refer to the continuum beginning at the master's-degree level until a researcher has established themselves independently. The current guidelines focus on a range of models to support researchers who are in the post-PhD phase, which is a stage on this continuum.

04 Typologies and models for post-PhD support

Context-specific models for support in the post-PhD phase are described in Section 4, with three broad types of post-PhD support being identified as common practice globally. Fellowships can be (i) independent, stand-alone grants; (ii) embedded into the grant of a senior researcher; or (iii) for the post-post-PhD phase, a transitional grant as steppingstone to a tenured position.

In the African context, and specifically in the 10 programmes that participated in the PERKA project, two high-level typology differentiators are discerned. The post-PhD programme is either firmly embedded into the institution or hosted within networks, consortia, or organisations, with the fellows based at a range of other institutions. An overview of these programmes clustered under either one of these types (institution or network based) are provided in Tables 1 and 2 of Section 4. These tables summarise each programme's aim, type, duration, target group, disciplinary focus, and country focus, where appropriate.

05 The lifecycle of a post-PhD support programme

Section 5 makes the case for post-PhD support programmes that are both intentionally designed and effectively implemented and considers this in terms of a lifecycle. The different phases – namely, the design phase, the implementation-planning phase, and the programme-implementation phase – are briefly described. Some suggestions for an approach to monitoring and evaluation are also included.

06 Designing post-PhD support programmes

Section 6 offers evidence-based pointers for the design of impactful post-PhD support programmes in Africa. The aim is to suggest how constraints endemic to some contexts can be solved, rather than to make best-practice recommendations.

There is no one-size-fits-all post-PhD support programme solution in Africa, and programme design should be informed by a clearly defined set of objectives. Six high-level objectives (within each of which there are nuanced sub-objectives) can be discerned. These objectives are knowledge production and dissemination, capacity building, strengthening African academic institutions and systems, building academic networks and communities, promoting diversity, and impacting development in Africa. *Context relevance* is critical, as programme design must be responsive to the needs and/or challenges faced by the institution/network.

Programme design should ensure that fellows are given the *time* and *means* for developing both scientific and *complementary skills* for research-focused careers. *Mentorship* matters; in addition to their supervisor, postdoctoral researchers benefit greatly from having one or more mentors – either formally assigned through the programme (a preferred model) or informally engaged (less successful, as not everyone is able to form such relationships).

Deliberate *networking* opportunities, as well as support to develop the concomitant networking skills, are critial for impactful design, as are time away or residencies in a foreign country to expose fellows to different research settings. It is advisable to *'fill the gap'* during time away by making provision for substitute staff to absorb the fellow's workload in their home department and thereby mitigate the challenge of unreasonable performance expectations.

To achieve *inclusivity and/or equity,* programme design needs to be intentional about whatever aspect of the designated group it wants to advance. This may require special logistical and/or financial support and will vary from programme to programme.

Duration of fellowships as well as remuneration of fellows require careful consideration during the programme design phase.
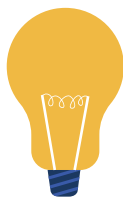
Mentorship is defined as a relationship in which a more experienced individual provides guidance and support in both the professional and personal aspects of career development to their mentee.

Supervision is task-specific, where the supervisor has the express goal of helping the postdoctoral fellow to meet all requirements to successfully complete their postdoctoral fellowship.

Although the roles of the mentor and supervisor may differ, they may be fulfilled by the same or different people.

07 Implementing post-PhD support programmes

Action points for the *implementation* of impactful programmes in Africa are provided in Section 7. This includes an *implementation-planning phase*, which is easily overlooked, during which partners who will help operationalise the programme must come on board to craft the call for applications and plan robust review and selection processes. *Flexibility* to tailor offerings over the period of implementation should be factored in during the planning phase, so that programmes remain responsive to the evolving institutional/network context.

This section furthermore provides guidelines on open, closed, or hybrid *programme calls, marketing, and application* processes as well as *selection criteria* and processes. *Induction meetings or orientation sessions* with new fellows are important to clarify expectations, and a *written Memorandum of Understanding (or conditions of grant)* is highly recommended, as this codifies the agreement between the fellowship programme and the fellow.

Expectations for the fellowship should be *matched to the discipline* (for example, the number of publications expected per annum varies widely by field of research) and be cognisant of the *amount of time* fellows will be expected to dedicate to research during the fellowship (i.e., those with multiple roles involving both teaching and research will have different levels of output for research than those who dedicate 100% of their time to research).

Appointing a *small steering committee or advisory group* to provide high-level strategic guidance to the programme further strengthens implementation.

08 Creating enabling environments

The role of enabling institutional environments is discussed in Section 8, as this has significant impact on the extent to which fellows can benefit

from the support programme activities, regardless of whether these programmes are embedded within the institution or administered by networks or consortia. The impact of support programmes is enhanced when institutions explicitly recognise the importance of post-PhD fellows – for example, by sanctioning the growth of the next generation of academics as a goal within the institutional strategy.

Practical considerations that may arise during implementation and which, if dealt with upfront, can help cultivate enabling institutional environments, include the choice of fellows' classification (as students or employees). This classification has important ramifications, and the programme should strike a balance between the pros and cons of being placed in either of these two categories.

Relevant *policies and standards* must be developed if not already in place, and implementation is enhanced where there are dedicated institutional services to handle fellows' end-to-end administrative and operational/logistical needs. Institutional capacity to host, design, and deliver programmes include *dedicated offices* and *postdoctoral associations* as well as adequate and dedicated *human resource (HR) capacity*.

All avenues should be explored to provide *holistic support* to fellows who may need non-academic support when taking up residencies away from their home institutions as well as during the return-home phase.

Efficient communication capabilities (both within the institution and with external stakeholders) contribute significantly to the successful hosting of post-PhD programmes.

09 Monitoring and evaluation of post-PhD support programmes

Guidelines for the reflection, monitoring, and evaluation required to understand the impact of support programmes are provided in Section 9. Indicators of success are suggested in terms of the individual fellows, institutions, and at the macro level.

Some challenges are highlighted, specifically in relation to capacity, with suggestions on how these could be addressed.

10 Funding partnership models for post-PhD support programmes

Section 10 considers funding partnership models for post-PhD support programmes in Africa and highlights the need for equitable and sustainable partnerships. A broad range of examples are discussed, with guidelines on how collaboration with funding partners can be strengthened.

Funding partners have a critical role to play in incentivising good practice through the requirements and incentives that they embed within the programmes and initiatives they fund, such as setting guidelines and standards, developing and funding stand-alone career-development opportunities, ensuring appropriate compensation and benefits, holding institutions and Principal Investigators (PIs) accountable, leading national/continental monitoring-and-evaluation efforts, and collaborating with academic institutions.

11 Transitioning out of the early-career-researcher phase

Section 11 concludes the guidelines by considering the *post-post-PhD phase*, when fellows often face significant challenges in obtaining a tenured position and need support to create sustainable, long-term career pathways. A broader conversation among funders, institutions, and programme designers is needed to identify potential solutions.

Introduction

01

1.1. PURPOSE OF THE GUIDELINES

As the significant efforts to increase the number of PhD holders in Africa begin to yield results[1], it has become necessary to thoughtfully consider and systematically identify impactful mechanisms to nurture young doctoral graduates into becoming future intellectual leaders.

These guidelines aim to:

- Describe a framework for designing impactful post-PhD support programmes in Africa.

- Provide guidelines for, and share the experiences of African programmes in, implementing impactful post-PhD support programmes in Africa.

- Describe partnership models for funding post-PhD support programmes in Africa.

- Provide action points and recommendations for enhancing post-PhD support across the continent.

1.2. HOW TO USE THE GUIDELINES

These guidelines target multiple audiences, including research funders, development partners, higher education institutions, and networks who wish to implement early-career-researcher support programmes focused on the postdoctoral phase, as well as the project teams responsible for implementing these programmes. Recommendations relevant to specific stakeholders are flagged using a series of icons, as illustrated below.

1.3. THE PERKA PROJECT

These guidelines have been developed based on the activities and outputs of the PERKA project.

PERKA was a joint participatory research project focusing on support provided to early-career researchers in the post-PhD phase in Africa. Funded jointly by the Carnegie Corporation of New York (CCNY) and the National Research Foundation (NRF) of South Africa, the project was implemented in collaboration with the Centre for the Advancement of Scholarship at the University of Pretoria (UP), South Africa.

The purpose of PERKA was to identify, analyse, document, and share the key lessons learned from CCNY's investment in post-PhD support programmes in Africa. PERKA adopted a collaborative, participatory peer-learning approach to document and investigate partnership models for post-PhD support in Africa.

Prior to PERKA, there had been limited attempts to synthesise learnings across programmes to develop an evidence-based understanding of the factors that enable, and the characteristics of, successful post-PhD support programmes on the continent. PERKA sought to address this gap by studying successful models implemented in other parts of the world and engaging with role players who were implementing and funding post-PhD support programmes in Africa, in order to develop and document a contextualised understanding of effective practice in Africa.

Science funders, including science granting councils, ministries responsible for funding science, and other science-funding organisations.

Higher education institutions who may have (or intend to establish) their own or externally funded post-PhD support programmes.

Project teams, including persons, units, and teams responsible for implementing post-PhD support programmes.

Development partners, including international aid and philanthropy partners interested in funding science and capacity building in Africa.

To understand and examine the experience of other role players in both the Global North and South, a comprehensive literature review of academic and grey literature on postdoctoral fellowships and early-career-research support models internationally was undertaken.

Role players in the CCNY post-PhD support programmes who were engaged included those responsible for administering and delivering the programmes in Africa and the early-career researchers sponsored by the programmes. Role players were engaged by hosting two participatory meetings. The meetings provided programme implementers and administrators the opportunity to share their models and experiences for the purposes of peer learning. In addition to these meetings, online interviews were conducted with the directors and programme staff of PERKA's participating institutions.

A survey with CCNY-supported early-career researchers was conducted to understand their experiences within the programmes.

An iterative process of documenting, convening, and refining documentation (in an action-research approach) was established to ensure that the lessons learned at the meetings and through the interviews and survey were recorded and incorporated into written outputs.

All the above processes and outputs informed a draft set of guidelines, which was submitted for further scrutiny to the Centres of Excellence within the African Research Universities Alliance (ARUA). The purpose of subsequent interviews with these entities, as hosts of numerous post-PhD fellows and relevant support programmes, was to (a) validate, modify, and strengthen the PERKA good-practice guidelines to further ensure their relevance and usefulness to other networks and organisations in Africa and to (b) enhance a nuanced understanding of post-PhD support in general and identify common challenges and priorities for investment. It is hoped that these guidelines will enable future African post-PhD support programmes to build on the past and be more intentionally conceptualised.

BOX 1
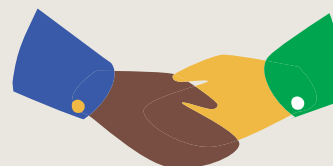
CCNY-supported programmes in PERKA

- Building a New Generation of Academics in Africa (BANGA-Africa), hosted by the University of Ghana, Ghana

- Nurturing Emerging Research Leaders Through Postdoctoral Training, hosted by Makerere University, Uganda

- Developing Emerging Academic Leaders (DEAL), hosted by the University of Cape Town, South Africa

- Programme at the Global Change Institute at the University of the Witwatersrand, South Africa

- Programme in Clinical Medicine at the University of the Witwatersrand, South Africa

- Accelerating Excellence in Science in Africa – Regional Initiative in Science and Education (AESA-RISE), led by the African Academy of Sciences

- African Humanities Programme (AHP)

- Consortium for Advanced Research Training in Africa (CARTA)

- Regional Universities Forum for Capacity Building in Agriculture (RUFORUM)

- Future Africa – Research Leadership Postdoctoral Fellowship, led by UP, South Africa
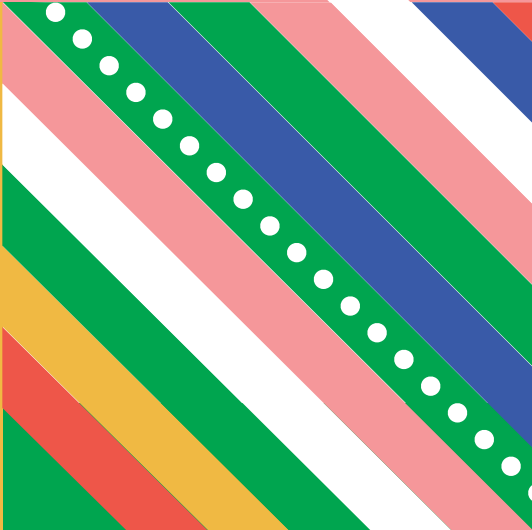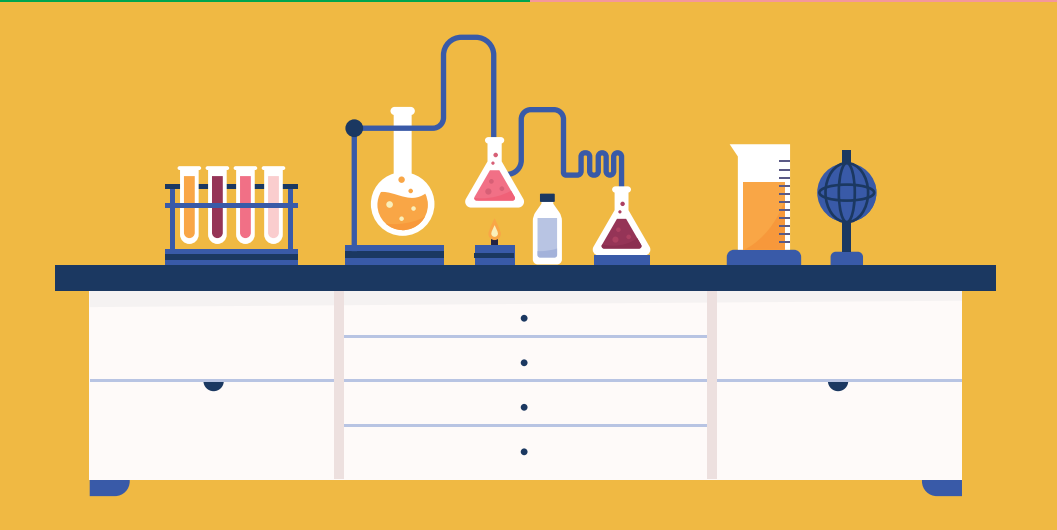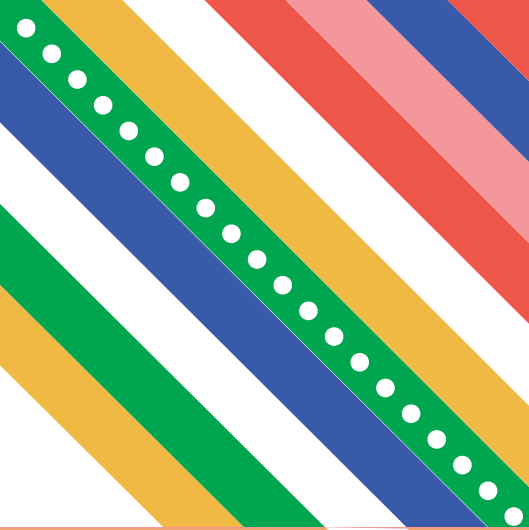
The case for post-PhD support in Africa

02

There is a compelling case for increasing investment in post-PhD support programmes in Africa. The global science enterprise has expanded rapidly over the past two decades. This expansion has been driven, at least in part, by the emergence of the modern knowledge economy within which science, technology, and innovation (STI) play an important role in economic activity. In recent years, there have also been growing calls for STI to make fundamental contributions to solving global sustainability challenges. Within this landscape, the research enterprise continues to increase in competitiveness and, to solve challenges related to sustainability, must be able to address increasingly complex problems.

These trends in the global science system (discussed further below) should influence how role players think about training the next generation of researchers, who will be the knowledge workers of the future.

In addition, postdoctoral fellowships and early-career-researcher programmes have been shown to benefit not only the early-career researchers they aim to train, but also hold numerous institutional and macro-level benefits. The benefits of postdoctoral fellowships and early-career-researcher programmes at the individual, institutional, and macro levels are discussed on page 31.

2.1. MEGA-TRENDS DRIVING THE FOCUS ON HIGH-LEVEL SKILLS DEVELOPMENT

The need for effective post-PhD support programmes in Africa is evident from three global mega-trends.

The first is the *demand for higher-level skills in modern knowledge economies*, which have been shown to be strong predictors of long-term economic growth. Higher education plays a significant role in the knowledge economy, not only through providing education that builds high-level skills, but also through the research created within its structures. Doctoral students and postdoctoral fellows are crucial actors in the knowledge-creation system through the important role they play in undertaking research. In the long term, they are the foundation of the future generation of researchers upon whom the sustainability of the scientific enterprise depends. The role of higher

education in advancing information and communications technology (ICT) infrastructure (an essential pillar of the knowledge economy) revolves around workers such as doctoral graduates who can provide the necessary high-level ICT skills and contribute to the research needed to establish and maintain this infrastructure. Similarly, the level of automation anticipated with the 4th industrial revolution (Industry 4.0) will require (doctoral) graduates who can lead the socio-economic transformations that are being ushered in with this revolution.

African countries have been lagging in the transition to knowledge economies and, as a continent, Africa falls behind on the knowledge economy index developed by the World Bank. Systematic action to address this gap is urgently needed, and investing significantly in the continent's early-career researchers is one of several actions necessary.

The second mega-trend is the *growing and increasingly competitive science landscape*. The expansion of the global research enterprise is evident from the significant changes in gross domestic expenditure on research and development (GERD), the number of researchers in the workforces, and scientific output.

Figure 1 shows the changes in these three variables for the United States (US), Europe, East/South East Asia[i], and Africa between 2007 and 2016/2017/2018. The figures provide for a comparison between examples of leading knowledge economies (the US and Europe), rapidly developing economies (East/South East Asia), and Africa (the focal point of these guidelines).

Although increases on all three variables are noted across all regions, the scale of change differs. The result is that the gap between the leading and rapidly developing economies has narrowed significantly on all three indicators; in some instances, East/South East Asia now outperforms Europe. Although there have been improvements in these indicators over the past decade in Africa, in contrast to the growth seen in the research enterprises in the Global North and Asia, Africa continues to lag.

i South East Asia is a subregion of Asia consisting of the regions that are geographically south of China, east of the Indian subcontinent, and north-west of Australia

Postdoctoral fellowships and early-career-researcher programmes have been shown to benefit not only the early-career researchers they train, but also hold numerous institutional and macro-level benefits.

FIGURE 1

The changing science landscape
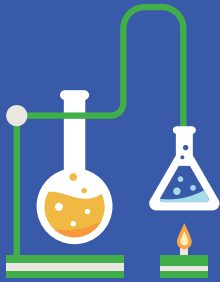
GERD as % of GDP

African governments have committed (and remain committed) to investing 1% of their gross domestic product (GDP) in STI, yet few managed to reach this target by 2010. Africa also lags when compared to non-African BRICS (Brazil, Russia, India, China, and South Africa) nations. Both Brazil and Russia had GERD values of more than 1% of their GDP in 2017.

US
2.79%
2.63%

EUROPE
1.86%
1.62%

EASTERN / SOUTH-EASTERN ASIA
2.13%
1.73%

NORTHERN AFRICA
0.61%
0.34%

SUB-SAHARAN AFRICA
0.38%
0.37%

2017
2007
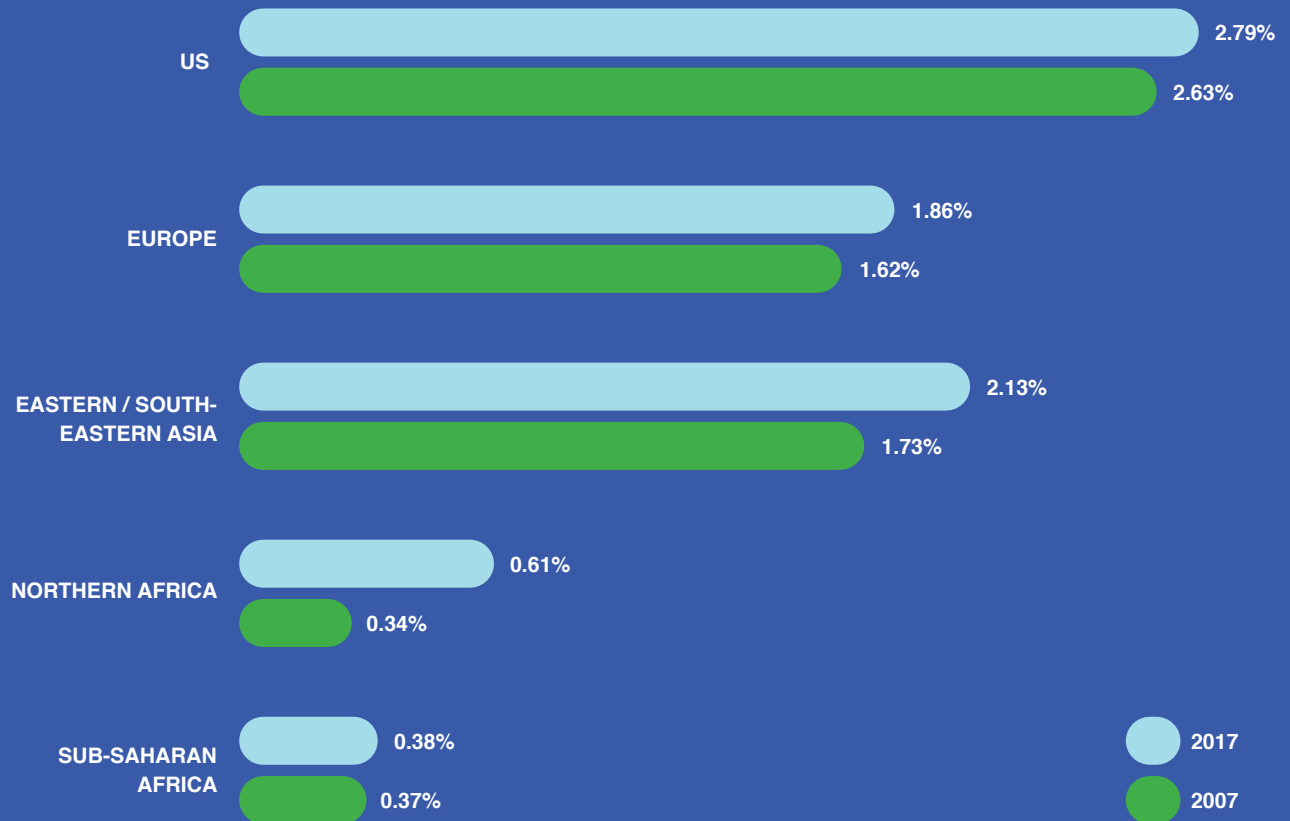
Number of publications

The US saw an increase of 8% in the number of publications from 2007 to 2018, whereas Europe experienced a rise of 32% and Asia an increase of 107%. Although Africa saw a substantial increase (171%), the absolute number of publications from Africa in 2018 was low when compared to all other world regions. Africa made up only 2% of the total articles published globally in 2018.

US
- 410,000
- 390,000

EUROPE
- 800,000
- 590,000

EASTERN / SOUTH-EASTERN ASIA
- 790,000
- 370,000

NORTHERN AFRICA
- 14,000
- 5,000

SUB-SAHARAN AFRICA
- 15,000
- 6,000

● 2018 ● 2007
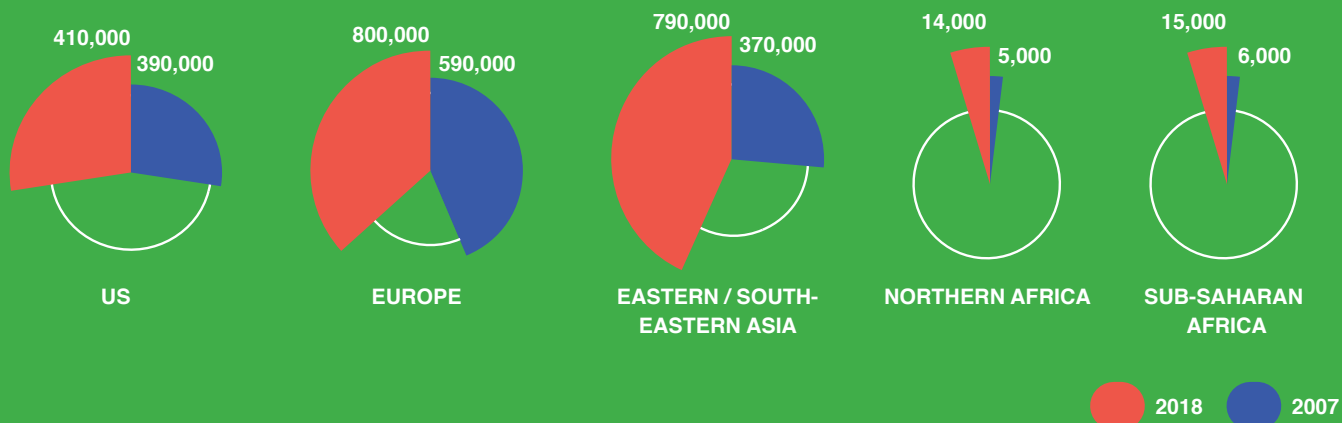
Number of researchers

Despite an 80% increase in the number of researchers in sub-Saharan Africa and 70% in Northern Africa from 2007 to 2018, the absolute number of researchers on the continent made up only 3% of the world's researchers, with sub-Saharan Africa contributing 1% and Northern Africa 2%. When compared to the non-African BRICS nations in 2016, Africa was also shown to lag behind Russia, and especially China, which contributed 5% and 19% to the global pool of researchers, respectively.

US
- 1,100,000
- 1,400,000

EUROPE
- 1,700,000
- 2,200,000

EASTERN / SOUTH-EASTERN ASIA
- 2,000,000
- 3,250,000

NORTHERN AFRICA
- 100,000
- 200,000

SUB-SAHARAN AFRICA
- 80,000
- 100,000

● 2007 ● 2016

BOX 2
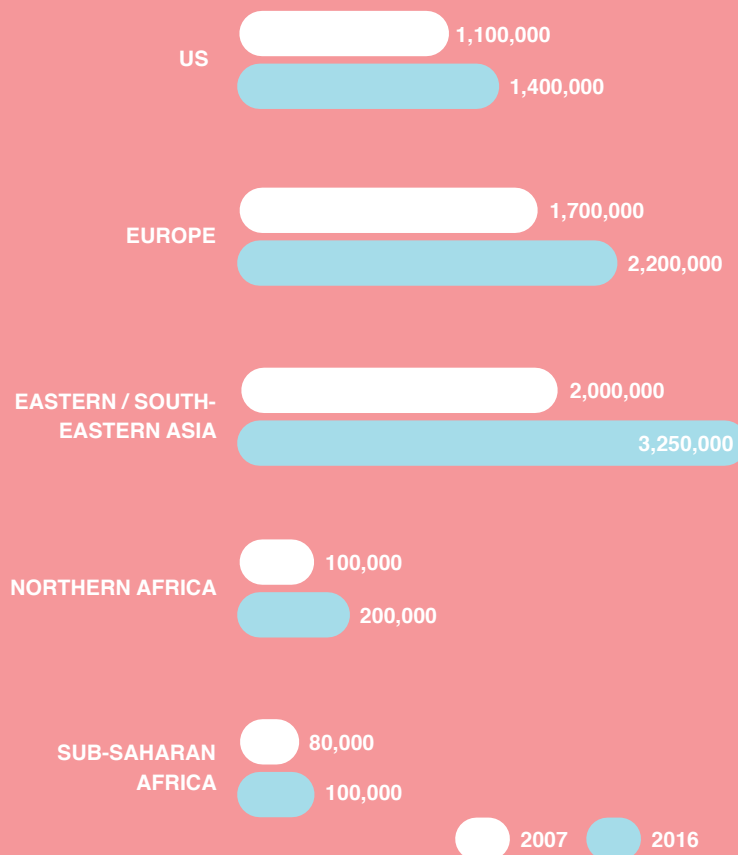
PhD enrolment and graduation in Africa at 8 flagship insitutions

PhD enrolments in Africa are predominantly at the University of Cape Town (UCT) in South Africa, which accounted for 1,226 of the 2,614 enrolments. The remaining 1,388 enrolments were in the seven other universities combined.

The graduation rates of these enrolled doctoral graduates are concerning, with a combined total of only 367 doctoral students graduating across all eight universities in 2011 and three universities (UCT, University of Nairobi, and Makerere University) producing over three-quarters of these graduates.

To put this into perspective, the University of Sao Paolo in Brazil produced over 1,000 doctoral graduates in 2011, which is roughly equal to the number produced by all 23 of South Africa's universities combined in the same period[3].

South Africa is the only African country with comprehensive data on doctoral graduation rates[4] after 2011. Despite an increase in the number of doctoral graduates in this country, it is still only a fraction of the graduates produced by the world's top PhD-producing countries[5] and is also lagging behind other BRICS nations in this respect.
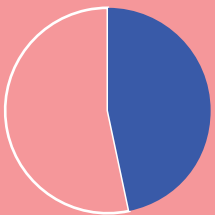
46.9%*

of PhD enrolments at 8 flagship institutions were at UCT in South Africa in 2011

Given the vital role that doctoral graduates play as researchers in knowledge economies, the global drive in the policy sphere to increase the number of PhD graduates is not surprising and has resulted in an exponential increase in the number of doctorates earned each year in developed economies. However, in contrast to these countries where there is now an oversupply of PhD graduates, doctoral enrolment numbers in African countries are low, and doctoral graduation numbers are even lower. An 11-year study of doctoral education at eight flagship universities in Africa[2] revealed a total number of doctoral enrolments of only 2,614 across all eight universities during 2011 (see Box 2).

The *stark increase in competitiveness in higher education* is the third mega-trend that demonstrates the need for investing significantly in early-career-researcher development in Africa. Universities that do well in the global institutional rankings stand first in line for attracting high-quality students and renowned staff, gaining international visibility, and receiving money from various sources. Heavily reliant on research achievements, these rankings illustrate the necessity of

a robust cadre of researchers if an institution hopes to compete. African universities do not feature strongly in global rankings at all (see Box 3).

There is, however, a further compelling reason for Africa to focus on strengthening its science and technology capacity. The United Nations' *2030 Agenda for Sustainable Development*, which identified the 17 Sustainable Development Goals (SDGs), and the subsequent *2019 Global Sustainable Development Report*[ii] demonstrate the critical role played by STI in solving problems facing humanity – from simple challenges to wicked problems.

High-level agendas, such as the SDGs, have increased recognition of the vital role that STI, including the knowledge workers who tackle increasingly complex problems, should play in sustainable development.

In Africa, multiple strategic agendas align with the SDGs and strongly support the role of science in attaining

ii Independent Group of Scientists appointed by the Secretary-General, 2019

BOX 3

African universities in global rankings

On three of the most respected global university ranking systems (Times Higher Education World University Rankings, Quacquarelli Symonds [QS] World University Rankings, and Shanghai Ranking's Academic Ranking of World Universities), no African university features among the top 100 universities[6].

According to the Times Higher Education World University Rankings for 2020, South African universities fared best in the global rankings among African institutions.UCT came out on top, ranked 136th in the world; the University of Witwatersrand (Wits) ranked second, occupying the 194th position; Stellenbosch University (SU) ranked third in the 251-300 category; and the University of KwaZulu-Natal (UKZN) fourth in the 401-500 category. Outside of South Africa, the Aswan and Mansoura Universities in Egypt, and the Covenant University in Nigeria, were all three jointly ranked with UKZN in the 401-500 category[7]. UCT, Wits, and SU were ranked among the top five universities in Africa according to the QS rankings for 2020, with UCT ranked 198th in the world, Wits 400th, and SU 427th. The American University of Cairo in Egypt was ranked as the second-best university in Africa, coming in at 395th in the world[8].

BOX 4

Defining wicked problems

Rittel and Webber (1973) described 'wicked problems' as problems that involve multiple interacting systems, that are saturated with social and institutional uncertainties, for which only imperfect knowledge about their nature and solutions exist, and for which there are no correct solutions but only solutions that are either 'better' or 'worse'.

sustainable development. Most notable is the African Union's (AU) Agenda 2063, developed in 2013, which is a continental 50-year agenda to achieve the vision of *The Africa We Want*. Agenda 2063 aims to be Africa's blueprint and master plan for transforming the continent into the global powerhouse of the future.

Agenda 2063 is complemented by a 10-year strategy – the Science, Technology, and Innovation Strategy for Africa (STISA-2024) – that was adopted by the AU and is part of the longer-term AU Agenda 2063. STISA-2024 addresses six priority areas: (i) the eradication of hunger and achieving food security, (ii) prevention and control of diseases, (iii) communication (physical and intellectual mobility), (iv) protection of our space, (v) building the society, and (vi) wealth creation. All these priorities align with various SDGs.

Apart from these continental frameworks, an enhanced appreciation of the importance of STI in development is noted at the country level in Africa. An analysis of the STI policies of 15 African countries showed that common priorities include education and HR development, agriculture, energy, health, environment, industry, intellectual property protection, transport, and communications[9].

However, the national policies and continental frameworks have not yet produced their intended results due to a shortage of knowledge workers with high-level skills and research competence who can drive both technological innovation and technological diffusion. There is, therefore, an urgent need in Africa to build a critical mass of researchers and innovators who can help bridge the gap between the existing frameworks and policies and their successful implementation for sustainable development.

That said, globally and in Africa, finding solutions to the wicked problems embodied in the SDGs and national development priorities will require a new way of thinking. Due to the immense and increasing complexity of current global issues, intervention strategies that are linear and mechanistic will no longer suffice to solve problems that transcend single disciplines and have profound societal implications. Knowledge workers are needed who can correctly conceptualise wicked problems, work with transformational change, and develop innovative solutions to address the issues at hand. A cadre of sustainability leaders is needed who can employ systems thinking, transcend disciplinary boundaries, communicate effectively, engage diverse stakeholders and communities, and connect science to innovative, actionable solutions.

Given the above, there is a strong imperative to increase the number of researchers in Africa to enable the continent to improve its research competitiveness, transition to a knowledge economy, and achieve sustainable development.

At present, revitalisation of the PhD degree is the central mandate of many initiatives aimed at revitalising higher education in Africa for economic growth (e.g., the AU's Pan-African University; the World Bank's Africa Higher Education Centres of Excellence Project; the Kigali Communiqué on Higher Education for Science, Technology, and Innovation; the Dakar Declaration and Action Plan on Revitalising Higher Education for Africa's Future; and the Committee of 10 Heads of State and Government (C10) Championing Education, Science, and Technology in Africa). Although this is an important starting point in developing the skills Africa needs, a focus on PhD production exclusively is not enough. There is an equally pressing need to support the career development of these PhD graduates to enable them to grow into future research leaders.

Many early-career-researcher
programmes promote research
that addresses regional or national
priority areas, thus contributing
to solving pressing development
problems in these countries.
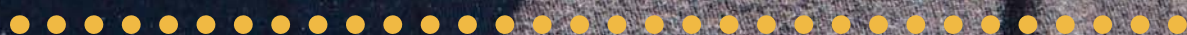
Investing in the development of researchers in the post-PhD phase has the potential to yield multi-layered benefits to the individual researchers, to the institutions within which they are embedded, and within society.

2.2. BENEFITS TO EARLY-CAREER RESEARCHERS

First and foremost, many early-career academics in the African context have not yet attained a PhD. A primary benefit of early-career-researcher support programmes for these aspirant researchers is that they are enabled to complete their studies and, consequently, propel forward their careers. However, support for these early-career researchers needs to move beyond the PhD.

In the global STI context described above, researchers are required to have progressively more advanced and diverse skill sets to succeed. In Africa, the predominant doctoral model is still the traditional PhD, consisting primarily of a dissertation written by a student under the supervision of one or more senior academics[10]. Although this model was historically viewed as adequate preparation for an academic career, it has come under scrutiny, and calls for alternative models have emerged[11].

The skills acquired during doctoral education are often insufficient to meet the needs within these complex, interdisciplinary environments – either inside or outside academia[12]. For careers within academia, the emphasis on research productivity results in graduates not being equipped to deal with diverse responsibilities such as teaching, mentoring, providing leadership, and participating in outreach activities[13]. Outside academia, companies have found that graduates often did not gain the relevant transferrable skills necessary to succeed in the world of work during their doctoral studies and, consequently, struggle to adapt and perform[14].

Although doctoral education is undergoing a process of transformation and modernisation around the world, these changes have come too late for early-career researchers who have already moved through the system. Moreover, universities often need to place limits on time-to-degree for PhD students in order to reduce costs for both the institutions and the students and to remain competitive in university rankings[15]. The need to

finish a degree within a certain number of years, in turn, limits the professional development opportunities that can be built into graduate education.

Thus, in both the African and international contexts, there is a need for post-PhD programmes that create the opportunity for graduates to develop and deepen the skills needed for the knowledge economy to ensure that doctoral graduates can contribute to their full potential within and beyond academic settings.

Numerous programmes for post-PhD early-career researchers have been developed globally to assist graduates to transition into the world of work, especially within academia. One of the most common models that has been adopted is a postdoctoral fellowship.

Postdoctoral fellowships are seen as an essential steppingstone for early-career researchers to gain both the scientific and complementary skills (see Sections 6.2. and 6.3.) deemed necessary to embark on an academic career[16]. Internationally, in some science fields, postdoctoral fellowships are now seen as a non-negotiable 'next step' after their PhD for researchers who want to work in academia[17].

Apart from building research abilities and gaining networking skills (mainly through conference participation and involvement in collaborative work), post-PhD programmes provide researchers with the opportunity to gain experience related to publications as well as other complementary skills that contribute to their career advancement[18].

2.3. INSTITUTIONAL GAINS FROM INVESTING IN POST-PHD SUPPORT PROGRAMMES

Through building the capacities of individuals, the capacity within institutions is strengthened.

Early-career researchers have become indispensable to the research enterprise globally, with universities increasingly relying on postdoctoral scholars for research outputs[19]. Early-career researchers are crucial contributors to publication outputs, and research shows that postdoctoral scholars and graduate students are the most significant contributors to research outputs in

universities in the US, appearing as authors or co-authors in the vast majority of articles accepted for publication[20].

Early-career researchers also serve as educators, trainers, and supervisors for junior laboratory members. They assist with grant-proposal writing, move the work of PIs forward, and present research findings at conferences and meetings[21]. Institutions further benefit from the fact that these highly skilled employees are relatively low-cost and (in most cases) do not require substantial training or supervision[22].

To a large extent, institutions in Africa do not optimally reap the benefits of a strong cohort of early-career researchers. With some notable exceptions, there are limited postdoctoral fellowships available in African institutions and few large-scale programmes to support early-career-researcher development.

Programmes participating in PERKA demonstrated an acknowledgement of how post-PhD support programmes can directly benefit institutions. Some of the main objectives across the programmes were strengthening African academic institutions through nurturing the next generation of researchers, retaining top-achieving researchers at African institutions, and in so doing, allowing African universities to become globally competitive[23]. The PERKA programmes thus highlighted a key institutional benefit relatively unique to the African context – the retention of high-level talent in the continent's institutions. After decades of brain drain from Africa's research institutions, quality programmes that invest in post-PhD early-career researchers can help to retain talent at these institutions.

2.4. MACRO-LEVEL GAINS FROM INVESTING IN POST-PHD SUPPORT

Besides representing the future of a nation's academic workforce (and in the case of the science and engineering fields, sometimes even replacing full-time staff members), early-career-researcher programmes play an essential role at the regional and national levels through training the next generation of researchers.

Many early-career-researcher programmes promote research that addresses regional or national priority

areas, thus contributing to solving pressing development problems in these countries[24]. This priority was clearly demonstrated by several of the PERKA programmes which aimed to strengthen African research-and-innovation systems through building a critical mass of researchers in Africa to address African-specific challenges[25]. Considering the scale of the CCNY programmes together, there is a cumulative effect at the macro level, with capacity within the African science system as a whole being strengthened.

Postdoctoral researchers play an important role in fast-moving and competitive scientific research – termed radical science – at the global level. Radical science is usually initiated by a single ground-breaking discovery, which leads to the proliferation of follow-on research and is associated with rapid scientific progress. Scientific progress, in turn, benefits society as a whole, since most of the tools, technologies, and medicines in use today are the products or by-products of scientific breakthroughs[26]. Research has shown that there is a high concentration of postdoctoral scholars in research teams conducting fast-moving and competitive scientific research and that the percentage of postdoctoral scholars is particularly high in highly cited papers[27]. These findings are not surprising since postdoctoral fellows have high-level learning capabilities, brought about by their knowledge of the latest cutting-edge methods of conducting research as well as the most recent scientific advances. In ideal circumstances, they can devote their time entirely to conducting research, thus speeding up the radical science research process. Most postdoctoral scholars still have to establish their reputation as scientists and secure permanent positions.

Therefore, they have a strong incentive to fully devote themselves to conducting cutting-edge research and contributing to radical science discoveries[28].

The postdoctoral career stage is important for researcher mobility, which, in turn, has proven to be very beneficial to the global scientific enterprise. In fact, in many fields, it is seen as standard practice to pursue a fellowship abroad after graduating with a PhD[29]. Postdoctoral scholars crossing borders results in a synergism and a dispersion of scientific discoveries across geographies. This simultaneous coming together and spreading of knowledge is fundamental to scientific progress and beneficial to all countries involved[30].

The early-career research phase: an African perspective

There is neither a single accepted definition of the early-career phase in the academic or research context nor of an early-career researcher. A range of definitions have been put forward and used in different contexts.

The term early-career researcher has frequently been used to describe the cohort of research career aspirants in the post-PhD phase of their careers who have not yet established themselves as so-called independent researchers. A postdoctoral fellowship is thus generally understood to be part of the early-career phase. Many early-career-researcher/-phase definitions include a defined period of time following a PhD or use age criteria to classify an individual as belonging to the early-career-researcher category.

However, there are some challenges associated with limiting the definition of the early-career-researcher to these narrow descriptions. The increasing number of researchers working on short-term or grant-based contracts, coupled with the limited number of permanent research positions in institutions, has brought about a scenario where the 'ideal career path' in academia is becoming the exception rather than the norm in many contexts.

Women, in particular, are likely to take career breaks to start a family and come back at a later stage when they fall outside the number of years post-PhD, or the age criteria, stipulated by these definitions. The implication is that increasing numbers of aspirant researchers do not meet the typical requirements to qualify as early-career researchers in programmes and funding initiatives.

In this context, some have argued for and, in some cases, adopted more inclusive definitions of the early-career research phase that are less rigid in terms of time or age and also include PhD students – given that transition into a research career begins at the postgraduate study level.

In the African context, most of the definitions of an early-career researcher include one or more of the following criteria: the age of the researcher, their length of service, their academic qualifications, their academic rank, and/ or their employment status. That said, the specifics of the criteria vary widely by context, and there is no single agreed-upon definition on the continent of an early-

career researcher. The terms 'early-career researcher', 'early-career scientist', 'early-career investigator', 'early-career academic', and 'emerging researcher' are all frequently used to describe researchers who are not yet fully independent. Many of these researchers may not yet hold a PhD, as a large proportion of staff within African higher education institutions hold master's degrees (having not yet obtained a PhD). Many may be working on or aspiring to do a PhD but, nevertheless, contribute to research programmes. The result is that, in the African context, the terms early-career researcher/ scientist/academic are frequently adopted to describe the broad category of researchers who hold either a master's or PhD degree, as well as postdoctoral researchers. Thus, in Africa, a more comprehensive and

BOX 5

Defining independent researchers

In the context of these guidelines, an 'independent researcher' is someone with (i) a track record of first-authored, peer-reviewed publications, and who is able to (ii) raise their own research funding, (iii) lead a research team as principal investigator, and (iv) supervise postgraduate students.

FIGURE 2

Early-career research phase

Master's obtained   PhD   Immediate post-PhD   Transitioning to independence

Early-career research phase

Post-PhD phase
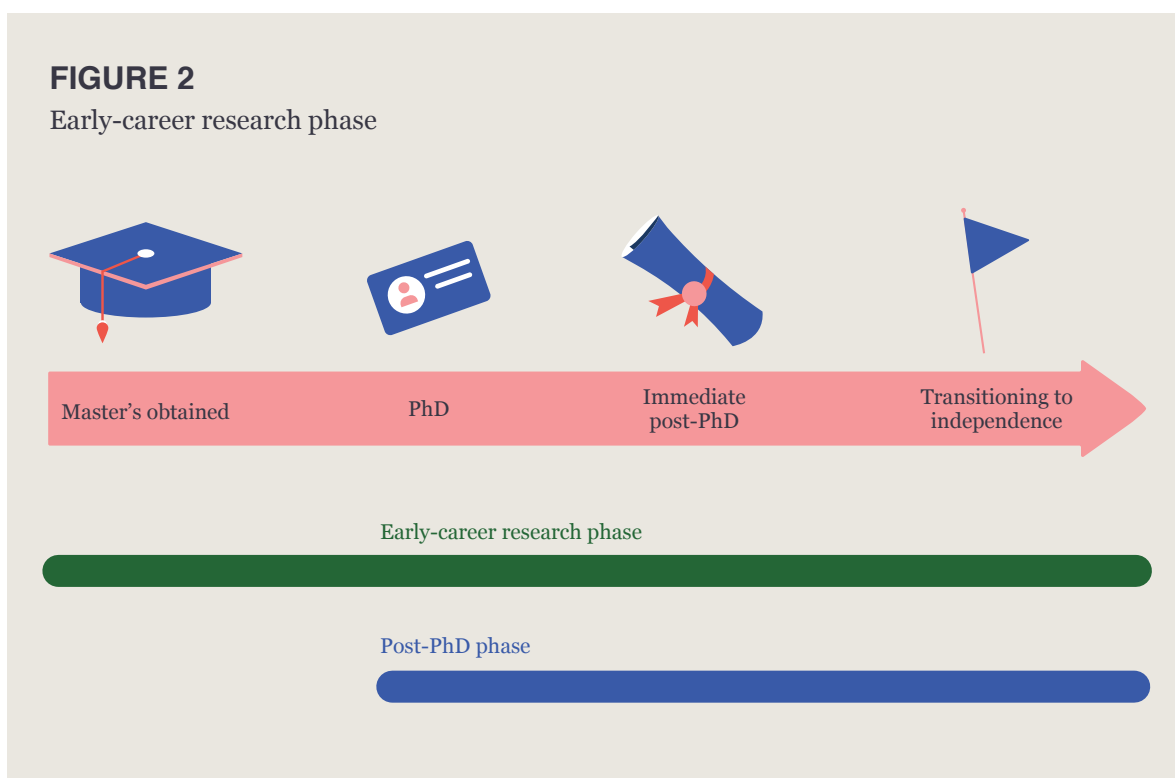
inclusive definition of the early-career research phase seems justified, and these guidelines thus adopt this more inclusive definition.

Figure 2 illustrates the definitions of the early-career phase adopted in these guidelines, beginning at the master's-degree level and as a continuum until a researcher has established themselves independently. The post-PhD phase is a stage on this continuum.

Within the early-career research phase, the post-PhD phase is defined as the period within the early-career stage when a researcher has obtained a PhD and is not yet fully independent as a researcher.

These guidelines propose and discuss a range of models to support researchers who are in the post-PhD phase of their early-career research journey.

As there are several ways to support researchers in the post-PhD phase, the guidelines move away from only

describing postdoctoral fellowships or calling all forms of support to young researchers with a PhD a postdoctoral fellowship, to include post-PhD support in a variety of forms. Regardless of structure, support to aspiring researchers in the post-PhD phase should focus on deepening their research and other skills to enable them to establish themselves independently in a career of their choice.

In view of circumstantial differences and the resulting absence of a consistent definition for early-career researchers across the continent, it is essential for each institution to be clear on its own context-specific classification and to design support interventions accordingly. Please see Section 8.1. for further recommendations in this regard.
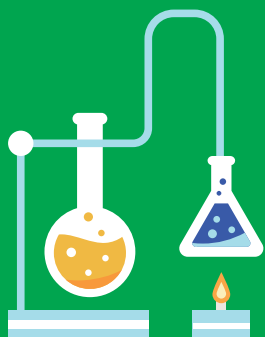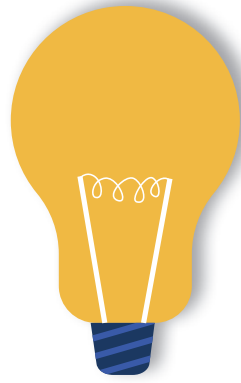
Models of support in the post-PhD phase

04

4.1. MODELS OF SUPPORT IN THE POST-PHD PHASE: GLOBAL CONTEXT

The PERKA project literature review examined models of support to researchers in the post-PhD phase globally. Three broad types of post-PhD support were identified.

4.1.1. Independent postdoctoral fellows

These so-called 'bread-and-butter' grants constitute the 'typical' postdoctoral fellowship grant, with funding usually provided for at least 2 years to researchers who are within a few years after obtaining their PhDs.

These independent grants are not linked to a senior researcher in an institution, and fellows are typically not yet employed. If they so desire, these fellows are enabled by such grants to move away from the institution where they completed their PhD, providing valuable exposure to a different research setting.

The grants allow the fellows to focus almost exclusively on research, and researchers have a relatively high degree of flexibility in choosing their research topic and developing their projects.

Independent postdoctoral fellowships are funded through several mechanisms, including by funding agencies and institutional funds.

Funders (funding agencies and donors) are important actors in supporting well-designed postdoctoral fellowship programmes that provide an avenue for career development to the early-career researcher workforce and should be encouraged to support independent postdoctoral fellowships. Through this support, funders can play a significant role in the career progression of talented and innovative early-career researchers, as these independent, standalone fellowships allow a degree of autonomy by avoiding regulations that place undue restrictions on the research activities of grantees[31].

4.1.2. Grantholder-linked funded fellowships

The dominant postdoctoral fellowship model in both Europe and the US is one where universities appoint researchers in the post-PhD phase with money from grants awarded to senior researchers or PIs. The senior researchers or PIs apply for research grants (from federal or private sources) and, with secured funds, recruit a research team, often including postdoctoral researchers, to support them in doing the necessary work[32].

These grants offer less flexibility to the early-career researchers, as the research direction is determined by the grants. With pressure to deliver on grant conditions, postdoctoral researchers funded by grantholder-linked fellowships often receive inadequate mentoring and additional training that would help them establish an independent career.

When funding provided to senior researchers includes funding for early-career researchers or postdoctoral fellows, funders should require that applicants provide information related to the capacity-development components that will be built into the fellowships, the salary that the postdocs will receive, and the mentoring that will be available. These should be considered grant deliverables and will help enhance the postdoctoral experience and benefits for early-career researchers[33] (see Box 6 for good-practice examples).

4.1.3. Transitional grants

Transition grants provide support that can play an important role in transitioning promising postdoctoral researchers from 'trainees' to 'employees'. These grants can help facilitate transitions to careers either within or outside of the research context. With the shrinking number of full-time academic job openings, training researchers for non-academic careers has become just as important as training them for academic careers.

Funding agencies can facilitate intersectoral mobility by providing funding for industrial postdoctoral schemes and thus help early-career researchers to switch careers at the postdoctoral stage[38].

4.2. POST-PHD SUPPORT MODELS IN THE AFRICAN CONTEXT

The African context differs substantially from the European and US contexts. In particular, and as already mentioned above, Africa faces a severe shortage of

BOX 6

Contribution of funding agencies to early-career-researcher good practice

Some funding agencies in both the US and Europe are already set up in ways that hold the host institutions accountable for the career development of their postdocs.

In the US, some National Institutes of Health (NIH) training grants require a research-and-training plan to be submitted, which is subjected to a peer-review process and includes stipulations for professional development and the provision of adequate mentoring to the early-career researchers.

Researchers supported on National Research Service Award grants are bound by the NIH to adequately prepare their postdoctoral researchers for research-intensive careers in various sectors – both within and outside of academia[34].

In Europe, the Health Research Board of Ireland and the National Research Fund of Luxembourg have made offering career-support services to postdocs a binding requirement for the host institutions they fund[35].

That said, in both the US and Europe, these types of grants are still the exception rather than the rule, with career development still seen as the primary responsibility of the research-performing organisations rather than the funders[36].

BOX 7

Example of transitional grants for promising early-career researchers

In the US, grants such as the Burroughs Wellcome transitional awards acknowledge that the period after a postdoctoral fellowship can be rife with uncertainty and that promising early-career researchers may need more time to write grant proposals, set up a research group, and find the next employment position.

The intent of these transition grants is to identify the highest-quality scientists while they are still postdoctoral fellows and provide them with funds to design and begin new scientific projects in the time following their postdoctoral fellowships but prior to them obtaining fully independent positions[37].

qualified staff in its universities, with most staff members holding only master's degrees rather than doctoral degrees. Increasing student numbers also result in early-career academics being put under immense pressure, with substantial teaching and administrative workloads that leave them little time to conduct research. These and several other factors have contributed to a situation where institutional postdoctoral or early-research-career training programmes in African universities, especially outside of South Africa, are limited[39].

A picture of the current support available to early-career researchers emerged from a survey conducted with established and early-career researchers at 29 African institutions in nine African countries[iii]. Most respondents indicated that there was neither a strategy or policy in place at their institutions to support early-career researchers, nor formal researcher development or mentorship programmes (although informal mentoring did occur in some institutions)[40]. In South Africa, the picture is somewhat different from the rest of Africa, with numerous policies and initiatives to support early-career researchers. Yet, only five of the 26 institutions surveyed indicated that they provide funding for postdoctoral fellowships. Outside of South Africa, very few institutions have institutionalised mechanisms in place to support early-career researchers.

Although few African universities have institutionalised mechanisms to support early-career researchers, recognising the urgency of early-career-researcher development in the African context, numerous international funding schemes and programmes have been developed to achieve this goal – either in collaboration with African universities/research institutions or independently.

In the 10 programmes that participated in the PERKA project, two high-level typology differentiators were discerned. The first relates to programmes that were university-based, with the fellowships firmly embedded in the institution. This model applied to the programmes hosted by the Universities of Ghana, Makerere, the Witwatersrand, Cape Town, and Pretoria. The second typology differentiator relates to programmes managed by a network-based organisation, with the fellows in the programme based at various other institutions. This

model applied to the AHP, RUFORUM, CARTA, and AESA-RISE.

A descriptive summary of each programme is provided in Appendix A of these guidelines (see pages 96 onwards). These summaries can be used by stakeholders aspiring to develop post-PhD support programmes in Africa to guide thinking on possible programmatic structures. An overview of the key features of the PERKA programmes is provided in Table 1 and Table 2 on the following pages. The tables compare the fellowship aims, length, target groups, and disciplinary focus areas (where relevant).

Comparing the models adopted in the PERKA programme with the three broad models identified in the global context, similarities and differences can be noted. Some models adopted in PERKA are closely aligned with the independent postdoctoral fellowships. These include the AHP grants, the Wits Global Change programme, and the postdoctoral fellowship category of the UCT-DEAL programme. In these cases, funding was provided to early-career researchers who were not yet full-time employees of an institution and broad flexibility was given in the selection of a research focus. These grants funded the salary or stipend of the fellow.

There is similarity between the strong skills development component in the PERKA programmes and the way in which funders of grantholder-linked funded fellowships increasingly require evidence of capacity-development opportunities for early-career team members as part of the grant deliverables. The exposure to high-quality research environments, training, and experienced supervisors that tend to be inherent in grantholder-linked funded fellowships resonate with similar capacity-development features in the design of the PERKA programmes. Examples include a range of mentoring initiatives, research residencies at other institutions, or exposure to multiple senior academics in a supervisory or advisory capacity.

A key difference between many of the programmes participating in PERKA and global models is that grants were often awarded to researchers who are already full-time employees at institutions (e.g., BANGA-Africa, NERLP, and CARTA). Within the African context, there is a need for grants that support researchers who are not yet employed and grants that support the career development of researchers who are employed. Both are

iii Ethiopia, Ghana, Kenya, Nigeria, South Africa, Sudan, Tanzania, Uganda, and Zimbabwe.

needed, as many staff in African institutions will obtain their PhD while employed and need targeted support to build an independent research career. On the other hand, there are limited opportunities within research organisations in Africa. PhD graduates who completed their studies before employment need opportunities to build up a portfolio of work as they seek more permanent employment. The structure and nature of programmes for researchers in these two categories will differ.

BOX 8
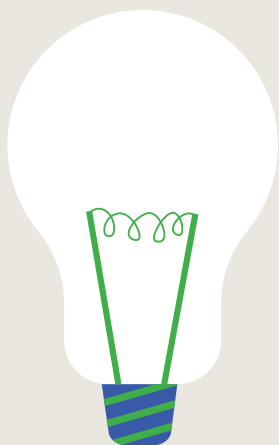
Ideas for structuring independent postdoctoral fellowships

Stakeholders aiming to develop independent postdoctoral fellowships should examine the AHP grants (see page 100), the postdoctoral fellowship category of the UCT-DEAL programme (see page 106), and the Wits Global Change programme (see page 112) in greater depth for ideas on programme design.

BOX 9

Ideas for fellowships for researchers of different employment statuses

Stakeholders aiming to design, implement, or fund programmes for early-career researchers who are already employed should examine BANGA-Africa (see page 102), those holding transitional grants in the UCT-DEAL (see page 106), Wits Clinical Medicine (see page 114), and NERLP (see page 116) in greater depth for ideas related to programme objectives, design, and structure.

Stakeholders aiming to design, implement, or fund programmes for early-career researchers who are not yet employed should examine AESA-RISE (see page 98), AHP (see page 100), CARTA (see page 104), those holding free-standing fellowships in UCT-DEAL (see page 106), Future Africa (see page 108), Wits Global Change (see page 112), and RUFORUM (see page 118) in greater depth for ideas related to programme objectives, design, and structure.

TABLE 1

Institution-based PERKA post-PhD support programmes

	BANGA-Africa	NERLP	UCT-DEAL	Wits – Global Change	Wits – Clinical Medicine	Future Africa
INSTITUTION	University of Ghana	Makerere University	University of Cape Town	University of Witwatersrand	University of Witwatersrand	University of Pretoria
COUNTRY	Ghana	Uganda	South Africa	South Africa	South Africa	South Africa
NAME	Building a new generation of academics in Africa	Nurturing emerging research leaders through postdoctoral training	Developing Emerging Academic Leaders	Global Change Programme	Clinical/Academic Medicine Programme – Nurturing the Next Generation of African Scientists	Future Africa Institute – Early-Career Research Leader Fellowship
AIM	Skills development Transition from early-career to established researchers Staff retention	Develop institutional capacity Staff retention	Strengthen higher education in Africa Support academics in the transition phase	Support early-career researchers to establish an independent, viable, and fully funded research programme Elevate the visibility of research conducted by young Africans Strengthen science-communication skills	Address decline of research-based medicine through 'buying out' time from clinicians' week Give clinicians time and space to conduct research while continuing their clinical postings	Produce transformation-minded science leaders Create capacity to develop interdisciplinary research teams to respond effectively to global environmental change
FELLOWSHIP TYPES	No sub-types	No sub-types	Postdoctoral fellowships; Early-career researcher grants	No sub-types	No sub-types	No sub-types
LENGTH	1 year	2 years	3 years	1 year (subject to renewal based on performance)	2 years	2 years
TARGET GROUP	Full-time as academic staff at the university Employed within the last 5 years Earned their PhD no more than 5 years ago	Former CCNY-supported PhD graduates Employed full-time at Makerere University Completed PhD no more than 10 years ago	Former Next Generation of Academics in Africa grantees National African country Postdocs: PhD less than 5 years ago/ less than 2 years postdoc funding Early-career researchers: UCT soft-funded staff eligible	Postdoctoral, early-career researchers from the Southern African region GCI/CCNY alumni. If not enough, then open to all applicants	Carnegie Clinician Scientist PhD Programme graduates Preference given to females and applicants of colour	Former CCNY-supported PhD graduates Faculty or a continuing research position at a research institution Active in research and teaching at African institution
DISCIPLINARY FOCUS	Open to all disciplines	Open to all disciplines	Open to Infectious Diseases and Molecular Medicine, Microbiology, Civil Engineering, Economics	Open to all disciplines	Clinical Medicine	Open to all disciplines

TABLE 2

Network-based PERKA
post-PhD support programmes

	AHP	RUFORUM - Wajao	CARTA	AESA-RISE
NETWORK	African Humanities Program in partnership with the New-York based American Council of Learned Societies (ACLS)	Regional Universities Forum for Capacity Building in Agriculture	Consortium for Advanced Research Training in Africa (jointly led by African Population and Health Research Centre [APHRC] and the University of Witwatersrand)	Africa Academy of Sciences
NAME	African Humanities Programme	RUFORUM Wajao	Consortium for Advanced Research Training in Africa	Regional Initiative in Science Education Postdoctoral Fellowship Programme
AIM	Invigorate postdoctoral research in the humanities Providing staff with a year free from teaching to build their capacity Allowing time for revision of dissertations for publication, or for the first major project after the PhD	Build capacity for agricultural research across the African continent	Establish a vibrant African academy able to lead world-class multidisciplinary research that impacts on population health in Africa	Build the capacity of African researchers to conduct globally competitive research Contribute to the transition of African economies to knowledge-based economies
FELLOWSHIP TYPES	No sub-types	No sub-types	Re-entry grant Postdoc fellowship	No sub-types
LENGTH	1 year	2 years	1 year	3 years
TARGET GROUP	Scholars in the humanities Graduated no more than 8 years prior	African PhD graduates in agricultural sciences	PhD graduates that are staff of participating institutions	Alumni of the RISE programme Graduated no more than 7 years prior
DISCIPLINARY FOCUS	Humanities	Agricultural Sciences	Public Health	Medical, agricultural, aquatic, environmental, and engineering sciences
COUNTRY FOCUS	Researchers in South Africa, Ghana, Nigeria, Tanzania, and Uganda	Researchers in Benin, Democratic Republic of Congo, Ghana, Kenya, Malawi, Nigeria Uganda, Zambia, and Zimbabwe	Researchers in Uganda, Kenya, Malawi, Nigeria, Rwanda, South Africa, and Tanzania	Researchers in Botswana, Kenya, Malawi, Nigeria, Tanzania, and Uganda

Lifecycle of a post-PhD support programme
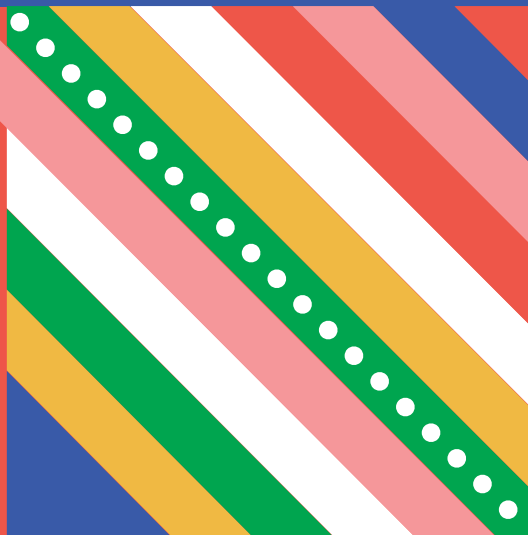
05

A well-conceptualised post-PhD support programme lays a strong foundation for impact. However, programmes need to be both intentionally designed and effectively implemented for individuals, organisations, and systems to optimally benefit. It is helpful to consider a post-PhD support programme in terms of a lifecycle consisting of the following phases:

A **design phase**, during which programme objectives are clearly articulated and their relevance to the institutional, regional, and/or continental context is ensured. This implies assessing the extent to which the programme will help to advance the strategic objectives of the institution, region, or continent. The different programme components must be defined during this phase and would include (i) the space and means to provide science- and complementary skills development, (ii) mentoring models to provide support at the individual level, (iii) mechanisms to hone networking and communication skills, (iv) time away or residencies at other institutions, (v) intentionality regarding inclusivity if programmes intend to address inequalities (such as gender), and (vi) careful consideration of the duration and remuneration of fellowships.

An **implementation-planning phase**, in which the institution must (i) invest sufficient time to bring on board the relevant role players such as the supervisors, mentors, and administrators; (ii) develop the call documents and prepare for a rigorous application and selection process; (iii) allow for orientation and career planning once the fellows are in place; and (iv) consider establishing a small advisory group to oversee and guide the implementation team.

A **programme-implementation phase**, during which practical considerations might surface that point to systemic adjustments and improvements needed to ensure an enabling institutional environment. These considerations include (i) the classification of fellows within the institution, (ii) the policies and standards to address mutual expectations and responsibilities within the programme or institution, (iii) the structures to effectively host and deliver on post-PhD programmes, (iv) the ability to provide holistic wellness support, and (iv) HR capacity to manage the programme responsibly.

A **monitoring-and-evaluation approach** that should be integrated from inception to conclusion of the programme and should be integrated into the project budgets.

Each of these phases is discussed in the following sections of the document.

FIGURE 3

Lifecycle of a post-PhD support programme

Design	Implementation Planning	Implementation	Evaluation
Set clear objectives	Set aside adequate time for planning	Considerations related to institutional environment	Link indicators and monitoring-and-evaluation mechanisms to objectives
Ensure context relevance	Identify and engage relevant role players	Classification of fellows	Integrate lessons learned through ongoing monitoring and evaluation to inform the design of future programmes
Define programme components in detail	Develop call documents and assure rigorous selection processes	Appropriate policies and standards	
	Allow for orientation of fellows and career planning	Capacity to host and deliver	
	Establish a small advisory group to oversee and guide	Holistic support	

Ongoing monitoring of project to inform planning and implementation

A well-conceptualised programme lays a strong foundation for impact. Programmes need to be intentionally designed and effectively implemented.
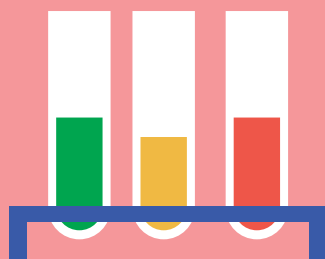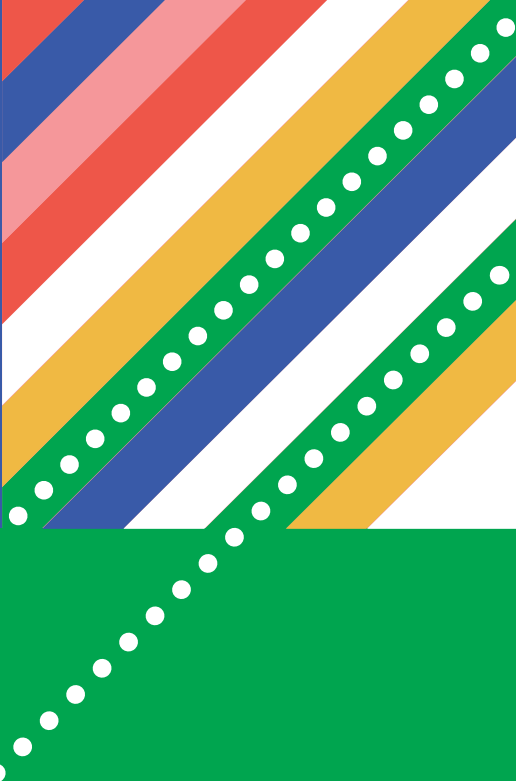
Designing African post-PhD support programmes
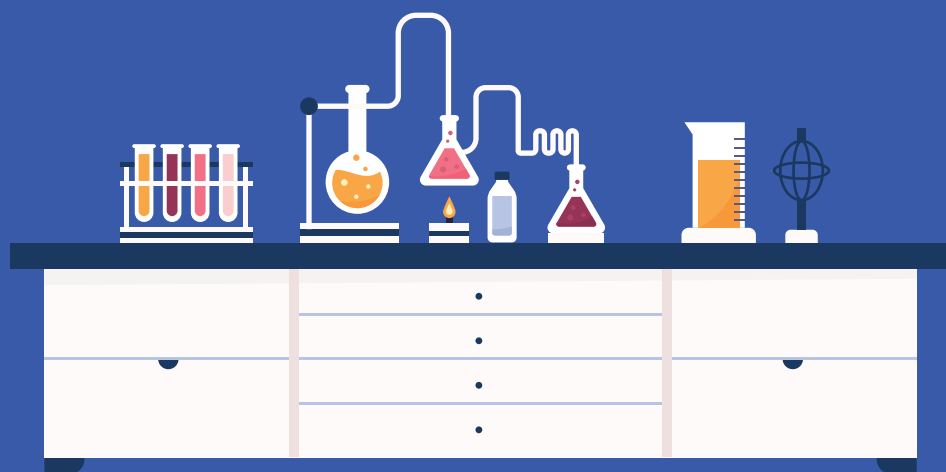
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Drawing from the evidence available in the European and North American contexts, and the lessons learned through PERKA, the section below provides evidence-based guidelines for the design phase of a post-PhD support programme's lifecycle. The guidelines focus on programme aspects needed for fellows to build skills and what institutions/programme implementers need to put in place to provide an optimally enabling environment.

The purpose of this section is not to make best-practice 'recommendations' as much as demonstrate how different programmes have solved common problems based on their specific context and constraints.

6.1. SETTING CLEARLY DEFINED OBJECTIVES

Although the objectives of post-PhD support programmes will (and should) differ by context, a clearly defined set of objectives that inform the programme design is critical.

Six high-level objectives of post-PhD support programmes were identified among the programmes participating in PERKA and from the literature review. Within each of these objectives, several sub-objectives of a more nuanced nature could be discerned. All these objectives could be considered typical for post-PhD support programmes in Africa.

1. Knowledge production and dissemination.
All Carnegie-funded programmes had at least one objective related to producing or disseminating knowledge through publications and/or conference presentations.

Specific programme objectives related to knowledge production that a post-PhD programme aims to achieve may include (i) strengthening specific disciplines, (ii) promoting the development of research projects that have the potential to become independent, (iii) promoting multi-, inter- or transdisciplinary research, (iv) encouraging new directions for research, or (v) providing the opportunity for research-grant proposal development.

When designing programmes, in so far as those developing the programme can exert influence,

mechanisms should be put in place to ensure that the early-career researchers have the time they need to focus on doing their research, developing their research skills, and applying for future grant funding.

2. Capacity building.
All Carnegie-funded programmes had at least one objective related to capacity building, with a focus on scientific and complementary skills development. In addition to scientific proficiency to contribute to knowledge production as outlined above, specific additional capacities are required for an academic career, such as science writing, supervision, teaching or presentation skills, and leadership skills (also see 6.2.). Exposure to high-quality research environments, training, and experienced supervisors or mentors are key vehicles for developing these capacities.

Complementary skills with a broader focus than only sharpening research capabilities are similarly necessary for researchers to succeed (see 6.3).

Funders and institutions have an important role to play in ensuring support for a portion of a postdoctoral researcher's working time to be set aside for personal and career-development activities[41].

3. Strengthening African academic institutions and systems.
All Carnegie-funded programmes had at least one objective related to strengthening African academic institutions and systems through helping to build a critical mass of researchers in Africa – not only through increased numbers, but also through career pathing and attractive opportunities to promote retention.

4. Building academic networks and communities.
This applies to engaging regionally, internationally, and/or between institutions to embed fellows into a community of scholars and enhance future employment and/or collaboration opportunities.

5. Promoting diversity.
Although not a cross-cutting objective in all programmes, improving equity – for example, by focusing on gender equality or formerly disadvantaged groups – can be identified as a specific objective for a programme.

6. Impacting on development in Africa.
Less common as an explicit programme objective, links with development occur through increasing the scientific workforce and strategically researching areas of need. Programmes that focus on a specific global challenge, such as climate change, are an example of how this objective can be embedded into the programme objectives. Collaborative programmes that involve industry stakeholders to create opportunities beyond the academic realm are further examples of an explicit development agenda.

A well-designed programme need not include objectives related to all of the above categories. However, at a minimum, objectives related to knowledge production, capacity development, and networking should be considered essential to any post-PhD support programme in Africa.

6.2. CONTEXT MATTERS: ENSURING RELEVANCE

There is no one-size-fits-all model for post-PhD support programmes in Africa. Context relevance is critical, and the analysis of programmes participating in PERKA has demonstrated how their design was responsive to a specific context or challenge faced by the institution or network implementing the fellowship.

This responsiveness allows programmes to position themselves for impact by matching the programme's objectives to the particular circumstances where it will be delivered. Such context relevance also allows disciplinary nuances to be accounted for, where programmes are tailored to help researchers prepare for careers within a particular field.

Designing by discipline has implications for the number of fellowships that can be offered, the optimal length and nature of the activities within a fellowship, and even the selection or eligibility criteria for the fellowship. Several Carnegie-funded programmes clearly illustrate how fellowships can be tailored to strengthen specific disciplinary foci. Examples include (but are not limited to) the Wits Clinical Medicine fellowships, which catered to a unique niche of clinician-researchers, and the African Humanities Programme, which focuses on strengthening the broad field of the humanities.

BOX 10

Ideas for fellowships focusing on specific disciplines or fields

Stakeholders aiming to design, implement, or fund programmes for early-career researchers within a specific discipline or field should examine the AHP (page 100), CARTA (page 104), Wits Global Change (page 112), Wits Clinical Medicine (page 114), and RUFORUM (page 118) fellowships in greater depth for ideas related to programme objectives, design, and structure.

6.3. SCIENCE SKILLS DEVELOPMENT

Post-PhD support programmes need to be intentionally designed to provide the space and means for fellows to be exposed to a wide array of opportunities that will empower them to acquire the skills needed for a successful research career. Gaining the right skills is not only of paramount importance in finding rewarding positions, but also expands career choices within and beyond academia[42]. The common thread connecting all post-PhD support programmes should be an emphasis on developing skills for research-focused careers.

In the period immediately post-PhD, researchers are expected to develop in-depth knowledge of the basic concepts underlying their field as well as keep up to date with any new developments as the knowledge base evolves. They must grasp the gaps, conflicts, limits, and

Skills development should be at the forefront of any post-PhD support programme since it is, by definition, a period during which early-career researchers should further develop their scientific competencies and professional skills before embarking on an independent research career.

challenges that exist within their research area to enable them to construct testable hypotheses as they seek to develop their own research agendas[43].

Besides the knowledge base related to their specific area of research, they also need to develop other research-related skills to meet the demands of the increasingly complex research environment. During the postdoctoral phase, early-career researchers should learn all they need to know to become an independent researcher who is well versed in every step of the professional research process. In this regard, the researchers should acquire skills needed to design research programmes, supervise other researchers, effectively search through and critically evaluate the literature, analyse and interpret data, and, finally, publish as a senior author[44].

For post-PhD support programmes to provide researchers with the opportunity to publish as a first or single author is essential since the quantity and quality of these publications will be vital determining factors when these early-career researchers compete for future professional positions[45]. In tandem, it is crucial to develop skills related to conducting responsible research during the postdoctoral phase and to deeply entrench the principles of ethical research.

The ever-increasing importance placed on research that crosses disciplinary boundaries requires post-PhD support programmes to emphasise the development of multidisciplinary research skills[46]. As noted by the National Academies of Sciences, *'the nature of research itself has evolved: team science, with its attendant premium on collaboration in multi-investigator and multidisciplinary projects, is ascendant'* (National Academies of Sciences, Engineering, and Medicine et al., 2018, p. 4).

Given the high value placed on research publications when competing for research positions[47], it is imperative that post-PhD support programmes limit the administrative, clinical, and/or teaching responsibilities of fellows to allow sufficient time to focus on research. Many emerging researcher grants emphasise the importance of dedicated research time through stipulating a minimum percentage of time that must be dedicated to research[48].

6.4. COMPLEMENTARY SKILLS DEVELOPMENT

Although research should be the primary focus of a post-PhD fellowship, an exclusive focus on research may disadvantage fellows through the lack of opportunity to develop the *complementary skills* required for a successful career within academia[49]. It is essential that a portion of early-career researchers' working time is set aside for them to participate in personal- and career-development activities with a wider focus than only sharpening research capabilities[50]. Being intentional about opportunities for skills development and allowing early-career researchers the time off to invest in developing these skills result in learning environments within which researchers can practice and get structured feedback.

Prime among these complementary skills are *supervision* and *teaching* skills (in addition to supervision know-how)[51]. Programme design should allow researchers in the post-PhD phase to supervise postgraduate students or less experienced researchers so that they can develop supervisory skills and gain experience in leadership roles – for example, through allowing them to manage a small project or laboratory[52]. With the stringent competition for research positions in academia, experience in supervision, teaching, and *project management* (which are essential skill sets for an academic career) may give early-career researchers an edge over other applicants when applying for employment positions[53].

Early-career researchers also need to learn how to integrate their research obligations with the duties of teaching and (eventual) academic service (such as administrative and committee work), making it imperative that they receive guidance on how best to *manage their time*. Learning to manage workloads through appropriate planning must be instilled at an early stage, especially where the early-career researcher is also employed as full-time staff member.

Further examples of personal- and career-skills development include professionalism in *networking*, *conflict resolution*, and giving and *receiving performance reviews* and *feedback*, as well as securing continued project funding.

Without the ability to *identify potential funders and successfully raise funds* to support their research, those in the post-PhD phase may find that they are unable to establish themselves as fully independent researchers. Developing fundraising skills takes time, and fellows should be provided with training on how to *develop successful proposals*. They should also be given the opportunity to put these skills into practice – ideally under the guidance of a senior academic or mentor[54].

Learning to *communicate and present information effectively* to scientific and non-scientific audiences is central to academic success. Over and above academic publication, training fellows to produce material for diverse audiences (such as a pamphlet, non-academic article, or blog) helps to sharpen these skills. It also helps researchers to think ahead in situating their findings within communities or markets and sensitises them to potential partnerships.

Where applicable to the field of study, development training should include exploring how the potential for impact must inform the focus of one's research. Ways in which disciplinary expertise can be 'pivoted' and applied is not necessarily a skill that is taught by the supervisor. Understanding the need to *shape research questions for impact* can be enhanced through exposure to multidisciplinary fora where fellows can broaden their understanding of how their particular expertise could be applied in broader contexts.

The need to *develop resilience* is often underestimated, and there is value in creating fora where peer support and good mentorship can help early-career researchers to cope with feedback on or setbacks in funding applications and publications.

Given the stringent competition for positions in academia, programmes should also include the *development of transferrable skills for careers outside of academia*[55] – for example, in the form of internships in such settings[56]. Institutional or PI partnerships with industry or private-sector entities can be invaluable in this regard. At a more basic level, exposure to institutional careers offices (where these exist) or simple awareness-raising of workplace opportunities beyond academia that value skills acquired during the post-PhD phase can play an important role.

Figure 4 provides a graphic overview of the types of complementary skills that post-PhD programmes can include.

FIGURE 4

Complementary skills development in the post-PhD phase

- Networking
- Conflict resolution
- Communication to scientific and non-scientific audiences
- Giving and receiving feedback
- Identifying potential funders and writing proposals
- Team- and project-management skills
- Supervision
- Teaching skills
- Time management
- Pivoting research for impact
- Awareness of workplace opportunities beyond academia
- Resilience training

6.5. MENTORSHIP

Mentorship matters, and support at the individual level for those in the post-PhD phase is paramount in the design of such programmes. In addition to a supervisor, early-career researchers can benefit greatly from having one or more mentors. Whereas the supervisor is primarily responsible for supervising the research done by the early-career researcher, a mentor can further their professional development through providing advice and support outside of the constraints of a mutually dependent relationship[57]. In line with the definition of the post-PhD phase as a period of mentored and advanced training, early-career researchers can justifiably expect good mentoring in the form of oversight, feedback, sympathetic consultations, and periodic evaluations[58].

In the conceptualisation and design of post-PhD programmes, the model of mentorship, modalities for offering mentorship, and issues related to the training of, and provision of incentives for, mentors should be taken into consideration.

6.5.1. Mentorship models

A range of mentorship models that vary within and between countries and academic contexts[59] can be considered when designing post-PhD support programmes. The mentorship available to post-PhD researchers varies. In the US, for example, the traditional mentoring model is one where the primary supervisor also serves as the mentor. However, given that many supervisors have insufficient time available to serve a dual role as mentor and supervisor, models other than the traditional supervisor–postdoc mentoring model are becoming more widespread, with postdoctoral researchers being encouraged to seek advice from multiple sources via formal and informal mechanisms[60].

Several institutions encourage early-career researchers to actively search for mentors, or so-called 'mentoring committees', in addition to their PI/immediate supervisor. These mentoring committees consist of a diverse range of experienced researchers who are required to meet every 6 to 12 months to advise the postdoctoral researcher. A diverse range of mentors equates with a diverse range of skills and experience on which the postdoctoral researcher can draw. The mentoring committees provide the early-career researcher with additional perspectives and guidance apart from that

provided by their primary supervisor and help them to build a professional network[61].

An important distinction needs to be made between informal mentoring and formal mentoring programmes. Informal mentoring relationships occur spontaneously based on shared interests and appeal, whereas formal mentoring programmes tend to be arranged institutionally or at the programme level[62]. Although informal mentoring relationships have been found to be more successful than formal programmes under some conditions[63], some drawbacks have been noted. In particular, not everyone who requires a mentor manages to form informal mentoring relationships. In many contexts, this would apply to women and is especially true for minority groups, which is problematic since minority groups in academia have been recognised to be most in need of mentoring[64].

Although formal mentoring programmes are still the exception rather than the norm in the US, Europe, Australia, and Africa[65], numerous such programmes have been developed in recognition of the important role mentors play in an early-career researcher's career progression.

Numerous studies have pointed out how beneficial mentoring, whether formal or informal, is to researchers early in their careers. In fact, the success of the post-PhD experience often depends on the mentoring relationships built during this period. Some of the benefits mentioned include greater motivation, focus, and productivity; a more positive disposition towards career prospects; higher levels of confidence; more efficient career decision-making; improved integration in the profession; and a more widespread network[66].

6.5.2. Training of mentors

Given the importance of mentoring, host institutions and funding agencies should guarantee access to quality mentoring by requiring that evaluations of, and training programmes for, mentors are included in the design of post-PhD support programmes. Mentor training programmes are especially important, given that many PIs and senior faculty have neither received formal training in mentoring, nor had a mentor themselves from whom they could learn the tricks of the trade. Although training for postgraduate supervisors is increasingly becoming available, training materials on effective mentorship are less widespread. Institutions and

BOX 11

Examples of formal mentoring programmes in the Global North

The Royal Society (UK and Ireland) offers a mentorship scheme to early-career researchers in their first year of a University Research, Dorothy Hodgkin, or Sir Henry Dale Research Fellowship. The scheme matches early-career researchers with Fellows of the Royal Society, Royal Society Research Fellow alumni, or Wolfson Research Merit Award Holders. Mentors provide support and guidance on a diverse range of topics to their mentees, advising on establishing independence, managing groups and relationships, building effective networks, and maintaining a work–life balance[67].

At the **Johns Hopkins University (JHU) (US)**, the Biotech/Pharma Industry Mentor Match Programme provides postdoctoral fellows at JHU the opportunity to select a mentor from a group of experienced professionals, including JHU alumni and other career professionals. The mentorship programme aims to expose postdoctoral researchers to the many careers available in the industry, provide them with tools to transition to a career of their choice, and build up a network with industry professionals[68].

At the **Brigham and Women's Hospital (BWH) (US)**, a teaching affiliate of Harvard Medical School, the BWH Postdoc Association runs a mentoring programme for postdoctoral researchers known as the Mentoring Circle Programme. Postdoctoral fellows within the first 2 years of their fellowships are matched with senior postdoctoral fellows who serve as mentors. The mentors engage with their mentees a minimum of 2 to 3 hours per month over the academic year and attend four mentoring events during the year with their mentees. The programme promotes postdoctoral fellows' professional growth by providing a supportive environment where career experiences, challenges, and opportunities can be shared. The aim is to build junior postdoctoral fellows' confidence and develop their professionalism, leadership, and communication skills[69].

programmes should ideally provide training to mentors to prepare them for their role or, where this is not possible, provide written guidelines and materials to support mentors.

Mentor training must include giving the mentors an overview of the typical challenges faced during the post-PhD phase as well as tools to address these challenges within the context of the mentor–mentee relationship[70]. Funding agencies can improve the mentoring received by early-career researchers by requiring formal evidence of training programmes offered to mentors by the host institutions. In addition, funding agencies can evaluate the quality of mentoring through requiring mandatory self-reporting of their experiences by the mentors or through blinded assessments by the early-career researchers[71].

6.5.3. Recruiting, retaining, and incentivising mentors

Good mentorship requires intentionality in the design of post-PhD support programmes and can be resource-intensive to implement, needing regular monitoring to ensure its effectiveness. Some programmes have faced problems instituting a mentorship component, particularly when there is no material gain for the mentor or when professors already have too many time constraints. Various incentives have been experimented with, such as conference or travel grants for participating mentors, but more insight is required into the specific design and impact of mentorship components and incentives.

A diversity of models for mentorship with varying degrees of formality were adopted among the Carnegie-funded programmes and, in several cases, fellows had access to more than one mentor. Based on lessons gleaned from these experiences, and supplemented by those from the African Women in Agricultural Research and Development (AWARD) programme[72], which has shown great success as a mentoring-focused fellowship in the African context, the following recommendations are proposed:

- Managing formal mentoring that is integrated into fellowships requires dedicated capacity. Dependent on the scale of the programme, one option to be considered is a full-time staff member appointed as

mentorship coordinator, who can keep a finger on the pulse throughout the fellowship and respond to any problems that may arise between fellows and their mentors. In smaller programmes, managing mentor–fellow relations should be explicitly delegated as a responsibility to one of the team members.

- To be most effective, there should be a careful fellow-mentor pairing. Fellows can be invited to nominate potential mentors, but the management team should make the final decision regarding the mentor–fellow match. Mentor–fellow matches are made taking into consideration many factors, including the achievements of the mentor and the extent to which they align with the goals expressed by the fellows in their applications. A mentorship coordinator should ideally liaise personally with potential mentors to assess their suitability for a particular candidate.

- Fellows should be located within reasonable proximity of their mentors (or have the means and opportunity to spend time in close proximity to the mentor during a residency). Technology-mediated mentorship has potential, but opportunities for at least some face-to-face engagement are preferred.

- The mentorship model and modalities for implementation must be matched to the purpose and objectives of the programme.

- An active database of former and potential mentors should be developed; mentors can be drawn from this as new fellows are appointed.

- Fellows and mentors should be given the opportunity to clarify their expectations of each other and reach mutual agreement, after which a code of conduct/agreement should be signed that provides the guidelines for managing the mentorship relationship professionally. It should be made clear that success requires dual responsibility: building the relationship cannot depend solely on the mentor or the mentee.

6.6. NETWORKING OPPORTUNITIES

Post-PhD support programmes should have built-in mechanisms to allow early-career researchers to hone their networking skills as well as expand their national and international networks. As the research world

becomes increasingly international and collaborative, with researchers collaborating in teams across international boundaries, early-career researchers must be able to develop collaborative networks to remain competitive.

One of the most important avenues for building networks and also to acquire and practice their presentation skills is the opportunity to attend professional meetings and conferences[73]. Conference attendance should therefore go hand in hand with opportunities for communication skills development, not only so that early-career researchers can hold their own while presenting their work to professional audiences, but also while interacting with students, media, and society at large. They need to be skilled in communicating their research findings via academic and science writing as well as via presenting at conferences and seminars to both scientific and lay audiences. Workshops aimed at sharpening early-career researchers' writing and communication skills therefore play an important role in this regard[74].

Although networking opportunities such as conferences and professional meetings are important, it is also critical to create opportunities for early-career researchers to build relationships that can lead to future collaborations. These types of relationships are more challenging to build at once-off events such as conferences but could be achieved through other mechanisms – for example, when fellows operate within teams located in structured research hubs such as institutional units, centres, or institutes. The African Research Universities Alliance (ARUA) Centres of Excellence are a case in point, where early-career researchers are inserted into existing networks of collaboration, enabling them to grow within a community of scholars in their field. Another example of enhancing network capabilities is to plan for time away or residencies.

6.7. TIME AWAY OR RESIDENCIES

Time away or residencies are key considerations in the conceptualisation and design of post-PhD support programmes. As a compulsory or optional funded component that is part and parcel of an early-career fellowship, a residency period in a foreign country provides early-career researchers with important development opportunities, especially if the researcher is still in the same institution as where they graduated. Such time away usually varies from 6 weeks to 6 months during a 2-to-3-year programme, facilitated through

formal or informal links between the host and home departments or between home supervisors and other PIs.

The residency period allows early-career researchers to explore intra-regional ties and build their international and inter-regional networks, while at the same time exposing them to different research settings and institutional environments. This helps to develop confidence and to embed the early-career researcher into a community of scholars that, in some instances, also fosters career paths or serves as entry point into cross-boundary collaborations. In fact, for citizens of many countries, embarking on a post-PhD experience abroad (usually in the US or Europe) is deemed mandatory for an academic career[75].

In Africa, international travel by early-career researchers is not always a given, due to family obligations which make it difficult to leave home for long periods of time and due to universities not being able to manage the decline in capacity when such researchers are away. The reality is that time away is hard to manage and usually reserved for senior academics going on sabbatical. Where a meaningful length of time away is not possible, short-term repeat visits as funded components of a fellowship have been found to be a good substitute to accommodate women with children and staff-stretched university departments.

Programme design and budget planning must take into account that early-career researchers who take up residencies or time away would require support through the provision of research assistance or substitute teachers that take on their duties during their absence, so that they do not have to catch up on tasks or face a backlash upon their return from colleagues who had to absorb the extra workload due to their absence. Programmes that provide mechanisms to 'fill the gap' when the early-career researchers are away on residencies help to mitigate this burden and challenge. Exchange-rate differences and visa constraints must also be factored into budget and programme design to manage funder and fellow expectations.

6.8. EQUALITY, DIVERSITY, AND INCLUSION

As a principle, if programmes are to achieve inclusivity, they need to be intentional about this in their design

– for example, by considering the needs and care responsibilities that female early-career researchers may have and how this impacts their decision to apply for or take up funded post-PhD opportunities.

The ways in which programmes will support equality, diversity, and inclusion also need to be made clear to applicants. For example, making it explicit that programme design will accommodate flexible working hours and residency requirements will go a long way to improve gender representation.

Maintaining a work–life balance is especially challenging for women, given the demands of family and parenting responsibilities[76]. Some strategies that appear to have been successful are, for example, the provision of a caregiver grant that allows their partner to accompany them to conferences or workshops along with their children. Where a programme can accommodate parenting needs, it is important to state this explicitly at the recruitment phase in order to optimise recruitment potential.

Ideally, research organisations and institutions should ensure that the necessary measures are in place to allow all early-career researchers to meet the demands of both their family and professional lives without needing to compromise on either. These ideal conditions would include financial support and employment accommodations so that female early-career researchers are not unduly disadvantaged in their career progression. Women who give birth should be accommodated so that they do not lose momentum in the progression of their research careers. Childcare support should be provided for when mothers return to work, and women should be allowed to work flexible hours to enable them to meet their family's needs. Working from home should be allowed and such hours recognised, with these terms preferably stipulated in employment contracts[77]. Some of these ideal conditions would be difficult and costly to implement. However, as a matter of principle, programme design should demonstrate sensitivity to social context and at least include some of them.

6.9. DURATION OF FELLOWSHIPS

The *optimal duration* of a post-PhD fellowship will vary according to context, and it is important to give this

serious consideration. The lengths of the post-PhD fellowships offered by the Carnegie-funded programmes were informed by a range of factors (such as the intended objectives and the expected deliverables) and differed widely; there is no universal or straightforward answer to the question of how long a fellowship should be.

In some cases, a balance must be struck between the number of fellowships that can be offered and the duration of a fellowship. More fellowships of a shorter duration give fellows less time but expand the overall reach of the programme. In other cases, longer fellowships to fewer fellows are needed to ensure adequate time to conduct and publish research. The duration of a fellowship thus needs to be guided by its purpose, intended outputs, disciplinary norms, and available resources, ensuring that the deliverables expected of the fellows are feasible within the duration of the fellowship.

6.10. REMUNERATION

Not all programmes will offer renumeration. Some programmes that are targeted at staff who are already employed may offer only funding for research projects, time away, and other programme activities.

When renumeration is offered, it is important to consider that *remuneration levels* differ between institutions and countries and will depend on the discipline, different roles, and purpose of the fellowships. For some institutions, post-PhD fellowships are provided specifically to retain skilled researchers in the country. At other institutions, they are provided to bridge the gap between completing a PhD and commencing an academic career or to buy out the time of high-skill professionals (such as the example of the Clinical Medicine fellowships at Wits) so that they can take time to contribute to the research enterprise. Because the purposes and goals of post-PhD programmes can vary significantly, the appropriate funding levels for each may also be different.

To determine appropriate, context-specific funding levels, the following should be considered:

- The relative wage of post-PhD researchers should appropriately reflect their value and contribution to

research. This implies that wages should ideally be pegged on a scale, depending on expertise and experience, to differentiate between someone who has just completed a PhD and someone who has some post-PhD experience (such as supervision and peer-reviewed publications). International examples of such grading scales abound, but the values are context-specific rather than uniformly applied.

- Indexing – that is, adjusting remuneration based on other values or composite indicators – can provide a useful proxy. Indexing could be done to contemporary graduates who did not engage in further studies and have been employed in the marketplace for 6 or 7 years; stipends in other programmes of a similar nature; newly hired staff performing similar tasks; or inflation on previous recommendations.

- The postdoctoral researcher's salary should be fair and fit rationally within the spectrum of salaries for researchers in that discipline, at that institution – for example, well above that of a PhD student and significantly less than that of a mid-career or well-established researcher at the institution.

- The local cost of living as well as disciplinary norms vary and should be taken into consideration.

- Institutional or sector salary scales might dictate higher remuneration for fellows in a particular post-PhD programme.

Remuneration levels offered to fellows pose several challenges, and setting guidelines or norms in this regard is not a straightforward matter. As evident from the above, remuneration for fellows differs by geographic location, disciplinary field, the fellow's level of expertise and contribution to research, and the employment status of the fellow within the institution.

Most institutions do not have specific policies, standards, or criteria for fellow remuneration – leaving programme staff with the challenge of determining what would constitute an attractive package given the resources available. It is a challenge for programme directors to determine what an appropriate remuneration would be in new programmes, and guidelines or tools to assist in this regard would be extremely useful. It is therefore recommended that funders, institutions, and science councils work together to set guidelines on adjusting for local cost of living in African countries, taking into account different levels of postdoctoral expertise and past experience. This will require considerable effort and coordination but will be invaluable to inform fit-for-purpose fellowship remuneration levels. Where fellows are not on the monthly HR payroll but depend on stipends sourced from ring-fenced awards, funding for a 4-year period (based on good progress) should ideally be secured upfront, as shorter funding tranches hamper effective recruitment and career planning.

BOX 12

Determining duration of fellowships – balancing quantity and duration with cost and objectives

The African Humanities Project (AHP) provided 1 year free from teaching and administrative responsibilities to complete a first major research project following the PhD. A higher number of fellowships could be granted in view of the short duration of the grant and having a very focused objective of one publication.

The Nurturing the Next Generation of African Scientists (NNGAS) programme aimed to develop the research skills of emerging clinicians and provided 2 years of dedicated research time while allowing the continuation of their clinical practice. As the cost of buying out clinicians' time is high and the duration of the grant was longer due to the objectives having to be achieved, fewer fellowships were awarded.

BOX 13

Indexing example

In the US context, the Research Grade Evaluation Guide adjusts for local cost of living by providing grading criteria for non-supervisory professional research work in the engineering and biological, medical, agricultural, physical, mathematical, and social sciences occupational groups for General Schedule and other 'white collar' pay plans.

Implementing impactful programmes in Africa
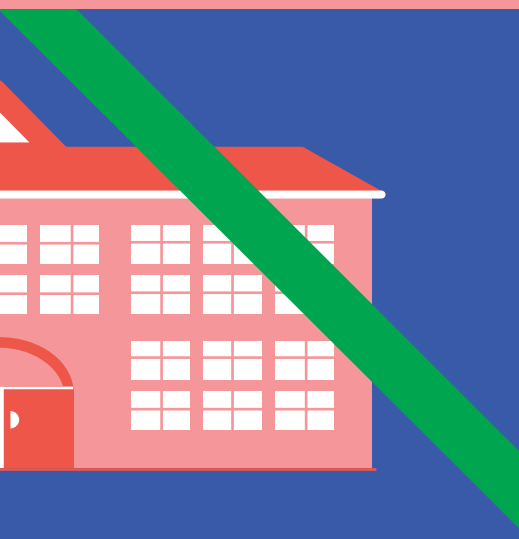
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7.1. THE IMPLEMENTATION-PLANNING PHASE

Prior to proper programme implementation (when the fellows are in place and commence their work), there is an *implementation-planning phase* that is important but easily overlooked.

Funders and institutions have a responsibility to ensure that sufficient time and resources are written into the programme proposal and project plan to allow time for this inception phase, which will allow the necessary structures and processes for implementing the programme to be secured upfront.

The partners who will help operationalise the programme should be briefed and brought on board during this phase of the programme. This includes both the academics who will serve as supervisors and mentors as well as the support and professional services (such as HR or finances) who will be engaged in the administrative components of the programme.

The task of crafting the call for applications should take place during this phase and must be appropriately allocated and aligned with institutional practice. Robust review and selection processes must be planned during this stage and adequate time allocated to each during the planning.

Terms of reference for, and the appointment of, a small steering committee or advisory group should be considered to provide high-level strategic guidance for the programme as it unfolds (also see 7.4.).

Flexibility in the programme implementation that makes it possible to tailor offerings over the fellowship period is important. This allows a programme to remain responsive to the needs of fellow cohorts and the evolving context. The COVID-19 pandemic was a case in point, where the funds for research visits abroad that were cancelled due to travel restrictions could be repurposed towards the production of research outputs or to serve other aspects of the fellows' skills development.

7.2. PROGRAMME CALLS, MARKETING, AND APPLICATION

During the programme design phase, the target beneficiary group of a specific programme should be clearly defined and made explicit in the marketing material. This will enable marketing efforts to be targeted, nuanced, and appropriately directed.

Identifying fellows who are the right match for particular programme will help ensure that the fellows benefit optimally and that the programme can achieve its objectives. Marketing, application, and selection processes all contribute to ensuring that a high-quality pool of fellows who are well suited to the opportunity are selected.

Within the programmes participating in PERKA, beneficiary groups were targeted via closed, open, and hybrid calls. Closed calls focused on identifying fellows from precursor initiatives that, for example, funded PhD studies. Early-career programmes with closed calls have the benefit of knowing their potential applicant pool well and being able to draw on these networks to select a strong cohort of fellows. While this cohort pipeline approach has advantages, it should not be seen as the only or preferred model.

New programmes – or open calls – that draw in applicants from outside the group of previously funded PhD students help create new entry pathways into career-development opportunities and widen the reach of funders and programme implementers. Hybrid models that build on previous programmes and allow an element of an open call can also work. In these hybrid models, programme implementers have the advantages of a mature programme and network partners, but with the wider reach of an open call.

Regardless of the model – closed, open, or hybrid – the call must allow time for applicants to develop high-quality proposals. The timing of the call needs to take into consideration the typical 'rhythm' of the institution or context – for example, in most African countries, calls that close over the December or January period may exclude some potentially high-quality candidates, as many institutions are closed over this period for the extended vacation.

BOX 14

Examples of closed calls building on previous initiatives

The NERLP post-PhD programme at Makerere University was targeted specifically at former CCNY-supported PhD graduates who were employed full-time at Makerere University and who completed their PhD no more than 10 years prior to the call opening.

The DEAL programme at UCT targeted only alumni from the CCNY-supported Next Generation of Academics for Africa (NGAA) programme.

BOX 15

Examples of open calls for applications

The CARTA programme was open to all PhD graduates that are staff at any of the participating institutions, encompassing seven African countries.

The Wajao programme of RUFORUM targeted African PhD graduates in Agricultural and Life Sciences and supported researchers in nine African countries.

Learn more about these models in Appendix A.

Figure 5 provides a summary of typical documents or information required in the call for applications of the programmes participating in PERKA.

Once the target beneficiary group of a specific programme has been clearly defined, marketing should be prioritised to ensure applicants have sufficient time to prepare competitive applications. All marketing material should be very clear on selection criteria and time frames. To manage the varied ways in which an early-career researcher is defined across different institutions and countries, it is necessary to make it very clear in the call document what the profile of the applicant should be and to apply these criteria rigorously in the selection process.

Depending on the nature of the call, marketing will be directed internally, externally, or both inside and outside the institution, as appropriate. Marketing costs should be factored upfront into programme proposals unless these can be absorbed by the host institution. Where programmes are aligned to existing institutional policies and practices, calls for applications may need to take institutional guidelines for student and/or staff recruitment into account. In addition, administrative units (or relevant individuals) that will be involved in operationalising the support programme should be alerted to the marketing timelines to ensure that they factor implementation into their own work plans.

Drawing on a combination of marketing platforms to promote a programme increases its reach and could include institutional, departmental, and organisational websites; relevant academic journals; posters; and student and/or staff associations. A direct approach through letters of invitation to apply, addressed to select or relevant constituencies, can also be effective. The impact of marketing done through institutionally managed social media (Facebook, Twitter, etc.) cannot be overestimated and is becoming common practice today. Where applicable, making reference in marketing materials to precursor or sister programmes – and highlighting some of these earlier successes – can help to strengthen promotional impact.

7.3. SELECTION CRITERIA AND PROCESSES

The selection criteria and processes of a programme both need careful consideration. Criteria and processes

FIGURE 5

Typical documentation required for a post-PhD programme application

- A comprehensive research proposal or concept note (ranging from 2,000 words upwards)
- Summary of proposal (ranging from 200 words upwards)
- Comprehensive curriculum vitae (CV)
- Publication lists
- References
- Academic records
- A project workplan

should be clearly articulated in call documents, along with expected time frames for all processes.

Institutional context relevance and programme objectives will inform the criteria for selection – for example, the need to support existing staff who have not yet completed their higher degrees (where the fellowship will accommodate those that still need to finish their doctoral degrees) or to focus on the development of post-PhD individuals who are not yet sufficiently established to compete for academic appointments.

The question of an age or time-since-PhD cut-off needs very careful consideration as an inclusion or exclusion criteria. Due to circumstance, many fellows in Africa come to their higher degree studies quite late in their careers. Women, too, often first raise a family before being able to fully focus on their own advancement. This must be weighed up against the time left in such a career trajectory to assure a likely return on the investment of the fellowship and may differ from institution to institution or between funders.

A comprehensive and rigorous selection process was identified in the PERKA project as a key success factor for effective early-career support programmes. Figure 6 provides an overview of the different processes adopted across the participating programmes; it is, however, a compilation of processes across the programmes, rather than a reflection of the process that was followed by all programmes. Most programmes adopted one or two of these steps.

Screening for eligibility would entail scrutinising applications in line with pre-determined non-qualitative criteria such as age of applicant, time since completion of PhD, and/or discipline or research-field relevance in relation to programme objectives. External reviews of applications add rigour to the selection process. Selection processes that include interviews (face-to-face, where possible) enable programmes to assess candidates more holistically than processes dependent solely on written applications. A committee comprising members with appropriate disciplinary expertise from departments willing to take co-ownership of the support programme can strengthen the selection process, either making the final selection of fellows taking all the different inputs into account or giving inputs and/or ratifying decisions that were made.

Time needs to be allocated reasonably to each of the steps included in the selection process. The engagement of external experts needs to be done in a manner that is cognisant and respectful of their time and other commitments.

Where feasible, matching of postdoctoral fellows to supervisors and/or mentors should be done as early as possible. Application processes that allow fellows to identify potential mentors help the programme widen the pool of potential mentors.

Although it is time consuming, providing feedback to shortlisted but not selected fellows can provide an additional opportunity for capacity building and increase the chances of success for the unselected fellow in future applications to different calls.

7.4. ORIENTATION AND CAREER PLANNING

It is important to set and communicate clear expectations to fellows early in the programme, including what will be expected in terms of participation in fellowship activities and their expected outputs and processes for reporting during the fellowship. Orientation should include support to mentally shift from the (often narrow) objectives of one's PhD to understanding the bigger picture of the post-PhD phase. Fellows must understand the need for disciplinary expertise to now be expanded to contribute to collaborative, often interdisciplinary, projects and that research questions must be increasingly shaped towards benefit for society or applicability to the private and public sector.

Induction meetings or orientation sessions are a good platform to clarify expectations, and a written Memorandum of Understanding (MoU) or conditions of grant is highly recommended, as this codifies the agreement between the fellowship programme and the fellow.

FIGURE 6

Overview of possible steps in a selection process
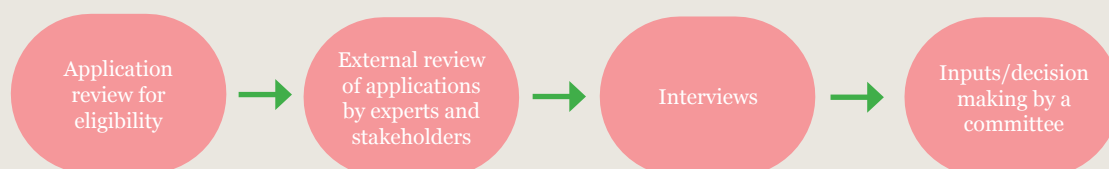
Expectations for the fellowship should be matched to the discipline (for example, the number of publications expected per annum varies widely by field of research) and be cognisant of the amount of time fellows will be expected to dedicate to research during the fellowship (i.e., those with multiple roles for teaching and research will have different levels of output for research than those who dedicate 100% of their time to research).

During the post-PhD phase, there are multiple stakeholders who need to play a role in enabling early-career researchers to achieve their career goals. The host institutions, the departments within the host institutions, and the supervisors and PIs within these departments should provide comprehensive information, support, and guidance to researchers in the post-PhD phase to enable them to acquire expert knowledge in their fields of study, as well as the transferrable skills they will need to compete in the wider employment arena[78].

In the case of free-standing programmes offered to researchers not in permanent employment, it is vital that host institutions signal early on if permanent academic employment within the institution is unlikely to happen, and fellows should be given subject-specific information about non-academic career options available to them. Early-career researchers should be encouraged to see such opportunities as positive career choices, rather than as a failure to build an academic career[79]. Some have suggested that those in the post-PhD phase be split into two streams, based on an evaluation of the abilities and aptitudes of the researchers. The one

stream would receive training solely focused on careers in academia, while the other stream would be trained for research careers in the mainstream economy[80].

Funders have an important role to play in the career development of researchers in the post-PhD phase through embedding career-development requirements in their funding calls, keeping host institutions accountable for implementing such requirements, and offering dedicated funding to enable early-career researchers to engage in career-development opportunities[81].

7.5. STEERING COMMITTEE OR ADVISORY GROUP

There is merit in establishing a small steering committee or advisory group at the programme's outset consisting of senior academics from relevant fields, especially in cases where programme participants are drawn from different disciplines or departments. The main purpose of such a committee is to guide the programme manager and administrative implementation team as the programme evolves and to provide the opportunity for holistic oversight as well as advice on flexibility that might be required due to unforeseen or changing circumstances. A steering committee also helps to inculcate a sense of ownership within the departments where the programme is hosted, ideally strengthening alignment between the programme's strategic objectives and those of the institution.

There are multiple stakeholders who need to play a role in enabling early-career researchers to achieve their career goals.

Cultivating enabling institutional environments

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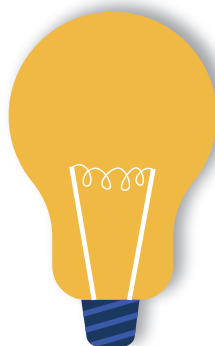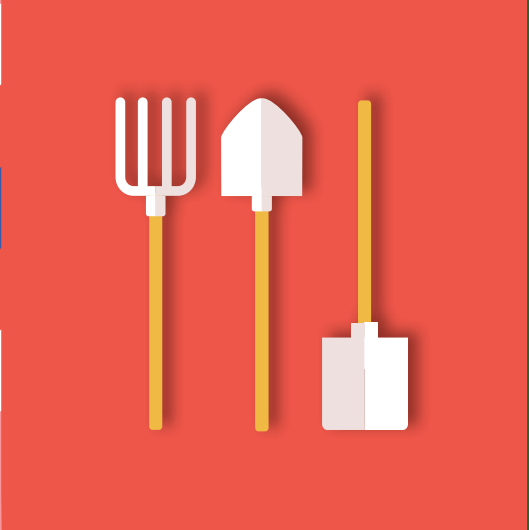
The environment within which early-career researchers are embedded during a post-PhD programme makes a significant contribution to their experience of the programme and the extent to which fellows can benefit from the programme activities. The impact of a well-conceptualised programme that is not embedded within a supportive institutional environment may be diminished.

Institutional context is thus a fundamental concern for post-PhD support programmes – regardless of whether these programmes are embedded within the institution or if they are administered by networks or consortia. Constraints within the institutional environment at African institutions have been previously identified as a factor that inhibits the growth of the research enterprise on the continent – and a limiting factor for the development of early-career researchers.

Funders supporting post-PhD programmes should take into consideration institutional context and consider ways to strengthen both individual and institutional capacities. One innovative example of a programme focused on early-career-researcher development and institutional context is the Climate Impacts Research Capacity and Leadership Enhancement (CIRCLE) Programme. CIRCLE was initiated and funded by the Department for International Development (DFID) of the United Kingdom (UK) and was implemented as a dual-purpose programme. Firstly, the programme delivered visiting fellowships to master's and PhD graduates through a partnership between the Association of Commonwealth Universities (ACU) and the African Academy of Sciences (AAS). Secondly, CIRCLE ran an Institutional Strengthening Programme (ISP) managed by the ACU in partnership with Vitae and aimed at 39 African research institutions across nine African countries.

The sections that follow highlight practical considerations that may arise during implementation of a programme, which, if dealt with upfront, can contribute significantly to cultivating enabling institutional environments.

Box 17 on the following page provides a summary of the good-practice recommendations for cultivating enabling institutional environments, along with references to the section of the guidelines where these practices are discussed in greater detail.

BOX 16

Example of a programme targeting early-career researchers and enabling institutional environments

The CIRCLE visiting fellowships afforded master's-qualified and postdoctoral researchers the opportunity to spend 12 months doing research at an African institution outside of their home institutions, with the aim of developing their research expertise on the impact of climate change across Africa. Fellows were paired with a research supervisor from their host institution, a mentor at their home institution, and an international expert in their field of research.

The ISP, in turn, aimed to enhance the professional development support for early-career academic staff at participating African institutions, while at the same time helping to establish more robust institutional frameworks for supporting both climate-change and general research[82].

The programme ran from late 2014 to early 2018, awarding 100 fellowships to 39 researchers with master's degrees and 61 researchers with PhD degrees.

8.1. AWARENESS OF POST-PHD FELLOWS EMBEDDED IN THE INSTITUTION

Given that postdoctoral fellowships are not yet pervasive in African institutions, programmes face some institutional challenges, including a lack of awareness about the role and purpose of fellows. Institutional awareness and embeddedness in the strategic aims of the institution are critical – for example, by having the growth of a next generation of academics explicitly sanctioned as an institutional goal. Their status within the institution should be valorised upfront, and their achievements – such as peer-reviewed publications – celebrated, for example, through mention in research reports or on university websites. Lack of awareness and role clarification also exacerbates administrative hurdles and the time-consuming navigation of bureaucratic processes. In some instances, where heads of department and deans are inexperienced and do not have institutional knowledge, leadership training

can help them navigate HR policies and manage the complexities of a growing workforce in their areas, as it is not possible for individual supervisors to find systemic solutions to bureaucratic challenges.

8.2. CLASSIFICATION OF POST-PHD FELLOWS WITHIN AN INSTITUTION

Although a number of post-PhD support programmes in Africa are geared at fellows already on the permanent staff body of the institution, many fellows in post-PhD support programmes are researchers who are not yet employees. Consequently, it is an important issue to clarify their status within an institution.

Classification of fellows who are not employees within institutional structures has important ramifications, as this has a direct impact not only on the tax status of fellows but also on their standing within the university. Wide diversity in the classification of post-PhD fellows exists, even within countries[83].

BOX 17

African and global good practice for enabling institutional environments

- Awareness of post-PhDs embedded in institutional strategy (Section 8.1)
- Clear and consistent institution-specific classification of post-PhD fellows (Section 8.2)
- Appropriate policies and standards readily available on website or in handbook (Section 8.3)
- MoU between fellow and host to agree on expectations and responsibilities (Section 7.4)
- Leadership training for inexperienced deans and heads of department to resolve systemic challenges related to administration of fellowships (Section 8.1)
- Dedicated administrative capacity to service processing of fellowships, attend to visa and travel requirements, and be responsible for logistical arrangements (Section 8.4)
- Access for post-PhDs to a university-wide association of peers for mutual support and to have a platform for raising concerns (Section 8.4)
- HR capacity to manage targeted post-PhD support programmes (Section 8.5)
- Institutional capabilities for strategic communication (Section 8.6)

It should be emphasised that these fellows represent a temporary or fixed-term research workforce that is separate and distinct from employed staff and students. They are apprentices and, therefore, not staff; at the same time, they are not students since they have already completed their doctorates.

Classifying this group of researchers presents challenges and needs careful consideration, as the matter is not straightforward. Should they be classified as employees, they would, in principle, be entitled to remuneration benefits not available to students, such as fringe benefits, hours/wages protection, and equal pay for equal work guidelines for men and women. Should they be classified as students, they would have limited (or no) employee benefits but may receive other advantages such as tax exclusion.

If the stipends they receive are 'income', then by most country laws they should be taxed. To avoid this, postdocs are often registered as 'students', but fellows dislike having student status, as they have completed their PhDs and are professional researchers. Dedicated graduate offices, however, do not typically have the capacity to process monthly or biweekly disbursement of funds, so fellows tend to receive their funding in lump sums, which further entrenches the inaccurate perception that they are receiving a scholarship or are 'special status students'. In cases where they are classified as students, fellows have access to all the support structures and on-campus amenities available to students, including student healthcare centres, recreational facilities, housing, and access to student grievance procedures[84].

The choice of classification also impacts on the types of visas for which fellows who need to travel – either from home countries or for residencies away – are eligible. Programmes that require (or have the option of) an international residency component often face difficulties in securing the correct documents and navigating complex bureaucratic processes. Even among African countries, it is often not clear what category fellows fall into and, as a result, it can be difficult for fellows to secure the required visas. For instance, fellows might technically be considered as 'employees' of an institution and, as such, may require work permits. However, work permits are often very expensive and difficult to obtain. To circumvent this requirement, many fellows apply as 'students' but this is not technically correct, as they are also not in this category. There is an opportunity (and

a need) for a continental-level entity, such as the AAS, which works closely with the AU, to advocate for a type of researcher visa or work permit to encourage mobility between countries that would be relevant to fellows travelling and working on post-PhD programmes.

Given the variable pros and cons of being classified as employees or as students, institutions should consider establishing classification categories that are specific to post-PhD researchers and embody their unique position in the institution[85]. Such classification also helps to inform the choice of support interventions and administrative structures from which the different categories may derive the most benefit. The aim of such institution-specific classification should be to strike a balance between the pros and cons of being classified as either a student or an employee and thus create an environment that enables fellows to develop to their full potential. For an example of institution-specific classification, see Table 3.

It is important for funders to be cognisant of differing situations within institutions and, in cooperation with granting councils, they should advocate for setting guidelines – nationally or more broadly for the continent.

8.3. POLICIES AND STANDARDS

Once a distinct classification category has been established for fellows, policies and standards should be developed as is done for graduate students and staff. Issues such as the purpose of the post-PhD career phase and the mutual expectations and responsibilities of all the actors involved must be addressed before any policies can be designed[86].

Once this shared understanding has been established, policies should be designed that explicitly guide the appointment, training, compensation, benefits, performance evaluation, and career guidance of postdoctoral researchers[87].

Furthermore, institutions must adopt guidelines for the duration of postdoctoral terms (it is recommended that the cumulative time spent does not exceed 5 years) that take into account unusual circumstances. There should also be an upward progression in the seniority, pay, and benefits as they move to the later stages of the post-PhD career phase[88].

Example of work in progress at Stellenbosch University to formalise institution-specific classification of postdoctoral research fellows and early-career researchers

POSTDOC	EARLY-CAREER RESEARCHERS
Within 5 years of PhD, age does not matter.	Employed as an academic. Holds either a master's or PhD or is post-PhD, but not yet independent researcher; still has a mentor or supervisor.
Cannot be employed (or have been employed) elsewhere – postdoc is an internship only.	Already on the university staff payroll as an academic; aims to have an academic career track.
Scientific skills development for academic career but also complementary skills that include exposure to career tracks outside of academia (e.g., public or private sector, industry, science communication and policy, research management, etc.).	Training aimed at academic career only: focus on scientific skills development and complementary skills that are required for an academic career, such as supervision and teaching skills, raising grants, writing for publication, etc.
After 5 years, can receive a maximum of 24 months extension, after which department must take over or person must raise own funds to cover salary. At this point, called a research associate or a research fellow. No longer a postdoc.	
Postdocs have access to an electronic platform with info on mentors that join on a voluntary basis. Postdocs make use of this on a voluntary basis.	Early-career researchers have access to a structured mentorship programme, where individual mentors are appointed based on the needs of the European Research Council (ERC). Mentors commit through a signed letter of commitment and receive a small honorarium for their time spent with the mentee.
Postdocs have formal MoU with supervisor.	
Dedicated office for postdocs that looks after all aspects of their needs. One-stop-shop for postdocs, but office works closely with existing service providers across campus such as international office and wellness services.	Access to all services available to academic staff.

Access to benefits such as leave, including family and parental leave, could be crafted into institutional policies to provide some employee-type benefits to fellows, even if they are classified as students.

Consistency in terms of policies, services, and procedures is important, regardless of the source of funding for fellows across an institution, as is the periodic review of mutual benefit between the fellows and the host institution.

Based on the above, a comprehensive handbook or online resource should be available that covers all aspects of being an early-career researcher at the institution and for use not only by post-PhD fellows but also their hosts, mentors, and host departments.

8.4. INSTITUTIONAL CAPACITY TO HOST, DESIGN, AND DELIVER PROGRAMMES

There are various structures that can be set up within institutions to support researchers in the post-PhD phase. These include dedicated offices and postdoctoral associations.

Implementation of programmes is enhanced when there are institutional capacities to host, design, and deliver programmes, such as dedicated offices that advise both local and international early-career researchers holding fellowships and handle their end-to-end administrative and operational/logistical needs. Such stand-alone offices can be a one-stop source of information for domestic and international fellows, manage their grievances, oversee data-gathering efforts, monitor institutional compliance with salary and benefits policy, and track the career progress of former fellows.

In Africa, offices dedicated to the administrative and support needs of early-career researchers are the exception rather than the rule, mostly due to resource constraints. Some universities opt to embed these services within other functional areas, such as a research office or a postgraduate office. But such practice has implications for identity and concomitant status of the fellows within the institution. It is therefore worth paying careful attention to the nomenclature of such an administrative structure – for example,

naming it early-career support services. In addition, at many institutions in Africa, there are no staff assigned or dedicated offices to assist foreign fellows with, for example, visas, taxes, social security, housing, and language skills. Many *foreign fellows* may also have difficulties with cultural and language adjustments which, in turn, hinder the optimal development of their teaching and other professional skills. Although some institutions have international offices, these are often focused on undergraduate or graduate students and do not always understand the unique challenges faced by post-PhD fellows.

In South Africa, there are examples of institutional offices providing support to both local and international postdoctoral researchers, collaborating with an international office to assist with visa applications, arrange temporary accommodation that cushions the time it often takes for researchers to find permanent housing, arrange transport to and from the airport, assist with registration, and provide information about the institution's immediate living environment.

Establishing postdoctoral associations constitutes a practice that should be expanded, as it provides the fellows with a platform for institutional representation and reduces their potential isolation. This has become an international trend, with numerous postdoctoral associations now established around the world.

There is currently no continent-wide postdoctoral association in Africa, with the postdoctoral associations that do exist limited to South Africa. The Universities of both Cape Town and Stellenbosch, for example, have an association created and run by postdocs at the university. Aimed at representing the interests of postdocs within the university's structures, these associations reduce postdoc isolation by connecting them through meetings, events, and social activities. They have representation on relevant institutional committees and provide a blueprint to help shape similar structures elsewhere on the continent.

8.5. MANAGING THE POST-PHD SUPPORT PROGRAMME

Implementing an effective post-PhD support programme requires adequate and dedicated HR capacity. In some

BOX 18

Towards sharing best practices in institutional policy, structure, and processes

As policy development often requires specialised expertise and can be resource-intensive, a continental-level entity, such as the AAS, which works closely with the AU could be approached to coordinate an electronic platform that gives access to examples of policies, structures, and processes related to the administration and support of early-career researchers. The purpose would be for institutions to draw on these examples to establish or strengthen their own institution-specific standards and practices.

BOX 19

Examples of postdoctoral associations

In the US, postdoctoral researchers began an initiative called the National Postdoctoral Association (NPA), which includes representatives from the offices of postdoctoral affairs and strives to serve as a forum for discussion and information, thus providing postdocs with a unified voice[89].

Similarly, the European Network of Postdoctoral Associations (ENPA)[90] is a recently established association that represents postdoctoral associations and postdoctoral researchers from across Europe. It advocates for the improvement of postdoc working and training conditions and promotes opportunities for career development and progression. It also provides information on, and compares, existing postdoctoral associations and movements; researches the career perspectives and opinions of postdoctoral researchers; and provides decision-makers with best-practice guidelines regarding the management of postdoctoral researchers.

The environment within which early-career researchers are embedded during a post-PhD programme makes a significant contribution to their experience of the programme and the extent to which fellows can benefit from the programme activities.

cases, programmes are managed through drawing on existing services, structures, and processes. While not all programmes require full-time staff dedicated solely to the programme, capacity allocated to managing the programme should be based on the scale of the programme, the nature and frequency of the formal training components in the programme, the reporting requirements, and the administrative load.

8.6. STRATEGIC COMMUNICATION CAPABILITIES

Without visibility and the strategic promotion of an institution's profile and strengths, the effective recruitment of early-career researchers and experienced supervisors and mentors can suffer. Similarly, the opportunities for inter-institutional collaboration, research partnerships, and networking that are considered crucial for early-career development are compromised.

Evidence-based strategic communication on the institution's strengths or points of growth aimed at lay audiences (e.g., through websites and promotional material) plays an important role in making sure that civic associations, the private and public sector, government departments, and industry are aware of its research expertise and the need to grow the next generation of researchers. This, in turn, facilitates training or internship opportunities and enhances funding flows.

Communication capabilities within the institution are equally important to ensure that early-career constituencies (fellows, supervisors, host departments) are well-informed on relevant policies, processes, and structures that are in place to help streamline professional growth.

8.7. ONGOING HOLISTIC SUPPORT

Programmes, institutions, and funders should explore all avenues and opportunities to provide holistic support to fellows throughout the life cycle of a programme. Providing post-PhD fellows who are not on the HR payroll with medical cover is the exception rather than the rule, but at the very least clear guidance should be provided on available support. The mental health of early-career researchers is becoming a topic of increasing interest, with studies conducted to date identifying pervasive mental health challenges experienced within this cohort[91].

An area deserving special attention when designing programmes for African early-career researchers is helping them to maintain a work–life balance. African researchers are often faced with greater extended family demands than those experienced by researchers from high-income countries, with people in Africa often expected to provide time, advice, and financial support to extended family members.

In particular, during residencies/time-away visits, fellows may need additional non-academic support in their new environments to adjust effectively to new cultural settings and to ensure that their psychosocial needs are met. Periods spent abroad can also be a source of significant stress. Differences in academic and social security systems between researchers' host and home countries, the risk of losing networks, and the non-portability of pensions are just some of the complexities.

Fellows may also need holistic support during the return-home phase. For example, when returning to departments that are not research-active, fellows will benefit from support and guidance on how they can link into research-active groups elsewhere after their return.
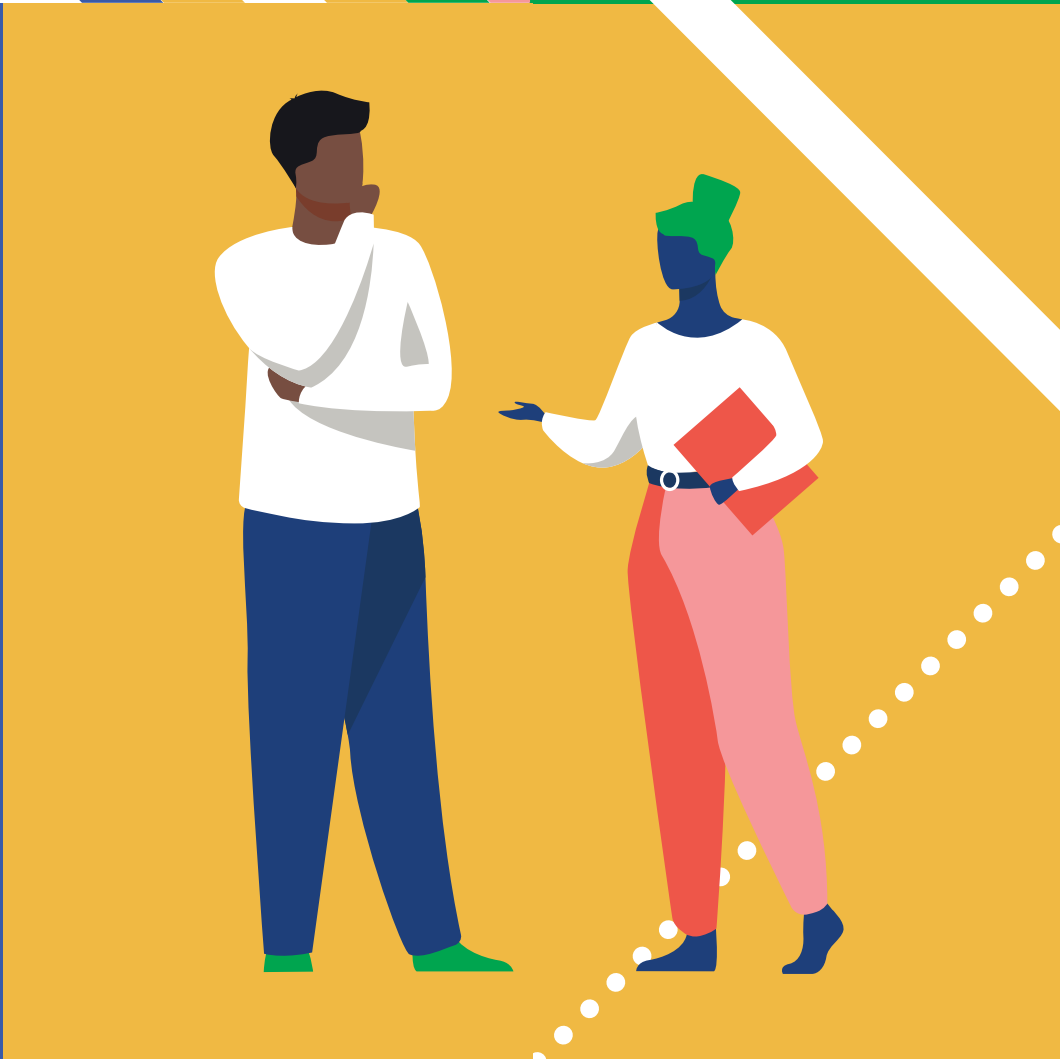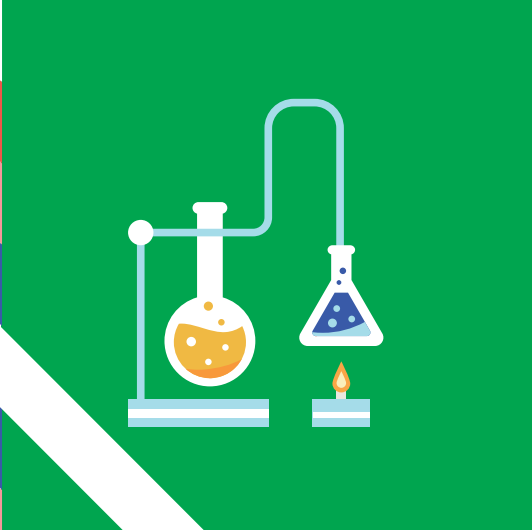
Understanding impact: reflect, monitor, and evaluate

09

As the number of post-PhD support initiatives in Africa grows, it is important to ensure that lessons learned by different programmes are documented and shared; there is a knowledge gap in terms of what works in capacity building in Africa. To enable such documentation and sharing, monitoring, evaluation, and learning activities need increased attention and funding.

Monitoring-and-evaluation activities are often seen as add-ons or as something done at the end of the programme. However, in order to truly implement an adaptive management approach, it is critical for programmes to integrate monitoring and evaluation into activities from inception to conclusion of the programme. This allows programmes to be responsive and adapt as they implement. It also allows for learning to be consolidated and shared. Although monitoring and evaluation are seen as crucial, it is mostly an under-resourced function that requires external funding. The costs should therefore be integrated into project budgets.

It is critically important for programmes to clearly define success from their perspective upfront. This allows for them to understand if they have been effective. Indicators of success will vary depending on the type of programme and need to be considered at the individual, programmatic, institutional, and macro levels. Examples of indicators adopted across the PERKA programmes are illustrated in Figure 7.

Monitoring and evaluation in the PERKA programmes occurred through different mechanisms, with varying degrees of formality. Some programmes collected feedback from fellows directly, while in other cases, fellows provided feedback to their supervisors or mentors. Both approaches can work if there is a

FIGURE 7

Understanding the success of post-PhD programmes - examples of indicators

INDIVIDUAL LEVEL

Fellows remain engaged in research and establish themselves as independent researchers
Fellows are competent in research dissemination
Fellows become research leaders – leading teams, large projects, or cutting-edge work in their field
Fellows successfully engage students in their research projects and supervise them to graduation
Fellows maintain cross-border networks and collaborations

INSTITUTIONAL LEVEL

Institutional research capacity is bolstered – more researchers and greater capacity of researchers who are retained in institution
Institutional capacity for research, including infrastructure, is increased
Research output at institutional level is increased
Capacity within institution for postgraduate teaching and supervision is strengthened
Mentorship programmes are institutionalised
Enabling environment for research is strengthened

MACRO LEVEL

A critical mass of researchers in Africa is attained and sustained
The value of the knowledge/research produced by African scholars is acknowledged by the public and policymakers in Africa
African institutions become policy influencers and sources of decision support

mechanism for channelling the relevant information to the programme director, who, in turn, needs to report to the funder or monitor several programmes at an institutional level.

Monitoring should ideally be linked to the MoU or agreement that fellows sign when starting the fellowship, within which expectations for reporting should be made clear.

Programme directors are expected to fulfil multiples roles and are often responsible for several programmes simultaneously. Few are monitoring or evaluation experts, although they may be expected to monitor or evaluate programmes. There is a need for strengthening capacities to monitor and evaluate post-PhD programmes. Funders can consider integrating training of this nature into grants and should support projects financially to implement robust monitoring-and-evaluation activities. There is also scope for developing and making available a toolkit that could be tailored when implementing new programmes. Support to build the capacities of programme directors to implement light, yet effective monitoring-and-evaluation systems could yield several benefits.

There is also very little known about what happens to the career pathways of fellows after they complete their programmes. Tracer studies are needed to trace the post-funding period of fellows and understand their employability and where they ultimately establish their careers. Such tracer studies can be time- and resource-intensive, but funders should consider supporting well-designed tracer studies that can help increase knowledge on the long-term impact of programmes. This knowledge could help shape the design of programmes to be more effective, ultimately benefitting the funder.

Additionally, many universities find it challenging to evaluate the impact of the research produced by their fellows (and other researchers, for that matter). Being able to demonstrate impact more clearly could help make the case to governments and other partners for greater research funding. Although it might require a separate project to be effective, universities in Africa support the idea of developing mechanisms to better understand and quantify research relevance, usefulness, and impact.
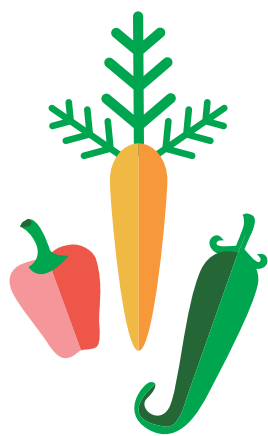
Funding partnership models

10

10.1. THE NEED FOR EQUITABLE AND SUSTAINABLE PARTNERSHIPS

The PERKA project has enriched our contextual understanding of the range of partnership models for early-career fellowship funding that can be used by donors, science funders, institutional leaders, and project implementers to design and deliver successful and impactful post-PhD support programmes.

In the context of the current resource constraints in African research and learning institutions, collaboration is widely considered critical to strengthen research capacity. But these partnerships must be non-hierarchical, mutually beneficial, transparent, and equitable, and should reflect different partners' values and priorities. The section that follows briefly alludes to examples of partnerships that aspire to be responsive to the challenges and complexities of growing the next generation of advanced researchers in, and for, Africa. It is hoped that these initiatives can serve as a springboard for fostering increasing numbers of such African-centred and globally enabled relations.

In the Global South, the role of national and regional research-funding agencies is complemented by the role of international development partners who fund research and capacity-development initiatives (both stakeholders are referred to as funders from here on). The contributions of these funders can be broadly classified as (i) designing and funding early-career or post-PhD support programmes; (ii) investing in stand-alone training and career-development opportunities; (iii) integrating early-career-researcher development into other funding schemes and; (iv) providing oversight, monitoring, and evaluation.

In addition, partnerships with industry have an important role to play – not just for funding, but also to create opportunities for post-PhDs to transition into the workplace, should they choose not to stay in academia.

10.2. PARTNERSHIPS FOR POST-PHD SUPPORT PROGRAMMES IN AFRICA

International funders fund a large proportion of research conducted in African countries. In recent years, capacity development has increasingly become a prerequisite integrated into research partnerships between African and high-income countries (HICs). One advantage of these types of partnerships is that seasoned researchers from HICs can help build the capacity of early-career researchers in Africa. However, with these partnerships focusing primarily on research excellence, the capacity-building component is frequently neglected. Therefore, it is increasingly recognised that there is an important role for researchers, institutions, and funding organisations in Africa to play in capacity-development efforts on the continent[92]. As such, a dialogue on what the structure and components of high-impact capacity-building programmes in Africa should be, is a timely and important one.

Recognising the urgency of early-career-researcher development in the African context, numerous international funding schemes and programmes have been developed, in collaboration with African universities or independently, to achieve this goal. Some of these programmes are situated within institutions and focused on developing staff within the institution. In many cases, however, they are situated within networks, consortia, or other organisations with a Pan-African mandate. The diversity of the programmes participating in PERKA has highlighted the range of programmatic models that funders can consider when investing in post-PhD programmes. Examining the programmes in Appendix A can shed further light on how funders can collaborate with either individual institutions or networks, consortia, and organisations with a Pan-African mandate.

Beyond the programmes supported by the CCNY, there are several other programmes and initiatives across the continent that could be examined as partnership-funding models.

The Africa Postdoctoral Training Initiative (APTI)[93] is a post-PhD support programme established through a collaborative partnership between the AAS (a Pan-African academic partner), the US National Institutes of Health (NIH; an international research-funding and -implementation agency), and the Bill and Melinda Gates Foundation (BMGF; an international philanthropy). The partnership is an example of how philanthropic funders can collaborate with leading research-funding organisations to connect researchers in Africa to development opportunities through partnership with an African organisation that has a broad continental mandate. More details about the APTI are provided in the box on the next page.

BOX 20

The Africa Postdoctoral Training Initiative: Pan-African academic partner – international research-funding and -implementing agency – international philanthropy

The APTI[94] is a post-PhD support programme established in 2018 through a collaborative partnership between the AAS (a Pan-African academic partner), the US NIH (an international academic partner), and the BMGF (an international philanthropy). The objective of the APTI is to build a cadre of researchers in African countries who can address key health issues, become scientific leaders in their communities, and serve as trainers for the next generation of researchers.

The programme targets African postdoctoral researchers with a relevant doctoral degree awarded no more than 15 years earlier, who are citizens of an African country, and who are currently employed in an academic, research, or government position in their home country.

Postdoctoral researchers who are accepted into the programme relocate to the US for 2 years to conduct research at the NIH in a medical or health sciences field. The field of study needs to be of importance to their country of origin, the AAS, and the NIH. Furthermore, they receive professional training in clinical and translational research while conducting research at the NIH. Following the 2-year fellowship, the fellows are expected to return to their home institutions, where they will receive continued support from the APTI in the form of 50% of their salaries to run a research project in one of these priority health areas at their home institutions[95].

Partnerships that are driven across borders at an institutional level have also been implemented. For example, the Cambridge-Africa Partnership for Research Excellence (CAPREx) programme[96] is a postdoctoral fellowship programme borne out of a partnership between the University of Cambridge in the UK (an international university), Makerere University in Uganda, and the University of Ghana in Legon, Ghana (both African universities, but in two countries). Funding for the programme was sourced from multiple philanthropic funders – illustrating the growing trend for funders to collaborate or co-fund initiatives. Further details about CAPREx are provided in Box 21 on the next page.

Given the ever-more competitive academic job market, as well as the increasing complexity of technological developments, both universities and companies outside academia have much to gain from exploring development partnerships beyond collaboration with funding agencies and philanthropic foundations. This trend has already been observed with companies collaborating with universities through policies of 'open innovation'. The most important role of universities in these collaborative partnerships is the access these institutions provide to research and research infrastructures, as well as the ability of universities

to conduct research that transcends disciplinary boundaries[97]. However, at present, it is mostly doctoral students who benefit from these partnerships, with collaborative university–industry PhD research projects becoming more prevalent[98]. Expanding such partnerships to include post-PhD programmes can play an essential role in exposing these early-career researchers to the employment possibilities outside academia. As industry projects often have deadlines and legislation that require institutional responsibility (or where additional work can be outsourced to more than one person), it is best practice for the supervisor to act as signatory and take ultimate responsibility, nevertheless allowing the post-PhD fellow to gain experience by leading the project, with guidance only when required.

Funding agencies can facilitate intersectoral mobility by providing funding for industrial programmes and thus help early-career researchers to switch careers at the post-PhD stage[99]. Where collaborative research projects between universities and industry for postdoctoral researchers are not possible, universities could still leverage their networks to connect postdoctoral researchers with mentors within the non-academic sector.

Cambridge-Africa Partnership for Research Excellence (CAPREx): International university in partnership with two African universities

The Cambridge-Africa Partnership for Research Excellence (CAPREx) programme is a postdoctoral fellowship programme borne out of a partnership between the University of Cambridge in the UK (an international university), Makerere University in Uganda, and the University of Ghana in Legon, Ghana (both African universities, but in two countries).

Established in 2012, the postdoctoral fellowships offered through this programme enable researchers from the partner institutions to develop the skills, networks, and vision to become internationally recognised, established researchers. The aim of CAPREx is to strengthen Africa's capacity for excellence in research through building research capacity and promoting the retention of the brightest academic staff at the two African institutions of the partnership.

Staff members from the University of Ghana and Makerere University who are awarded the 1-year CAPREx postdoctoral research fellowships spend between 1 and 6 months at the University of Cambridge. Here they work with collaborators from the University of Cambridge on research projects with relevance to building the research capacities at their home-institution departments. In addition, the fellows participate in several capacity-building initiatives to enhance their research skills, including seminars and training workshops, and are provided with numerous networking opportunities to expand their research networks.

The programme is funded by CCNY, the Isaac Newton Trust (at the University of Cambridge), and the ALBORADA Trust.

10.3. INCENTIVISING GOOD PRACTICE

Funding partners have a critical role to play in incentivising good practice through the requirements and incentives that they embed within the programmes and initiatives they fund. In particular, national funding agencies or science granting councils can play an important role in shaping good practice at the national level and leading monitoring, evaluation, and learning efforts to understand programmatic impact and value.

Setting guidelines and standards. National funders and Pan-African bodies can assist in setting standards with regards to appropriate compensation and benefits through the development of internal policies and national/continental guidelines that speak to a consistent designation of who qualifies to be a 'postdoctoral researcher'[100], what appropriate remuneration is, and what minimum expected employment benefits should be. Funders also need to be cognisant of imbalances in financial management and administration capacities

between partner institutions that may impact on relationship building and meeting funder requirements for joint projects. Such challenges are addressed in ad hoc and often time-consuming ways, while funders could help by requiring robust operational plans upfront that could lead to more systemic solutions.

Developing and funding stand-alone career-development opportunities. Funders can also play an active role by investing in stand-alone training and career-development opportunities for the early-career researchers that they fund, including training in professional competencies and transferable skills, management, and leadership skills. Funding could also be provided for networking activities, including travel grants for attending conferences and seminars. Funding for time away or residencies should also be integrated where possible. Funding agencies can also play an important role in removing the obstacles associated with researcher mobility through providing family support, relocation support, and return funding to help researchers reintegrate into their home country[101].

An increasing number of universities are engaging their early-career researchers in university tasks other than research through expanding their job descriptions to include tasks like teaching, outreach activities, and committee work. This practice is good for skills development for careers both inside and outside of academia. Funders can promote this practice through designating a part of the research grant awarded to fellows for participation in these types of roles and, in doing so, enhance their career development[102].

Ensuring appropriate compensation and benefits. Funders should ensure that early-career researchers funded through their programmes receive appropriate compensation and benefits. If stipends are provided as funding for the postdoctoral fellow, funding agencies should minimise the disadvantages associated with stipends by offering benefits and allowances for travel and family support, including maternity and parental leave[103].

Holding institutions and PIs accountable. The term 'postdoctoral researcher' should only be used when describing an early-career researcher who is receiving advanced training in research. Before providing funding for such positions (either independently or integrated into established researcher grants), funding agencies can request evidence that advanced research training will indeed be carried out during the funding period. In so doing, they can protect postdoctoral fellows from being exploited as inexpensive labour.

When funds for early-career researchers are embedded into grants for senior researchers, funders should require that grant applicants provide information related to the capacity-development components that will be built into the fellowships, the salary that the early-career researchers will receive, and the mentoring that will be available. This can ensure that a basic code of practice is followed that will enhance the post-PhD experience for early-career researchers[104].

Along the same lines, funding agencies can counteract the increasingly observed phenomenon of the 'perennial postdoc'. Ideally, appointments for a researcher designated as postdoctoral researcher should not total more than 5 years. National funding agencies can track the number of years that an early-career researcher has been working in a post-PhD capacity through assigning a unique identifier to each individual at the start of their

first post-PhD appointment. Funding grants can then be designed in such a way that they distinguish between early-career researchers who have been involved in post-PhD research for more than 5 years. Post-PhD researchers in the 'less-than-5-years' category can be considered as still being in training. However, those in the 'more-than-5-years' category should be seen as employees and be afforded the appropriate pay, benefits, and status.

Leading national/continental monitoring, evaluation, and learning efforts. Funders are in a position to collect data on the early-career segment of the workforce to help analyse, report, and disseminate information on research and development trends that is relevant and useful to practitioners, researchers, policymakers, and the public. They can furthermore promote good data-collection practices by giving preference to institutions with outcome data available for their early-career researchers when awarding grants. That said, the mandate for collecting data and keeping track of the early-career workforce does not have to rest solely with research-funding or -performing organisations. Other national-level bodies – for example, professional societies – could also be tasked with collecting data on the early-career population and thus ease the pressure on research-funding and -performing organisations.

Collaborating with academic institutions. It is recommended that funders and host institutions regularly interact with one another regarding the structuring of research careers.

Communication and coordination between the funding bodies, including government, business, national academies, philanthropies that fund research, and university representatives, are necessary to ensure that early-career researchers and all other stakeholders derive maximum benefits from the post-PhD experience[105].
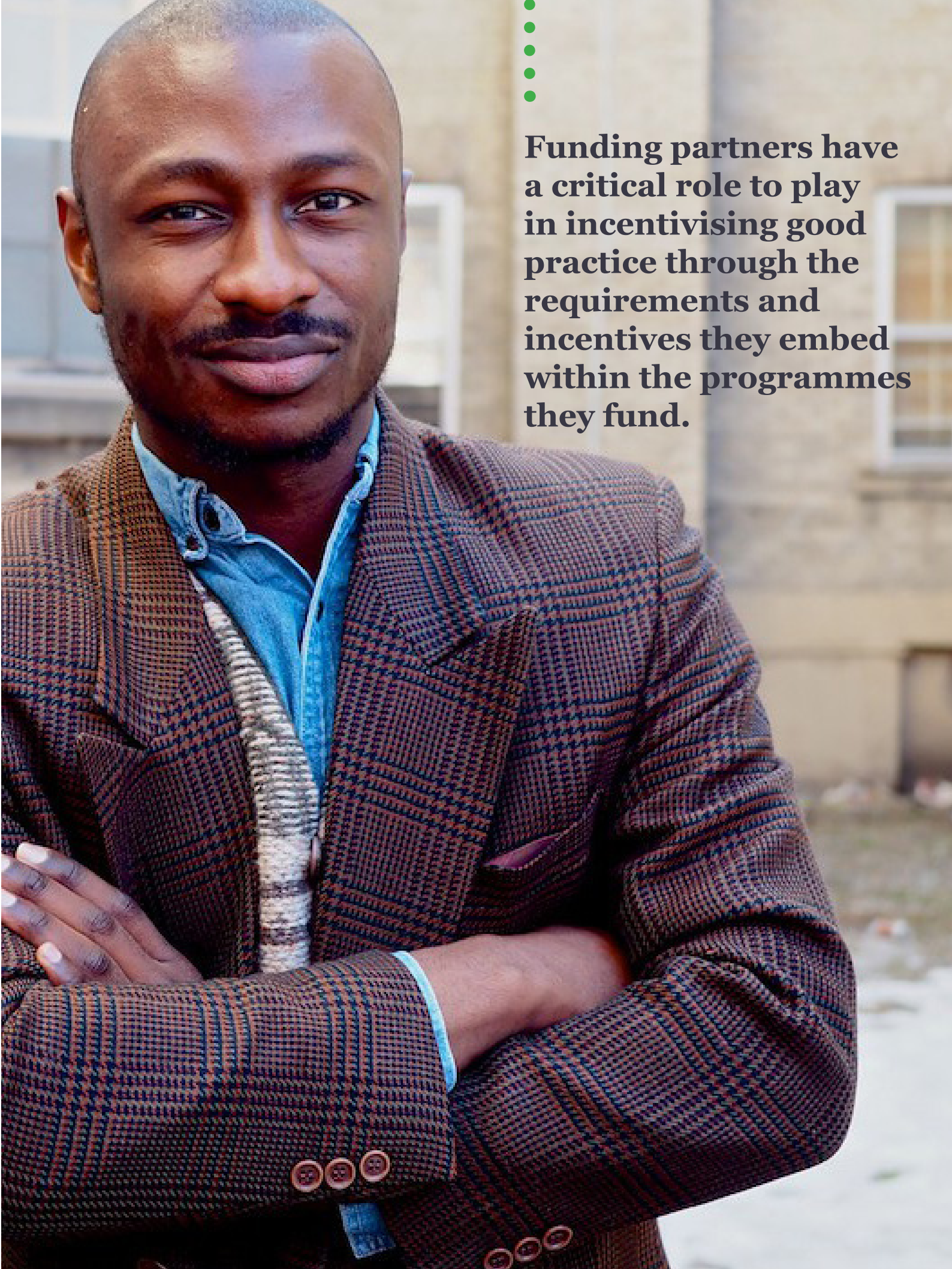
Creating spaces for shared learning. As the number of programmes to support researchers in the post-PhD phase increase across Africa, institutions, networks, programme teams, and funding partners can benefit from a common platform for sharing experiences, practices, and lessons learned. Such platforms could be used to strengthen or establish own practice according to institutional context, rather than each institution having to re-invent the wheel or deal with each post-

PhD fellow or programme on a case-by-case basis. A shared learning platform could be both virtual (providing electronic resources in a repository) and physical (providing opportunities for institutional exchange visits for project teams or administrators). Communities of practice for administrators of programmes hosted within a common platform could provide valuable opportunities for training and capacity development.

Science councils and other Pan-African entities (such as the Association of African Universities [AAU]) are ideally positioned to lead and support such efforts due to their wide reach and mandates. Collaboration with, or support to, research management associations (such as the Southern African or West African Research and Innovation Management Associations – SARIMA and WARIMA) could be explored for the creation and hosting of a shared learning platform.

Funding partners have a critical role to play in incentivising good practice through the requirements and incentives they embed within the programmes they fund.
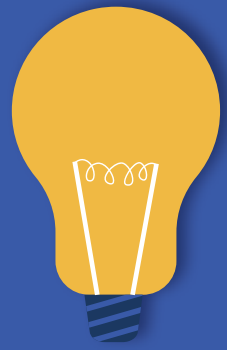
Looking into the future: the career pipeline

11

What happens to fellows after they complete the fellowship – the so-called post-post-PhD phase – is a concern for programmes where fellows are not yet full-time employees within academic institutions.

Even after completing a fellowship, many fellows will face significant challenges in establishing an academic career. In particular, securing funding to continue their independent research after (and in some cases, during) the fellowship is one of the most significant hurdles that must be overcome. Grant-proposal-writing workshops or personalised coaching have value, but the systemic challenges early-career researchers face are far more complex.

Determining how to overcome these challenges and support fellows to create sustainable, long-term career pathways is an area in need of attention. A broader conversation among funders, institutions, and programme designers is needed to identify potential solutions.

Determining how to overcome challenges and support fellows to create sustainable, long-term career pathways is an area in need of attention.

Appendix A ·················

Detailed Programme Descriptions

AESA–Regional Initiative in Science and Education (RISE)

Background	The Alliance for Accelerating Excellence in Science in Africa (AESA) is an agenda-setting and funding platform established by the African Academy of Sciences (AAS) to catalyse investments, strategies, and programmes that promote the brightest minds in Africa, foster scientific excellence, inspire research leadership, and accelerate innovation. The Regional Initiative in Science and Education (RISE) is a component programme of AESA and is a successor to a previous Carnegie-funded master's and PhD support scheme that ended in 2017.
Network	AAS
Aim and objectives	To train postdoctoral researchers to support globally competitive research in African universities and contribute to the creation of knowledge-based economies on the continent. To provide a quality and structured postdoctoral training programme to nurture the next generation of researchers. To promote the production, reproduction, and transition of knowledge.
Fellowship types	No fellowship sub-types.
Length	3 years.
Target group	The fellowship is open to all RISE/Carnegie-funded PhDs. Applicants need to have broad institutional support for protected research times, complementary resources, travel time, leave to work in an affiliated institution for up to 6 months, as well as clear prospects for staff establishment and career progression in their home institutions.
Disciplinary focus	Not a discipline-specific programme.
Country focus	In 2019, AESA-RISE supported seven postdoctoral researchers from Nigeria, Botswana, Malawi, Kenya, Uganda, and Tanzania.
Selection processes	Applicants need to submit a comprehensive research proposal of 2,000 words with a 200-word summary in which they demonstrate a thorough understanding of their research area. Applicants must have obtained a PhD not more than 7 years prior, and preference is given to interdisciplinary research areas that are critical to sustainable development in Africa and complementary to other AESA programmes. Applications undergo expert review, followed by in-person interviews and a final decision by the Steering Committee.

Structure	• **Capacity building** Leadership capacity building and other capacity-development workshops to address critical gaps. • **Mentorship** Structured mentorship component. • **Time away/residency** An optional residency component outside of the fellow's country of full-time employment.
Funding provided	The programme includes 3 years of funding. The full cost per fellow is a maximum of USD 144,447.10. This covers the following expenses: • Direct research inputs/running costs. • Home-institution support at USD 500 per month (pm). • Fellow's salary pegged at an average of USD 1,400 pm to cater for salary top-ups at 3% annual increment. • Fellow's external stipend while on 3-month study abroad. • Fellow's travel costs for the 3-month research/mentoring visit. • Allowances for technicians calculated at USD 250 pm for one technician per fellowship for 8 months per year. • Cost of mentorship. • Networking and collaboration costs in Year 2, which include establishing a community of practice. • The costs of accommodation, travel, meal visas, and any other costs directly related to a fellow's participation.

African Humanities Project (AHP)

Background	The African Humanities Project (AHP) was created through a partnership between the Carnegie Corporation of New York (CCNY) and the American Council of Learned Societies (ACLS), with the first fellowships awarded in 2009. The need for such a programme arose due to the humanities being deprioritised and pushed to the lowest rung when it came to the allocation of funds for PhD dissertations and post-PhD writing. The purpose of the AHP is to provide a year free from teaching and administrative responsibilities for early-career academics to complete their first major research project following their PhD. The AHP requires a single publication (book, article, or monograph).
Network	AHP in partnership with the New-York based ACLS.
Aim and objectives	The overarching aim of the AHP is to invigorate doctoral training and research in the humanities in Ghana, Nigeria, South Africa, Tanzania, and Uganda. Its primary objectives are to: • Encourage and enable the production of new knowledge and new directions for research. • Strengthen the capacity of early-career researchers and faculty at African universities by offering a year free from teaching for revising their dissertation for publication or for their first major research project after their PhD. • Build the field of humanities by establishing networks for scholarly communication across Africa and with Africanists worldwide. • Offer a peer-reviewed, Africa-centred mechanism for soliciting and evaluating fellowship applications and for distributing fellowship stipends.
Fellowship types	No fellowship sub-types.
Length	10–12 continuous months (one academic year).
Target group	Scholars in the humanities who graduated no more than 8 years prior.
Disciplinary focus	Not a discipline-specific programme.
Country focus	Fellowships are awarded to scholars resident in Nigeria, Ghana, Tanzania, Uganda, and South Africa – irrespective of nationality.
Selection processes	**Selection is based on the following criteria:** The intrinsic interest and substantive merit of the work proposed, the clarity of the intellectual agenda, the feasibility of the proposed workplan, the record of achievement of a postdoctoral scholar and the promise of a PhD candidate, and the contribution the work is likely to make to scholarship on the continent and worldwide.

Structure	• **Capacity building** Fellows undergo a rigorous development and peer-review process of their publications, which is overseen by the Series Editors. They may also apply to attend a manuscript-development workshop to discuss their manuscripts with AHP mentors and other fellows in a week-long, intensive retreat. • **Mentorship** There is no formal mentorship component of the programme, although informal mentorship relationships often form during the residency component (see below). • **Time away/residency** Optional 2-to-3-month residential stay at an institution outside of the fellow's home country.
Funding provided	The AHP provides for a stipend, books, media allowances, and a 2-to-3-month residential stay at an institution outside of the fellow's home country (although this is not a requirement).

Building a New Generation of Academics in Africa (BANGA-Africa), University of Ghana (Ghana)

Background	The BANGA-Africa programme commenced in 2017 and was developed to provide PhD candidates who have completed their programmes with further mentoring and postdoctoral support to consolidate the skills required during their PhD training and ensure they are well grounded in terms of research capacity and capability for delivering high-quality research outputs. In addition to funding and relief from administrative and teaching duties, the programme provides a number of structured developmental components. The programme provides for 3 months away from teaching/administrative duties for a visit to another institution, which fellows must use within 1 year of the fellowship being awarded. Additionally, a seed research grant of 1 year is available to some fellows.
Institution	University of Ghana.
Aim and objectives	BANGA-Africa aims to consolidate research capacity of early-career University of Ghana faculty to enhance their research productivity and ability to contribute effectively to global knowledge generation.
Fellowship types	No fellowship sub-types; however, some fellows get a seed research grant in addition to the time-away and training opportunities.
Length	1 year.
Target group	Full-time academic staff at the University of Ghana who were employed as academic faculty within the last 5 years and earned their PhD no more than 5 years ago.
Disciplinary focus	Not a discipline-specific programme.
Country focus	All fellows are Ghanaian.
Selection processes	**The steps in the selection process are as follows:** (i) Call for applications (sent via email to all University of Ghana staff members); (ii) submitted applications are checked to ascertain eligibility; (iii) applications are reviewed by two senior academics from relevant discipline(s); (iv) after the review process, qualifying applications move to the next stage. *To qualify for the seed research grant:* More detailed proposals are requested, panel interviews are conducted, and awards are given to candidates who score 70% or higher. *For the time-away component:* Interviews are conducted by panels, and awards are given to candidates who score 70% or higher.

Structure	• **Capacity building** Fellows are able to participate in proposal-writing-skills training, write-shops, academic-writing clinics, and career-development seminars. • **Mentorship** Formal mentoring is offered as part of the fellowship. Beneficiaries are required to work with mentors and/or collaborators. Some of the beneficiaries opt to work with senior academics with whom they worked during their PhD studies. • **Time away/residency** Residency outside the home institution is required for fellows who are selected for this component (time-away grants).
Funding provided	Funding is provided for the following: equipment, consumables, travel, administrative expenses, dissemination (including publications), stipend/subsistence allowance, accommodation, and insurance (travel and health).

Consortium for Advanced Research Training in Africa (CARTA)

Background	CARTA is a large-scale programme coordinated between eight African universities, four Africa-based research centres, and eight non-African partners, with funding from a large number of international donors.
Network	CARTA (jointly led by African Population and Health Research Centre [APHRC] and the University of Witwatersrand).
Aim and objectives	CARTA is trying, in part, to shift the institutional cultures at participating institutions by enabling the movement of postdoctoral researchers. The primary objectives of the programme are as follows: • Time for academics to pursue research. • Development of an independent project. • Publishing. • Development of a grant proposal for funding. • Exposure to a different research culture. • Receiving mentorship and providing mentoring to upcoming researchers. • Dissemination of research work at international conferences. • Formation of appropriate research-related networks and partnerships.
Fellowship types	Two sub-types – namely, re-entry grants and postdoctoral fellowships. CARTA focuses on the early-career employees of partner institutions through two pathways: traditional postdoctoral training awards and CARTA re-entry grants. Postdoctoral training awards are tenable at CARTA-affiliated research centres (typically in a different country from the fellow's home institution) and employ a mix of strategies to develop in-depth skills in the fellow's area of research as well as general research-leadership skills. CARTA offers both traditional fixed-term (1-to-2-year) fellowships and short-term repeat visits to accommodate women with children and staff-stretched university departments. CARTA re-entry grants target fellows returning to (or remaining at) their own institutions upon completion of their doctoral training. The re-entry grants are designed for graduates who cannot travel away from their home bases for postdoctoral training, especially women with children. The fellows must identify research-supportive environments at their home institutions that can provide mentorship and opportunities to network and learn specific skills and must write high-quality research proposals that have the potential to lead to larger research programmes.

	The uptake of re-entry grants has, generally, been higher than traditional postdoctoral fellowships, likely because some early-career researchers cannot leave home for long periods of time and thus cannot take up a traditional fellowship at a research centre.
Length	1 year.
Target group	PhD graduates that are staff of participating institutions.
Disciplinary focus	Public and Population Health.
Country focus	CARTA supports researchers in Ghana, Kenya, Malawi, Nigeria, Rwanda, South Africa, and Tanzania.
Selection processes	The selection process involves a competitive call reviewed by external experts (usually from Northern partners) based on quality of science. The CARTA Secretariat carries out the preliminary review of applications. External reviewers then make recommendations from a pool of shortlisted applicants, and the recommended applicants are given final approval by the Board of Management.
Structure	• **Capacity building** In addition to their own research, postdocs also get involved in curriculum design, PhD training, pedagogical training, and technical training. • **Mentorship** There are both formal and informal mentoring elements. Re-entry grants must include a visit to and from the out-of-home-institution mentor.
Funding provided	The following components are funded: travel costs, monthly stipend, funds for formation of new research collaborations and partnerships, funds for development of pilot projects, funds for training opportunities on specific research skills, and international conference attendance.

Developing Emerging Academic Leaders (DEAL), University of Cape Town (South Africa)

Background	In response to a 2009 joint statement by the Network of African Science Academies that *'Africa needs an additional one million researchers to address its critical needs'*, the initially named Next Generation of Academics in Africa (NGAA) programme (2011–2016) subsequently grew into the so-called Developing Emerging Academic Leaders (DEAL1) programme (2017–2020) and DEAL2 programme (2020–2023) at the University of Cape Town (UCT). These programmes were developed to strengthen the capacity for research leadership in Africa of researchers from Africa. Fellows received 3 years of funding for NGAA and DEAL1, and receive 2 years of funding for DEAL2, coupled with research-leadership training that includes a customised four-day residential writing retreat. The emphasis of the programme is on academic outputs (e.g., conference papers, journal articles, grant applications). Fellows are encouraged to take part in inter-university research projects across the continent and, in some cases, have been supported to spend time at partner institutions.
Institution	UCT.
Aim and objectives	The overarching objective of the DEAL programme is to address the gap in the development pipeline that occurs between graduating with a PhD and establishing oneself as an independent researcher in the field. The programme aims to strengthen the capacity for research leadership in Africa of researchers from Africa and ultimately for Carnegie fellows to take on research-leadership roles in African universities, especially in fields crucial to Africa's development.
Fellowship types	Free-standing and transitional for PhD students, postdoctoral fellows, and junior research fellows.
Length	The first NGAA and DEAL1 programmes offered 3-year fellowships, and the subsequent DEAL2 programme offers 2-year fellowships.
Target group	The DEAL1 programme targeted Carnegie-funded NGAA alumni only, while the subsequent DEAL2 programme has an open call for postgraduate students and postdoctoral fellows who show strong potential to become research leaders.
Disciplinary focus	Infectious Diseases, Economics, and Civil Engineering.
Country focus	The current DEAL2 programme supports researchers from 16 African countries.

Selection processes	**Selection criteria for the fellowship are as follows:** For the DEAL1 programme, fellows had to be Carnegie-funded NGAA alumni. For the subsequent DEAL2 programme, it is an open selection: all fellows have to show strong academic accomplishments (e.g., publications and conference presentations) and potential for taking on the role of research leadership. There are gender and race considerations (with specific targets outlined for the number of black and female applicants).
Structure	• **Capacity building** All fellows are required to attend a research-leadership course (four-day residential, customised course) and a writing-for-publication retreat (three-day residential programme) or writing workshops. Where fellows have not yet attended a retreat/workshop on supervision practices, they are encouraged to do so. An extensive suite of workshops for both academic- and professional-skills development is on offer. • **Mentorship** There is a formal mentorship component, with each fellow being assigned a PI to serve as mentor and, in some cases, an additional mentor is appointed. In Civil Engineering, a teaching mentor assists fellows in developing teaching strategies, preparing content, course administration, exam setting, and marking. Residentials and workshop retreats also entail being mentored. • **Time away/residency** A requirement is that fellows are embedded in a joint research project with an African or international university and they are encouraged to spend time at partner institutions.
Funding provided	Components funded are as follows: stipend and publication fees, attendance at a four-day residential customised programme on research leadership, attendance at a three-day writing retreat, one shared academic meeting (e.g., a research day), and one social function (e.g., a dinner or an outing) per year. The NGAA and first DEAL programmes did not cover conference costs. The current DEAL2 programme does offer a limited conference fund for each fellow which typically needs topping up from other sources, such as PI funding, the UCT-postdoctoral conference fund (very competitive), or the Institute for International Education (usually two global calls per year targeting Carnegie fellows from all over the world).

Early-Career Research Leader Fellowship (ECRLF), Future Africa, University of Pretoria (South Africa)

Background	Future Africa recognised the need for transdisciplinarity as a new frontier for research communities, given that traditional definitions of research excellence and training have been shown in recent decades to be unsuccessful in resolving complex problems facing the future of society and the planet. The Early-Career Research Leader Fellowship (ECRLF) was designed to produce a new generation of transformation-minded science leaders by creating the capacity to develop interdisciplinary research teams who can develop new knowledge to respond more effectively to the risks and opportunities of global environmental change.
	Fellows are from seven African nationalities and represent diverse disciplines including: African literature, animal production and nutrition, bioprocessing, cultural studies, epidemiology, food science and agricultural economics, history, microbiology, population studies, and plant chemistry.
	The first year of the programme focuses on skills development of the individual, surveying the research landscape, and setting up transdisciplinary collaboration. The second year of the fellowship focuses on implementation of the designed research project, including regular peer reflection and assessment. The programme additionally includes a structured leadership development component, with a strong focus on developing science-communication skills.
Institution	UP.
Aim and objectives	The ECRLF programme has an overarching objective of encouraging transdisciplinarity in research to connect the humanities, social sciences, and natural sciences for joint problem solving. Its specific aims are as follows: • Research skills development. • Leadership skills development. • Advancing inter-and transdisciplinarity for the bioeconomy. • Building bridges between home institutions for the future. • Active linkage with a Pan-African network of researchers.
Fellowship types	No fellowship sub-types.
Length	2 years.
Target group	Former CCNY-supported PhD graduates who are faculty of or have a continuing research position at a research institution. Applicants must be active in research and teaching at an African institution. Furthermore, applicants must have a sustained record of outstanding scientific or scholarly outputs, have an interest in translating and communicating the results of their work for impact in society, demonstrate leadership ability in research and beyond, and have an interest in collaborations across disciplines and sectors.

Disciplinary focus	Not a discipline-specific programme.
Country focus	The ECRLF programme supports researchers from Ghana, Kenya, Malawi, Mauritius, Nigeria, Uganda, and Zimbabwe.
Selection processes	Fellows are selected into the programme based on their display of having a compelling vision of their future involvement in the development of research projects, programmes, human capacity, specific policies, or societal structures. The selection process also takes into consideration that a diversity of culture, subject background (natural sciences, social sciences, and humanities), age, and gender is displayed among the selected fellows.
Structure	• **Capacity building** In terms of capacity building, the first year of the programme focuses on skills development of the individual. During the second year of the programme, fellows complete their projects and present them at the second leadership development training intervention, which consists of a 3-day, intensive on-site workshop. The programme also has a leadership development component, which uses a highly interactive approach to training, application of skills to a leadership project, peer support, and mentorship. Fellows attend an initial 5-day intensive on-site programme, cycling between theory, application, and reflection. Other structured training includes: approaches to inter- and transdisciplinary research; leadership for research programme development; science communication and advice for knowledge transfer; and critical research skills, such as writing, project design, and measures of excellence. • **Mentorship** The programme offers a structured mentorship system at both the home and host institutions. Fellows are paired with a career mentor at Future Africa, in addition to a research mentor. Guidance is given for the expectations from such mentorship relationships, including support for 'upward connection' in the research system and discussions on an academic career, structures and systems, and research programme and institutional development. The fellows are also expected to mentor four Future Africa resident PhD students to share their experiences from training workshops with these students. • **Time away/residency** The programme requires that the fellow spends at least 70% (8–9 months) of the academic year at the Future Africa Campus of UP for development. Training and development components of the programme require on-site engagement with a number of different audiences for the duration of the stay at Future Africa. These components are integrated into an overall schedule to allow for participation in the advanced workshops and other skills-transfer mechanisms envisaged to ensure the efficacy of the fellowship.

Funding provided	Full accommodation, meals, one return ticket a year, research running costs (including operational costs that are validated as necessary running costs to do the research), all costs for attending one conference a year, and an allowance for the host university supervisor to travel to the fellow's home institution. The supervisor's travelling allowance covers airfare to the fellow's home institution, local transportation during the visit, hotel accommodation, and a daily subsistence allowance. The fellowship does not cover costs for visas, vaccinations, medical insurance, and travel not related to the academic content of the programme.

Global Change Programme, University of the Witwatersrand (South Africa)

Background	The Carnegie grant to the Global Change Institute currently supports early-career researchers to establish an independent, viable, and fully funded research programme. The programme also aims to elevate the visibility of research conducted by young Africans and to strengthen their science-communication skills. The programme was rolled out in three phases: Building the Next Generation of African Scholars (Phase 1), Postgraduate Training and Research Programmes to Advance Scholarship and Improve the Retention of African Academics (Phase 2), and Nurturing the Next Generation of African Scholars (Phase 3).
Institution	University of Witwatersrand.
Aim and objectives	• Develop young African scientists to establish an independent, viable, funded research programme. • Develop young African scientists to be internationally recognised through reputable research publications. • Elevate the profile of young African scientists by disseminating their research findings on national and international platforms and by developing better science-communication and -leadership skills.
Fellowship types	No fellowship sub-types.
Length	1 year (subject to renewal based on performance assessment).
Target group	Postdoctoral, early-career researchers from the Southern African region. Preference is given to GCI/CCNY alumni, but if too few of these alumni apply, the programme is open to all applicants.
Disciplinary focus	The focus is on global change. Disciplines represented include energy transitions, urban planning and migration studies, nanotechnology and water purification, natural resource governance, remote sensing for seasonality studies, food security, and climate modelling.
Country focus	The current round of funding is supporting seven early-career researchers from South Africa, Kenya, Zimbabwe, and Tanzania.
Selection processes	Selection criteria are as follows: excellence; novelty (defined per discipline); interdisciplinarity (or relevance to global change); transformation; relevance to the discipline; quality of the proposal; and application pack (CV including academic record, concept note, and references). A small selection committee discusses awards based on these criteria and creates a shortlist. Interviews are then held with shortlisted applicants.

Structure	• **Capacity building** Formal mentorship includes capacity building through training, courses, seminars, and one-on-one research training. • **Mentorship** Fellows benefit from more formal mentorship through peer training, courses, seminars, and one-on-one sessions with the programme director. The programme includes a strong focus on self-actualisation and building the confidence of postdocs to engage with high-level professors. Feedback from previous cohorts indicated that they have received enough training over the course of their careers, and the programme has therefore shifted to a more informal process of mentorship, one-on-one research training, and relationship building with senior professors. • **Time away/residency** Fellows and postdocs are required to be in residence at Wits, which is a key enabler of the informal mentoring that occurs as a core component of the programme.
Funding provided	Each fellowship has a research stimulus package consisting of: an MSc bursary, salary (not a stipend, with income tax), research running costs (project management), travel funds, field costs, conference attendance, and a competitive element to co-host one of a limited number of postdocs and an international scholar.

Nurturing the Next Generation of African Scientists (NNGAS), University of the Witwatersrand (South Africa)

Background	Nurturing the Next Generation of African Scholars is Phase 3 of the Global Change Programme discussed above.
Institution	University of the Witwatersrand.
Aim and objectives	The overarching objective of the NNGAS programme is to address the growing concerns about the decline of research-based medicine in South Africa, often caused by the increasing workload experienced by clinicians in the academic hospital environment. The programme aims to continue developing the research skills of emerging clinicians and to provide dedicated research time while allowing the continuation of their clinical practice.
Fellowship types	No fellowship sub-types.
Length	2 years.
Target group	Carnegie Clinician Scientist PhD Programme graduates. Preference given to females and applicants of colour.
Disciplinary focus	Clinical Medicine.
Country focus	All NNGAS fellows are South African.
Selection processes	Postdocs must have successfully obtained a PhD as a fellow of the Carnegie Clinician Scientist PhD Programme and submitted a realistic and well-motivated application outlining their proposed activities during the 2 years of postdoc fellowship.
Structure	• **Mentorship** Each fellow chooses their own mentor (often their PhD supervisor). The Director of the programme also assists with mentorship. • **Time away/residency** Residency is not expected but encouraged if it would be helpful for the fellow's research.
Funding provided	The following funding is awarded per annum: funds for buyout of time, running costs, equipment costs, research assistance, and conference attendance and travel.

Nurturing Emerging Research Leaders Through Postdoctoral Training (NERLP), Makerere University (Uganda)

Background	The Nurturing Emerging Research Leaders Through Postdoctoral Training (NERLP) programme at Makerere University builds on a previous Carnegie-supported project at Makerere University – namely, Building, Nurturing and Retaining the NGAA. Some unique aspects of the NERLP fellowship are that it is team-based, including a PI, Co-PI, and two master's students. There is also a strong focus on developing science-communication skills, and funding is provided to try and elevate the position of research evidence in the policymaking process. A historical challenge at Makerere has been very siloed activities between colleges and departments, as they compete for external grant funding and are often unwilling to work together. Consequently, the NERLP tries to emphasise multidisciplinary research and collaboration between departments.
Institution	Makerere University.
Aim and objectives	The overall goal of the NERLP is to enhance the capacity of postdoctoral fellows to become research leaders in Uganda. The specific capacity-development objectives of the project are to: • Strengthen research capacity to conduct transformative research. • Increase the retention of postdoctoral fellows. • Build the capacity to communicate research outputs to both academic and non-academic audiences. • Research leadership. • Internationally recognised subject experts.
Fellowship types	No fellowship sub-types.
Length	2 years.
Target group	CCNY-supported PhD graduates in any discipline who are full-time employees at Makerere University. Applicants must have completed their PhD within the last 10 years.
Disciplinary focus	Not a discipline-specific programme.
Country focus	All NERLP fellows are Ugandan.

Selection processes	The NERLP selection process takes into consideration the following criteria: the quality and financial viability of the applicant's research proposal; the quality of the applicants , including their academic background, mastery of their discipline, and publication record; synopsis of an impactful research project and the relevance of this project to the National Development Plan (NDP), Africa agenda, and SDGs; and a multidisciplinary approach to research. At least 20% of fellowships are reserved for women.
Structure	• **Capacity building** The fellowship funds training/courses to enhance fellows' capacity to carry out high-quality, relevant research. • **Mentorship** Mentorship is a core element of the NERLP project and is conducted as per the Makerere Mentorship Policy. Mentors are vetted by an internal committee and formally appointed by the Director of Research and Graduate Training. Based on a needs assessment, career mentors and/or academic mentors are assigned to fellows. Mentors, fellows, and master's students conduct joint field activities, co-publish, share professional networks/collaboration, submit joint grant applications, and engage in joint supervision. • **Time away/residency** The NERLP programme is a retention grant, hence fellows remain at their workstation. They may engage in a short research residence (less than 3 months) at a regional institution.
Funding provided	The following components are funded by the NERLP project: Field work (field per diem, field transport, meetings with respondents, hire of venue, procurement of minor equipment and consumables, research assistants, IRB fee); field work supervision by senior faculty/mentor; benchmark fees; tuition and research funds for master's students; writing and publication funds; skills-enhancement training or courses; postdoctoral activities at the department; dissemination and outreach (workshop or science day); and travel grants for international conferences.

Wajao – Regional Universities Forum for Capacity Building in Agriculture (RUFORUM)

Background	The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) is a large-scale, African-owned, inter-university collaboration that seeks to build capacity for agricultural research across the continent. The RUFORUM postdoctoral fellowship, Wajao, seeks to enable individual early-career researchers to hone their research and supervisory skills while also building the capacity of institutions to provide the enabling environment required to retain top-tier research talent. The fellowship therefore seeks to work within the existing constraints of African institutions, while still building research and institutional capacity.
Network	RUFORUM.
Aim and objectives	The primary objectives of the Wajao programme are as follows: • Increase the ability of African universities to create an enabling environment to encourage the retention of the best researchers and to support their careers in the university. • Provide fellows with opportunities to hone their research and supervisory skills and strengthen both the home and host universities/institutions they are attached to. • Enhance effective regional and national research and teaching collaboration. • Strengthen the contribution of African universities to the global knowledge pool through research outputs in various forms.
Fellowship types	No fellowship sub-types.
Length	2 years.
Target group	African PhD graduates in Agricultural Sciences.
Disciplinary focus	Agricultural and Life Sciences.
Country focus	The Wajao programme supports researchers in Benin, Democratic Republic of Congo, Ghana, Kenya, Malawi, Nigeria, Uganda, Zambia, and Zimbabwe.

Selection processes	The selection criteria for the RUFORUM Wajao programme are as follows: The intrinsic interest and substantive merit of the work proposed, the clarity with which the intellectual agenda is presented, the record of achievement and the promise of the candidate, the contribution the work is likely to make, the proposed research area and the commitment to establish a research team and strengthen supervision skills, the effect the fellowship will have on the university and the expected future contribution of the fellow, and the feasibility of the work plan (bearing in mind constraints faced by many African institutions).
Structure	• **Capacity building** As part of the formal mentoring component of the fellowship, fellows also receive training from their mentors. • **Mentorship** The fellows receive mentoring and training by well-recognised scientists from within Africa, the diaspora, and other international partners. The mentor is responsible for collaborating with the fellow to create a research plan and to set goals, objectives, and expectations for the training programme. The fellowship is designed not only for the fellows to receive mentoring but also for them to become mentors, supervisors, and research leaders by forming teams with attached graduate students. • **Time away/residency** Fellows may complete a residency in another location, but they are not required to do so. The majority of fellows remain at their home institutions, as the fellowship is intended to improve retention of skilled researchers.
Funding provided	The fellowship covers a stipend, research costs, conference travel, and mentorship costs, along with other structured developmental elements.

Appendix B

Reference List

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Author Bios

Melody Mentz-Coetzee (BCom Honours, MCom, PhD)

Melody Mentz-Coetzee is a monitoring-and-evaluation practioner and researcher.

Her work has focused on theory-based mixed-methods approaches to evaluation and the evaluation of research and capacity development initiatives in Africa, with an emphasis on gender. She has worked as an evaluator in multinational contexts, engaged at national, pan-African, and international levels. Previously, she was an external member of the evaluation team for the African Women in Agricultural Research and Development (AWARD) programme, which is based in Nairobi (Kenya) and run in 11 African countries.

Dr Mentz-Coetzee is a co-author on national and international publications on the engagement patterns of undergraduate students and contributed several chapters to a social sciences research methodology textbook tailor-made for developing contexts. Most recently, she co-authored two book chapters focusing on agricultural education and training in Africa and the significance of doctoral education in Africa in the book *Education and Development: Outcomes for Equality and Governance in Africa* published by Palgrave MacMillan.

Currently working as a senior research fellow at the Centre for the Advancement of Scholarship at the University of Pretoria, she was the senior researcher on the PERKA project and is currently a Senior Researcher and Network Learning Lead for the Food Systems Research Network for Africa (FSNet-Africa) (www.fsnetafrica.com)

Marilet Sienaert (BA Honours, MA, PhD)

Marilet Sienaert is a research management professional and literary scholar who, prior to taking up the position of Executive Director for Research at the University of Cape Town (2001 to 2019), was professor in the Department of Modern Languages at the then University of Durban-Westville (now University of Kwa-Zulu Natal).

In her capacity as Executive Director for Research and member of UCT's Senior Leadership Group, she headed the Research Office, the Office of Research Integrity, the Postgraduate Studies & Researcher Development Directorate, and the Postgraduate Centre & Funding Office. Her remit included brokering partnerships through the International Alliance of Research Universities, Worldwide Universities Network, and African Research Universities Alliance.

She is a founding member of the International Professional Research Management Council and Chair of its Technical Review Committee – a quality assurance body to promote the professional and responsible conduct of research management.

Currently working as research consultant in the Centre for the Advancement of Scholarship at the University of Pretoria, she is also positioned as researcher at the University of Cape Town, with a return to the language and interdisciplinary research interests of her earlier career.