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ANALYSIS OF THE REGIONAL RESEARCH-FOR-DEVELOPMENT LANDSCAPE IN EASTERN AND SOUTHERN AFRICA: Actors, Trends and Drivers

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Report prepared for the
International Development Research Centre (IDRC)
Regional Office for Eastern and Southern Africa

June 5, 2023

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EXECUTIVE SUMMARY

Research-for-development (R4D) is about the production, diffusion and use of knowledge to address problems of developing countries. It is usually financed by funders (both public and private) from developed or advanced countries and conducted by various organizations (including universities, public laboratories, science councils, think tanks, research networks and non-governmental agencies) in either and/or both developing and developed countries. R4D focuses on any or a combination of the following: generating evidence for policy, producing new knowledge to improve the understanding of development problems, developing and applying new technologies to serve economically poor and socially marginalized people, and strengthening capabilities of developing countries to effectively engage in research and innovation.

This report is about trends in and drivers of R4D in eastern and southern Africa (ESA). Commissioned by the International Development Research Centre (IDRC), the report analyzes the R4D landscape or systems in the ESA region to inform IDRC's Strategy 2030 'check-in' or reflection. The analysis is based on (a) a comprehensive review of R4D actors' annual reports and some academic publications and development plans as well as research and development (R&D) strategies of ESA countries and regional organizations such as Regional Economic Communities (RECs) and the African Union (AU); (b) empirical information from an online survey with questions on key issues and aspects related to changes in the R4D landscape, including actors' configurations, their specific R4D priorities, key factors influencing choices of R4D priority areas, cross-cutting issues in R4D, challenges in R4D, and how emerging technologies (such as Artificial Intelligence and digital technologies in general) and modes of knowledge production (e.g. open science) influence R4D in ESA; and (c) interviews with individuals from a variety of professional backgrounds and organizations involved in R4D in various ways.

Below is a summary of the main findings and recommendations of the study.

1. ***There is an increase in the number and diversity of actors in R4D in ESA***—Actors (funders, Research organizations, advocacy agencies, research or evidence users and other stakeholders) in R4D have in numbers and variety. In the past decade, there has been a remarkable increase in the number of different think tanks (both independent and governmental ones), private universities, science councils, public universities, networks of research institutes, private consultancy firms, advocacy NGOs, and domesticate (national and regional) and international funders of R4D. Private universities are starting to compete with public ones for research fundings, a situation unwitnessed a decade ago. There are at least three key drivers of these new developments in the R4D landscape in ESA. The first is that international funders' portfolios and countries have increased, and today there are more philanthropic and bilateral as well as multilateral funders of R4D in ESA compared to a decade ago. The second driver is the expansion of political liberties and ease of registration of think tanks, private universities and NGOs in many ESA countries. The third driver, related to the other two, is the entry of more international or foreign Research organizations, particularly Northern universities, think tanks and private consultancies, into the ESA R4D space. This trend and its drivers raise challenges of how best to govern an expanding regional R4D system or landscape to ensure that research priorities are well aligned with pro-poor and sustainability agendas, and that resources are not thinly spread across the institutional terrain of research actors.

2. ***There has been a shift in R4D focus more towards social and humanitarian R4D and pro-sustainability innovation agendas***—Over the past decade or so, there has been a shift in the focus of national and regional R4D, from over-emphasis of basic and applied research in natural sciences

and technology development to a more pronounced research focus on political, social and humanitarian issues such as good governance, ecological stewardship, peace and strong institutions, and socioeconomic dimensions of climate change, and women empowerment and youth employment. This trend—the growing R4D focus on social and political dimensions of development--is to no small measure driven by the increasing recognition that many of the ESA countries' development challenges such as poverty, social exclusion, conflicts, political instability, and environmental degradation cannot be effectively solved by technological fixes or basic and applied natural sciences. Related to this, there is recognition that ESA countries' socio-political conditions influence the impact of R4D, and that R4D should be embedded in and informed by the political economies of these countries. The challenge for all actors in R4D is to ensure that they contribute to the creation of the right conditions for their interventions to make a difference in terms of addressing societal, economic and environmental problems in the countries. This includes creating a good balance between investments in natural sciences and social sciences as well as humanities in R4D systems.

3. **There is a rich and growing corpus of data or empirical evidence for public policy and innovation but relatively low uptake in many ESA countries**—Over the past decade many think tanks, science councils, universities and private consultancy firms in R4D have produced relatively rich amounts or volumes of data (or empirical evidence) on the nature and causes of as well as possible solutions to sustainability challenges in ESA countries and the region. For example, there is a large body of information and related policy options on how best to address social problems such as high levels of women and girls' exclusion from science, technology, engineering and mathematics (STEM) and education in general. There is also rich research-generated evidence on addressing problems such as the impacts of climate change, ambiguous property tenure systems and health inequalities on women and their contribution to sustainable development. However, there is limited uptake and use of the growing rich evidence to institute the right policy actions to empower women in the ESA region. Gender inequalities persist while decision-makers in ESA countries have or should have the empirical means to take policy action. Increasingly, the challenges are limited political capital and institutional inertia to institute the right policies to address gender inequalities and social exclusion in general. In this regard, inquiry into political and institutional barriers to policy action on the issues of women empowerment and youth issues (employment and inclusion in decision-making) is needed. R4D funders should consider investing in research on political economy of policy inaction on social exclusion problems.

4. **There is increasing networking of actors in R4D in ESA around specific programmatic agendas** (e.g., climate-water-food nexus and climate-gender nexus) and increasing support by many funders (and in many national STI policy frameworks) for multi-disciplinary R4D. As a result, there is a growing number of multi-issue networks and greater attention to knowledge sharing. However, the challenge is to *how to move into truly transdisciplinary research*. Networks such as those working on climate change are useful in mobilizing actors and resources to focus on specific R4D issues but are often not configured for transdisciplinary research needed to address complex interacting sustainability challenges. There is limited or low understanding of transdisciplinary research, what it is and how it is organized and conducted in ESA contexts. To address this need, IDRC and other R4D funders should explore possibilities of supporting initiatives that raise awareness of and help to develop good transdisciplinary practices in ESA.

5. **Domestic (ESA-based) private sector's participation in R4D is relatively low in ESA**. However, this is starting to change as foci of R4D is expanded to include issues such as cross-border trade and inter-regional trade. The entry into force of the African Continental Free Trade Agreement (AfCFTA) is stimulating greater participation of private sector in R4D around issues such as intellectual property protection and mobility of persons and goods as well as services. Some private

(business) associations such as chambers of commerce in ESA (countries and/ RECs) are funding think tanks to generate evidence on certain trade and investment dimensions of sustainable development issues. Some funders also support regional chambers of commerce to procure and use research in support of the implementation of trade and investment agreements such as AfCFTA. IDRC and other R4D funders need to forge more strategic research partnerships with regional chambers of commerce to support research that is of relevance to the private sector and encourage private sector to support R4D focused on the production of public goods.

6. **There are concerted efforts by most ESA countries' R4D actors to align their R&D priorities with UN Sustainable Development Goals (SDGs) and the AU Agenda 2063**. For example, with the support of IDRC and other funders, the Science Granting Council Initiative (SGCI) has supported Namibia and Mozambique to mainstream gender considerations into national science, technology and innovation (STI) policy frameworks. The challenge is the absence of locally designed methodologies and institutional capacities to 'practice' gender mainstreaming into STI and promote technological change that is sensitive to social, biological and economic needs of women and girls. In this regard, funders and governments need to support the institutionalization of policy toolboxes such as STI foresight and assessment to inform R4D priority setting and STI policy frameworks in general.

7. **Modes of knowledge production and governance of R4D are increasingly changing with the institutionalization of open science and rapid digital transformation of R4D systems**. ESA countries are among more than 180 UN member states that adopted the UNESCO Recommendation on Open Science in 2019 to make knowledge production and its sharing/dissemination more collective, mandatory and accessible to all levels of society. It is becoming a new norm that will facilitate more collaborative R4D. However, many R4D actors (funders, Research organizations and regulatory bodies) in ESA are not well prepared to engage in and with open science conceptualization and practice. There is limited understanding of what open science is and weak regulatory (institutional) frameworks for open science within countries and the region. It is only South Africa and Namibia that have launched national processes to develop open science policy frameworks. For ESA countries to leverage open science to address their development challenges, funders and science councils need to design and implement initiatives that build researchers' and research administrators' understanding of open science and how best to promote and practice it. Digital transformation (particularly building digital infrastructures) will help enhance open science and help ESA countries to leverage knowledge from global sources to spur research and innovation.

8. **Related to point 3 above, the demand, procurement and use of evidence generated by/from R4D need to be strengthened**. There has been a significant increase in R4D initiatives and large bodies of knowledge produced and technologies developed. However, the uptake of evidence and technologies is relatively low. This is mainly because R4D is not conducted or practiced using transdisciplinary approaches, and funders have focused more on strengthening the supply-side of R4D and not done much to *build dynamic R4D systems that include end-users* or potential beneficiaries of R4D. Because of this, the huge and growing body of knowledge (evidence) on how best address sustainability challenges (such climate change, social exclusion, economic poverty and hunger) is underutilized. Addressing this R4D deficit will require greater focus on strengthening policy institutions such as parliaments (both local and national assemblies). Funders and policy researchers need to pay more attention to 'inquiry into policy processes' and strengthen the capacities of legislative and other policy bodies to procure and use evidence. There is also need for the promotion of best practices of evidence for policy procurement and use, an important issue in science-for-policy studies that the SGCI may wish to address.

9. **Regional political and economic integration in ESA offers enhanced institutional space for R4D and stimulates new issues for research**. Regional Economic Communities (RECs) in ESA, mainly the Southern African Development Community (SADC), the East African Community (EAC) and the Inter-Governmental Authority on Development (IGAD) and the Common Market for Eastern and Southern Africa (COMESA), in addition to the AU, have set high-level priorities based on the SDGs or framed around climate action, industrialization, STI, food and nutritional security, and peace and security in the Horn of Africa, and other goals. Some R4D funders and Research organizations engage the RECs mainly as clients (potential users) for R4D and not necessarily as key intellectual actors that should be directly involved in framing research questions and helping to guide R4D processes in the region. Some RECs' secretariats have accumulated in-house research capacities and/or established their own think tanks, and thus are increasingly relying less on evidence or ideas generated outside their immediate circles. They are themselves sources of knowledge for development. However, many funders and think tanks tend to look at RECs as mere consumers not sources of knowledge. One interviewee for this study remarked: "Some RECs often ignore evidence generated by foreign funders' of research or their think tanks because they have their own sources of evidence from private consultants who they commission …., and some have established their own research offices." The issue is how R4D funders and Research organizations can strategically engage with and in the RECs as sources not necessarily recipients of knowledge. In this regard, building platforms on which RECs (EAC, IGAD, COMESA and SADC) in the ESA region and their think tanks participate in the co-creation of knowledge and policy experimentation would help researchers (research institutions, including think tanks) and the RECs to mutually benefit from their differentiated capacities.

10. **R4D in ESA should give more attention to building better understanding of local and traditional knowledge systems and generate policy relevant evidence on how ESA governments can integrate, promote and protect these systems for sustainable development.** There is scarcity of R4D focused on developmental roles of traditional knowledge and the rights of indigenous communities. In the 1990 and early 2000s, there was relatively robust research being undertaken on various aspects of traditional and indigenous knowledge systems in ESA. This was, in part, stimulated by the then ongoing negotiations on the Convention on Biological Diversity and national endeavors to entrench community rights in constitutions that were being developed across most of the region. Funders support non-governmental research bodies to conduct research on community rights issues. This trend seems to have waned. This study shows that issues of rights of indigenous communities, protection of intellectual property rights of the communities, and generally questions of communal resource tenure have fallen down the agenda of many R4D actors in the past decade or so. This may, in part, be due to increasing emphasis on global research agendas and over-inflation in R4D on 'new and emerging' topics. IDRC and other funders as well as ESA science councils (including the SGCI) should promote the creation of epistemic networks and R4D on issues on indigenous knowledge and community rights in ESA.

11. Another set of issues is on **the status and focus of sustainability science related research in ESA**. Sustainability science—much about the study of sustainability transitions or pathways—is a relatively new domain in R4D. This study established, based on review of bibliometric analysis and universities' websites, that the largest concentration on research on sustainability science is in South African universities (Stellenbosch University, University of Cape Town, University of Pretoria and University of Witwatersrand) with internationally funded programmes and/or institutes dedicated to various aspects of sustainability science studies. Most of sustainability science research being undertaken by or in these universities focuses on issues of climate change and the just energy transition, cleaner production and life cycle systems. Most of it has inter-disciplinary dimensions but gives limited attention to critical issues of political and environmental governance such as connections between climate change and conflicts and is empirically based on South African issues

and context. It is largely conceptualized and conducted in partnership with Northern universities and researchers. Most of it is less regional (ESA) in coverage or scope. Overall, sustainability science research is not being conducted in noticeable and conceptually coherent ways in most ESA countries. R4D funders, science councils and other stakeholders such as the African Research Universities Association (ARUA) should consider supporting the establishment of a network or 'community of practice' in sustainability science studies.

12. **There is a debatable view expressed by some interviewees for this study that some funders have supported the creation of think tanks and/or tend to channel support to their home country universities and private consultancy firms, and that this has contributed to the erosion of public universities' capacities to effectively engage in R4D.** Specifically, that many new think tanks have been established and attracted or taken researchers from public universities. That thinks tanks tend to pay more salaries and well-funded than public universities. Related to this is the view that many funders are promoting funding models that strengthen Northern universities and consultancy firms to conduct research in ESA with minimal or no engagement of local public universities. These are issues that require an informed discourse. This study just flags them because they impinge on the future roles of public universities in R4D, and how think tanks, consultancy firms and universities socialize and/or co-evolve to grow dynamic R4D systems in ESA.

13. Another important trend in and a driver of R4D in ESA is **increasing policy learning**. Some donor countries (e.g., Canada, Finland, South Korea and Japan) encourage and support some ESA countries to engage in benchmarking missions to learn how dynamic national research and innovation systems are configured and governed. Policy learning, not policy transfer, is about increased understanding by policymakers that occurs when they compare and synthesize different countries' policy processes and practices to their own. Finland through the Southern Africa Innovation Support Programme (SAIS) has supported several projects in Botswana, Zambia and Namibia to encourage policy learning. According to one interviewee, Namibia is reconfiguring its national research and innovation system based on the benchmarking missions and policy learning supported by SAIS, and it has integrated R4D in its National Science, Technology and Innovation Policy (2020-2030) and National Action Plan for the implementation of policy. Overall, funders should encourage and support ESA countries to engage more in STI policy learning.

In summary, the past decade or so witnessed major developments in R4D in both funder countries or organizations and ESA countries. There are many factors influencing R4D in ESA. The overall *there is increasing convergence between funders' and receipt countries' policies for or related to R4D*. The are two drivers of *R4D policy convergence*. The first is that there is greater effort to ensure alignment between funders' priorities and those of many countries (and regional and sub-regional bodies) in ESA. This is happening because both funders (particularly public ones) and ESA countries (using AU, RECs and sub-regional bodies) have established various common or joint forums for research and innovation priority setting. Examples include the AU-EU High-Level Policy Dialogue on Science, Technology and Innovation (HLPD on STI), the SGCI, the UN Commission on Science and Technology for Development (CSTD), and the new Global Forum of Funders (GFF). The challenge is that some ESA countries have limited capacities to participate in these forums to articulate their national and regional research and innovation priorities. **Capacity for science diplomacy and international cooperation in STI is thus a key need of ESA countries**.

The second driver of policy convergence is that all the ESA countries have some national development and STI policy frameworks in which they articulate their R&D priorities and, in some cases, R4D priorities. Though some are outdated (as in the cases of Kenya, Tanzania, Eritrea, Botswana, South Sudan, Zimbabwe and Mozambique), the STI policy frameworks are considered by many funders as important means for articulation of national priorities. Some donors use STI policy

frameworks and national development plans of ESA countries to formulate their R4D funding priorities, and some ESA countries use them in negotiating bilateral STI and development cooperation agreements. For example, South Africa has the largest number (at least 18) of bilateral STI arrangements with developed countries and the EU. There are growing Asia-Africa, and Latin America-Africa research partnerships informed or based on ESA countries own R&D priorities articulated in STI policy frameworks. Support to ESA countries to review and revise their development and STI policies to align them with the SDGs and Agenda 2063 will help to foster R4D in the region.

Overall, the policy environment for R4D has improved in the ESA region in the last decade or so. Both ESA governments, regional bodies and funders as well as practitioners of R4D need to get a more organized long-term strategy that will help them to leverage international partnerships in R4D for sustainable development. In fact, global challenges such as climate change, pandemics and epidemics, food and nutrition insecurity and the high burden of diseases are themselves levers to enduring international R4D partnerships. To strengthen ESA national and regional R4D systems, more attention should be put to building capacities of different actors, particularly think tanks and public universities to engage in knowledge production and dissemination, and capacities of decision-making bodies in executive and legislative arms of states to procure and use R4D evidence for public policy and action. In addition, funders can help to build enduring partnerships (based on trust and appreciation of differentiated capacities) between Northern researchers and local researchers (or institutes) in the ESA region so that there is *more peer-to-peer learning* as opposed to patronage in R4D. Furthermore, funders need to build their own capacities to articulate their strategic foci better and manage their expectations based on informed understanding of the diverse political and policy cultures of ESA countries. These issues need more careful reflection by all actors in R4D. IDRC and other funders may wish to stimulate dialogue on them.

1. INTRODUCTION

This study is about the regional research-for-development (R4D) landscape in Eastern and Southern Africa (ESA). It was commissioned for the International Development Research Centre (IDRC) Regional Office for Eastern and Southern Africa to analyze trends in and drivers of R4D in the ESA region to inform an overall reflection on IDRC 2030 Strategy. The study conceptualizes or defines R4D as the generation, diffusion and use of knowledge for development in developing countries supported by developed countries through a variety of institutional mechanisms in both groups of countries. R4D is receiving increasing attention in development and science, technology and innovation (STI) policy frameworks as well as plans of countries in the ESA region, and in development aid frameworks of developed countries and international organizations.

International development frameworks, in particular the Paris Declaration on Aid Effectiveness, the United Nations (UN) Agenda 2030 Sustainable Development Goals (SDGs) and related treaties such as the Paris Accord (Agreement) on Climate Change, the Convention on Biological Diversity and its Protocol on Biosafety, have principles and policy provisions on various aspects of R4D. For example, the Paris Declaration on Aid Effectiveness outlines the following principles related to R4D and development assistance in general: (a) ownership—developing countries should set their own strategies for sustainable development, particularly on poverty reduction, improving governance and strengthening institutions; (b) alignment—donor countries should align their support with priorities and strategies set by developing countries; (c) harmonization—donors should coordinate and share information to avoid duplication; (d) results—both developing countries and donors should focus on development results and get results measured; and (d) mutual accountability—donors and developing countries should be accountable for development results. These and other

agreed upon international development principles in various frameworks influence support for and practice of R4D.

There are various continental development frameworks such as the African Union (AU) Agenda 2063, the African Continental Free Trade Area Agreement (AfCFTA), the Action Plan for the Accelerated Industrial Development of Africa (AIDA), the African Union (AU) Gender Policy, the AU Strategy for Gender Equality and Women's Empowerment, the AU Health Research and Innovation Strategy, AU Science, Technology and Innovation Strategy for Africa (STISA-2024), the Comprehensive African Agricultural Development Programme (CAADP) and the African Youth Charter that define African R4D priorities, and are generally aligned with the SDGs. The 24 ESA countries[1] have subscribed or adopted the continental frameworks.

The are three main Regional Economic Communities (RECs) to which the ESA countries belong or are members of. These are the East African Community (EAC), the Southern African Development Community (SADC) and the Inter-Governmental Authority on Development (IGAD). These RECs have various frameworks or plans in specific development priorities and Research and Development (R&D) as well as science, technology and innovation (STI) priorities are set or outlined.

Some of the ESA countries have adopted long-term development visions and various national STI policy frameworks with explicit R&D and R4D priorities and plans. In general, common R&D priorities of these countries are or focus on food and nutritional security, health and wellbeing (emphasis on reducing the burden of disease), energy, drought and climate change, water and sanitation, and human resource development (education and training). These are aligned with international, continental and regional priorities, and many R4D initiatives in the region focus on addressing these to varying levels of intensity and in some cases, funders have tried to frame their programmatic interventions to link the countries' priorities with their strategic interests. Overall, there are frameworks that can help to foster greater alignment of funders' (donors' countries and organizations) strategic interests with priorities of ESA regional and national priorities.

This study shows that there considerable institutional (both normative and agency) growth and diversity in the region's R4D landscape or systems determined to a large measure by diversities in political and policy cultures, colonial legacies, governance structures and levels of socio-economic development. By normative institutional growth we mean that many countries are entrenching R4D issues in various policy frameworks (including regulations and laws). Agency type institutional growth is about the increasing numbers of different actors in R4D in the region, particularly think tanks (both independent and government ones), private funding foundations or philanthropic funders, networks, networks of networks, private universities, and policy advocacy organizations.

This first section has provided an introduction.

The second section of the study (report) provides a conceptual clarification of what constitutes R4D and why it matters. This is done because most interviewees for the study sought clarification, and some tended to confuse or interchangeably use R4D with related concepts of research and development (R&D) and research on development (RoD).

Section three of the study discusses the methodology which combined a desktop review, interviews and a survey.

[1] Countries in the ESA region are Angola, Botswana, Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Eswatini, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Seychelles, South Africa, South Sudan, Somalia, Uganda, Tanzania, Zambia and Zimbabwe. IDRC supports R4D initiatives involving 21 out of the 24 countries.

Section four is about the ESA context, with emphasis on geopolitical and economic outlook and regional and national development plans that influence R4D priorities in the region. It shows that the ESA region is diverse in many ways, particularly in terms of ecologies, languages, politics, problems, research cultures, institutional capacities (including research infrastructures) and economic endowments. Regional diversity influences R4D priorities and practices. Another key issue discussed in section two is the inter-dependencies of countries and shared or common sustainable development challenges in ESA. There is a growing recognition (among policy, political, donor, research organizations and civil society actors in R4D) of the need for regional and sub-regional initiatives to address sustainable development challenges. Exploiting economies of scale and fostering shared or collective learning as well as scaling the impact or benefits of R4D is

Section five maps the R4D landscape in ESA giving illustrative examples of various initiatives, particularly regional and sub-regional ones. Critical trends in R4D and their drivers are identified and analyzed. Among the key emerging issues emphasized in this section are: there is increasing emphasis by governments and donors to align research and innovation to specific sustainable development challenges (challenge-oriented and mission-oriented research and innovation); growing attention to and demand for science for policy and strengthening capacities of decision-makers to use evidence for and in policy-making; emergence of new R4D collaborative models among funders and among Research organizations; growing recognition of the importance of transdisciplinary R&D but relatively weak capacity to practice it; and increasing focus on and funding to research on social and humanitarian issues, and relatively few R4D initiatives on development and/or application of new technologies (e.g. Artificial Intelligence and genomics).

The sixth section analyzes trends in R4D on cross-cutting issues and questions that are directly related to IDRC current strategic (programmatic) focus with emphasis on the following: women and girls' empowerment in R4D and R4D that empowers them; governance and building state capabilities to use R4D; changing modes of knowledge production, sharing and use stimulated by open science and increasing digital transformation in R4D systems, the role as well as issues of regional economic/trade integration in R4D; AND innovative models of financing R4D among other issues that influence the regional R4D landscape in ESA.

The seventh and last section provides a synthesis of emerging issues and outlines implications and recommendations for IDRC's strategic programming. One of the key messages in the last section is that IDRC is an influential and strategic actor driving but also influenced by trends in the regional R4D landscape in ESA. Its support to and engagement in different R4D programmatic initiatives and policy processes are shaping the R4D landscape. IDRC should leverage its accumulated 'social capital' and learning over more than four decades of supporting and stimulating R4D on different development issues to strengthen the ESA R4D system.

2. RESEARCH FOR DEVELOPMENT: CONCEPTUAL ISSUES

2.1 What is and why Research-for-Development (R4D)?

The concept of research-for-development (R4D) has gained currency in the past two decades or so. It is now in the lexicon of many governments' policies, funding agencies, and academic research. Sometimes it is confused or used interchangeably with related concepts such as 'Research and Development' (R&D), and 'Research on Development' (RoD). Thus, it is important to provide conceptual clarity of what R4D means. There is a growing body of literature on R4D that helps clarify

what it is. Currie-Alder (2014)[2] and Habermann and Langthale (2010)[3] provide rich academic inquiries into R4D. According to Currie-Alder (2014, p. i), R4D has been "viewed as generating evidence on the effectiveness of foreign aid, inventing new technologies that serve poor people, and strengthening research capabilities in poor countries." It is research that is aimed at addressing problems of developing countries, including the strengthening capabilities of these countries to conduct research.

Some of the funders, both organizations and/or countries (e.g., Canadian IDRC and the United Kingdom), have varying conceptualizations or definitions of R4D. For example, the United Kingdom (UK) defines R4D as "research that is funded through ODA (Overseas Development), with the explicit aim that it should contribute to development outcomes for people living in" least and middle-income countries (LMICs).[4] IDRC defines R4D as "research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical and other knowledge to the economic and social advancement of those regions."[5] IDRC's definition of R4D provides flexibility to include non-ODA, private foundations, as actors in R4D.

Based on the UK and IDRC's conceptualizations, the key characteristics of R4D are: (a) developmental (including social) problem-oriented research, and not research the mere expansion of knowledge; (b) focused on the poor in developing regions of the world; and (c) the research is usually funded by public and private agencies from rich Northern countries and often performed by and/or with actors in the poor developing regions/countries.

Unlike R4D, R&D and RoD are not necessarily supported to benefit the poor in developing countries or regions. R&D (as defined below by the OECD) can be solely focused on issues or priorities of the rich in developed countries. It is not necessarily driven by pro-poor issues and can purposefully aimed at just contributing to the stock of knowledge. This is important because that knowledge may become useful in the future.

Research on development (RoD) focuses largely on the production of knowledge on development trends and issues. It is an inquiry into development policy and practice mainly conducted by social sciences and humanities to inform public policy, development assistance and R4D in general. RoD focuses on issues such as the political economy of sustainable development, donors' approaches and funding of development in poor countries. It is largely conducted by and/or for funding agencies and public bodies. Habermann and Langthale (2010, ibid) consider RoD as a part or form of R4D.

The Organization of Economic Cooperation and Development (OECD, 2015) provides an internationally accepted definition of R&D.[6] "R&D comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge" (OECD 2015, ibid, p. 28). Five main criteria that determine whether an activity is an R&D activity are: novelty, creativity, uncertainty, systematic, transferable and/or reproducible. R&D activities are generally undertaken

[2] Currie-Alder, B. (2014), Changing Governance of Public Research: Research-for-Development (R4D) Funders in the United Kingdom, Canada and Australia. Doctor of Philosophy Dissertation in Public Policy Carleton University Ottawa, Ontario.

[3] Habermann, B. and M. Langthale (2010) Changing the world of development research? An insight into theory and practice. *Development in Practice* 20(7): 771–783.

[4] Department for Business, Energy and Industrial Strategy (2020), Research for Development (R4D) Indicators: A Review of Funder Practice. www.gov.uk/beis

[5] IDRC (1985), International Development Research Centre Act, p.2. I-19.pdf (justice.gc.ca)

[6] OECD (2015), "Concepts and definitions for identifying R&D", in *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, OECD Publishing, Paris, https://doi.org/10.1787/9789264239012-4-en.

by firms, science councils, universities and national laboratories. Broadly, R&D tend to be confined to basic scientific research all the way to testing and refining products before commercial sale or use. This definition of R&D (as promoted by OECD and commonly used by governments in R&D surveys and priority setting) tends to exclude or give little attention to social sciences and humanities.

It is important to recognize that there is a nexus between R&D and R4D. In most developing countries, R&D is funded and conducted by international organizations, both public and private, from developed countries. Increasingly, R&D activities of universities and public laboratories are financed through R4D mechanisms and/or instruments, and there is pressure for these organizations to focus on knowledge production and transfer to solve societal challenges.[7] According to ICSU (2005):

> "In order to strengthen science for the benefit of society, scientists need to be responsive to the changing needs and concerns of society; and society, in turn, needs to understand and support the positive role of science. As the move towards a global knowledge economy gathers momentum, with an increasing premium on scientific knowledge and high technology, the time is ripe for a new international initiative that will advance the welfare of science as well as society."[8]

Overall, R4D encompasses R&D and RoD as well as other forms of research that multilateral development agencies, philanthropies, bilateral donors, UN specialized agencies, think tanks, developing countries' governments and other stakeholders engage in to promote knowledge-based solutions to problems of under-development in developing countries and regions. Investments in R4D are made also to help frame developed countries' foreign policy and determine development assistance priorities, develop new technologies and technology diffusion to address societal challenges such as climate change, build scientific and technological capabilities in developing countries, and help to expose developed countries' research institutions and researchers of problems in poor countries' contexts.

There is a consensus that R4D, if well governed, contributes to knowledge and innovation that address some of the pressing problems of the poor in developing countries as well as globally shared challenges such as climate change and pandemics (e.g., COVID19). There is now a large corpus of academic literature on social and economic benefits of public research (and innovation).[9] It shows that there are many different social, economic, and even political benefits from investments in R&I.

The first form of benefits is associated or relates to the increasing the stock of useful knowledge, and the creation of intellectual property. Codified knowledge (scientific publications, including in fields of social sciences and humanities) produced from research can be the source of many technological, economic, and social opportunities, including creation of enterprises that generate new jobs and develop health products such as vaccines that address problems (e.g., cholera).

The second form of benefits of investing in R4D relate to training and the production of skilled people in developing countries, and sometimes in developed ones as well. In this way, funding or investing in research is critical for developing a country's human capital, some of which is ploughed

[7] Ciarli, Tommaso (editor), 2022, Changing Directions: Steering science, technology and innovation towards the Sustainable Development Goals, STRINGS, SPRU, University of Sussex

[8] ICSU (2005), *Science and Society: Rights and Responsibilities.* International Council for Scientific Union, Paris.

[9] See for example Filippetti, A., and Vezzani, A., (2020), The political economy of public research, or why some governments commit to research more than others. UNU-MERIT Working paper #2020-029 www.merit.unu.edu

back into R&I. Most of the human capital is deployed in various sectors of the economy and society, in public and private sectors.

The third kind of benefits of investing in R4D relate to innovation. Many of the new technologies (products and processes) used in industry, in the economy and society in general are outcomes of research. Smartphones, vaccines, diagnostic kits, the Internet, improved seed varieties and other technologies that offer solutions to social and economic challenges are outcomes of investments in R&I.

The fourth category of benefits of investing in R4D relate to the generation and use of evidence that is crucial for informed policymaking. Science for policy—the use of science in policy—depends on research that generates scientific facts about specific problems and issues. Making informed decisions to solve contemporary problems such as the COVID19 pandemic, climate change, loss of biological diversity and persistent food insecurity demands and is dependent on good research, indeed good science. For example, inquiry (largely through genomics and gene sequencing) into the nature of the coronavirus and its mutations is making into possible for policymakers to make decisions aimed at combating the pandemic.

The fifth form of benefits of R4D investments is social. Research (and science in general) is a social endeavor. Funding of research stimulates and/or spurs networking, connecting scientists and countries and thus helps to forge international peace and cohesion. Through research, scientists and their countries build prestige, interdependence, and many unquantifiable social benefits. Overall, investment in R&I is good for society. According to Coccia (2018), a nation "can perform scientific research to support a socioeconomic power directed to take advantage of important opportunities and/or to cope with consequential environmental threats, such as a war. The socioeconomic power of a nation is based on a process of influence on other subjects towards the accomplishments of some goals (e.g., mutual trade), in some cases associated with (formal and/or informal) dominance and control of geoeconomic areas. Scientific research can generate achievements that are also important in the presence of socioeconomic shocks, such as warfare."[10]

Overall, funding of R4D is about long-term investments to reap different societal benefits. It is really about investment decisions and political choices to be made by executive and political leadership of countries. The role and influence of political institutions and leadership in making investment decisions and allocating national resources to R&I and R4D in general should not be underestimated.

2.2 Political economy of R4D: An overview of issues and analytical framework

R4D is laden with many complex political economy considerations or issues. It is not the remit of study to analyze all such considerations. The study just outlines some of the issues with the aim of stressing that political contexts and institutions greatly influence the setting of R4D priorities, which research is funded and how performs the R4D. Some scholars, for example Filippetti and Vezzani (2020), have argued that there is a direct correlation between a country's political governance (e.g., form of government) and its research and innovation (R&I) performance. Filippetti and Vezzani (2020) argue that there is "a robust relationship between public-funded research and political institutions. Countries with parliamentary forms of government, proportional electoral rules and bicameralism devote larger shares of GDP and of public expenditure to research. … also find a great role of encompassing civic society organizations in encouraging public research."[11] Whether this

[10] Coccia, M., (2018), Socioeconomic driving forces of scientific research. CocciaLab Working Paper 2018- No.35/bis.
[11] Filippetti, A., and Vezzani, A., (2020), The political economy of public research, or why some governments commit to research more than others. UNU-MERIT Working paper #2020-029 www.merit.unu.edu

assertion can generally be applied to African contexts is an issue of going inquiry on the political economy of research funding in the continent.[12] The Science Granting Councils Initiative (SGCI) in Africa has also commissioned research on the political economy of research funding, exploring the roles and influence of various political and civil society actors. This study emphasizes that R4D should be embedded in political and social systems in which it is funded and conducted, and thus involving political actors, civil society, and legislative bodies in determining priorities for R4D is critical.

There is a diverse range of actors and stakeholders in R4D. They include R4D funders in and/or from developed countries, development aid agencies, policymakers or decision-makers in governments (in both developed and developing countries, philanthropic private foundations, civil society organizations, Non-Governmental Organizations (NGOs), research institutes, think tanks (governmental and non-governmental), developing country science granting councils or national research funding agencies, universities (in both developed and developing countries), research networks, legislative bodies and other research users.

The high diversity of actors and stakeholders makes the governance of R4D complex and under constant change. According to Marshal, F et al (2023) "R4D operates in a volatile, uncertain, complex and ambiguous contextual environment and this necessitates new, different ways of working that can inform decision-making."[13] The actors and stakeholders have diverse and changing interests and priorities. For example, some R4D funders are also directly involved (and some even control) the setting of development priorities to be addressed by research and capacity. Some multilateral organizations e.g., the World Bank and the European Commission (EC) and private foundations e.g., the Bill and Melinda Gates Foundations have, traditionally, tended to control the setting of R4D priorities.[14] Some bilateral country funders (e.g., USA) have tied R4D to their foreign policies and economic diplomacy, often directing their resources to those R4D issues that help them to leverage greater geopolitical influence and trade opportunities.

There are, however, efforts being made by some developed countries and private foundations to promote more participatory R4D priority setting by involving actors from developing countries. Some donors (development partners) and developing countries' R4D actors have established bi-regional and multilateral platforms for participatory R4D priority setting processes. An example of a multilateral forum for participatory R4D priority setting involving ESA and all African countries is the AU-EU High-Level Policy Dialogue on Science, Technology and Innovation7 (HLPD on STI). The extent to which African countries are effectively using the AU-EU HLPD on STI is a subject of analysis and debate.[15] Some ESA countries are engaged with funders in other forums such as the Science Granting Councils Initiative (SGCI) as well as the Global Forum of Funders.

Some funders pre-determine the kinds of actors to be involved in and modes of delivery funders of R4D, with emphasis on those initiatives that largely focus on their countries' national interests. For example, the UK's Global Challenge Research Fund (GCRF) and the Newton Fund explicitly require that their funding is directed to initiatives that build the country's (UK) own abilities to deliver

[12] Mugabe, J. (2021), Unmet Commitments? Financing Science, Technology and Innovation in Africa. Report prepared for the Coalition for African Research and Innovation (CARI), African Academy of Sciences (AAS), Nairobi.
[13] Marshall, F., Du Preez, M., Cakouros, B., Bridges, B., Preiser, R., and Hichert, T., (2023), Disruptors and Enablers of Research for Development (R4D): Exploring Futures.
[14] Ciarli, Tommaso (editor), 2022, Changing Directions: Steering science, technology and innovation towards the Sustainable Development Goals, STRINGS, SPRU, University of Sussex.
[15] Mugabe, J. (2021), Unmet Commitments? Financing Science, Technology and Innovation in Africa. Report prepared for the Coalition for African Research and Innovation (CARI), African Academy of Sciences (AAS), Nairobi.

cutting edge research and are led by UK researchers.[16] Some of the private foundations', e.g., for example the Bill and Melinda Gates Foundation (BMGF), investments in R4D are mainly channeled through their home countries' institutions. Thorsteindottir and Bell (2017) show that in 2016 of the total grantees of BMGF's global health work, 59% were from or in the United States of America (USA) organizations.[17] The effects of this include misalignment between research and innovation and SDGs priorities of low-income countries. According to Ciarli, Tommaso, editor, (2022): "High-income countries (HICs) and upper-middle income countries (UMICs) contribute disproportionally to such misalignment: only 30-40% of research in HICs and UMICs is related to SDGs. In low-income countries (LICs), 60-80% of the research is related to the SDGs, but these countries account for only 0.2% of globally produced research. Since most global research is produced in HICs without collaboration with researchers in LICs (where SDG challenges are most severe), there is little chance that STI can address contextual challenges."[18] The challenge is how to ensure that R4D is focused on or steered deliberately to develop solutions to problems facing the poor in low income developing countries.

The issues raised above are largely about *how best to govern R4D*. There are recent studies that focus on the importance of systemic approaches to designing and delivering R4D. Building on a large body of academic literature and policy approaches on systems of innovation or innovation systems, the concept of R4D systems is gaining growing attention. The systems approach is based on the recognition that sustainable challenges faced by poor countries and globally are complex and inter-related. Orthodox approaches to designing, governing, and delivering R4D are hugely inadequate. There is a growing emphasis on the need for greater transdisciplinary research as the mode of delivering R4D. However, there is limited understanding of the concept of transdisciplinary research, and how to design and practice it. As Ciarli, Tommaso (editor, 2022) emphasizes: "Transdisciplinary research is hard; it is very different in approach from traditional research paradigms. Funders, institutions, academies, and others will have to adjust their understanding of research if progress is to be significant. HIC research funders must recognize that it is in their interests to support and promote research led by and shaped by experts in low- and middle-income countries and avoid the somewhat patronizing attitude that has too often dominated in internationally focused research."[19]

In this study transdisciplinary research is broadly defined as research that is organized to bring together actors from non-academic, academic, private sector, policy-making and other stakeholders from different backgrounds to engage in collective (or co-) production, dissemination, and use of knowledge to address specific challenges. It is about the *integration and implementation of different sciences and/or knowledge systems*.[20] Marshall et al (2023)[21] on the role of foresight in R4D recommends that mapping of R4D should be guided by the systemic approaches and the importance of integration of various knowledge systems. They propose *R4D systems* as a good conceptual framework for understanding actors' interests, relationships and roles in research and innovation. They emphasize: "Research for development systems refers to a framework that integrates research and development processes to address complex social, economic, and environmental issues in developing countries. It involves the collaboration of various stakeholders, including researchers, policymakers, farmers, and communities, in identifying research priorities and developing solutions

[16] Department for Business, Energy and Industrial Strategy (2020), Research for Development (R4D) Indicators: A Review of Funder Practice. www.gov.uk/beis

[17] Thorsteindottir, H., and Bell, J. (2017), Research for Development Models and Approaches—Main Features. Scanning paper prepared for the International Development Research Centre (IDRC).

[18] Ciarli, Tommaso (editor), 2022, op. cit. p. 11.

[19] Ciarli, Tommaso (editor), 2022, op. cit. p. 7.

[20] Rigolot, C., (2020), Transdisciplinarity as a discipline and a way of being: complementarities and creative tensions. *Humanities and Social Sciences Communications* 7: 100(2020)

[21] Marshall, F., Du Preez, M., Cakouros, B., Bridges, B., Preiser, R., and Hichert, T., (2023), Disrupters and Enablers of Research-for-Development: Exploring Futures.

that are context-specific, participatory, and sustainable. The research for development system is embedded in a wider science, technology and innovation system which encompasses the actors, institutions and processes involved in the development and diffusion of scientific knowledge and innovation."[22]

The R4D systems conceptualization is a useful approach to analyzing R4D involving several countries in diverse socio-economic and political landscapes. It draws from 'functional systems of innovation' and other new approaches such as transformative innovation that are advanced by many innovation scholars around the world. Many developed and developing countries, including a growing number in the ESA region, have embraced systems of innovation (innovation systems) approaches.[23] The systems of innovation (and R4D systems) framings put premium on the following.

(a) Interactions of various actors-dynamic (innovation and/or R4D) systems tend to have high densities or intensities of interactions among and between different actors. Networking is a critical feature (and indeed activity) of dynamic impactful R4D systems.
(b) Distributed and diversified functions of actors-dynamic R4D systems have diverse institutional actors with well distributed complimentary functions e.g., financing/granting, policy formulation and implementation, knowledge production and/or diffusion, public accountability and scrutiny, innovation and/or technology commercialization/uptake, training and education,
(c) Holistic approaches to research and innovation (and R4D in general)—contemporary societal challenges cannot be addressed through single technological fixes and mere delivery of new knowledge. The challenges, just as research and innovation interventions, are complex, interrelated and constantly changing. Short-term, top-down driven investments in research and innovation are often unimpactful. Collaborative, long-term and pluralistic co-production, or co-creation approaches to R4D are positively transformative.

It is important to note that mapping of actors and identification of trends in R4D can also be done based on constitutionally created territory (national/country system), regional and sub-regional location(ESA or East African and Southern Africa), sectoral (agriculture, health mining, etc.), technology (biotechnology, Artificial Intelligence and nano-technology) or issue/problem (climate change, gender equality, peace and political stability, etc.).

3. METHODOLOGY

This study is guided by the R4D systems and innovation systems approaches. We use multiple mapping frameworks. The overall aims of this study are to:

(a) Map key actors in R4D systems (in ESA regional landscape), with emphasis on public, private and civil society-based national, regional, and international actors contributing to regional and sub-regional research and innovation to attain SDGs and related development priorities in the ESA region.
(b) Provide an analysis of the strengths and weaknesses of (as well as opportunities and threats for) the R4D institutional actors and other contributing stakeholders.

[22] Marshall, F., Du Preez, M., Cakouros, B., Bridges, B., Preiser, R., and Hichert, T., (2023), Disrupters and Enablers of Research-for-Development: Exploring Futures, p. 7.
[23] Botswana, Ethiopia, Mauritius, Mozambique, Namibia, Rwanda, South Africa, Seychelles, Uganda and Zambia are some of the ESA countries that have explicitly adopted the 'system of innovation' approach in their national science, technology and innovation policy frameworks. Kenya's national STI agencies have embraced the concept, but the country does not have an explicit STI policy.

(c) Identify trends and shifts in the composition and roles of different actors in the R4D landscape and configurations over the past five years.
(d) Identify and critically analyze key drivers of the trends and shifts in the R4D agendas and R4D systems in ESA.
(e) Make or draw lessons and recommendations for IDRC's internal learning and inform the review of its 2030 Strategy.

Based on the outlined aims of the study, the methodology for and core issues to be covered were agreed upon during the revision of the Expression of Interest (EoI) and subsequent engagements with senior IDRC staff at the Regional Office for Eastern and Southern Africa.

To ensure that the study sharply focused on R4D, a review of literature was conducted to define R4D and related concepts. The literature review provided conceptual contours for the rest of the study. It also helps identify some of core issues in the policy economy of R4D as well as how different actors (particularly funders) influence the governance of R4D and R4D systems.

Based on the literature review and discussions with senior IDRC staff in the Regional Office for Eastern and Southern Africa during the inception meeting, a survey questionnaire was designed to gather both qualitative and quantitative information.

In order to gather adequate empirical data to illustrate certain issues and trends in R4D and changes in the regional R4D systems, a desk study was undertaken to review of annual reports (collected from websites) of selected regional and international organizations e.g. AfDB, AUDA-NEPAD, the SGCI and ESA countries' national research strategies and/or action plans, regional research strategies of EAC, SADC and IGAD, and some reports of regional R4D programme evaluations or reviews. Emphasis was placed on identifying trends in and drivers of R4D in IDRC programmatic focus areas and those of actors with emphasis on SDGs. The scope of issues and actors to be covered had to be limited because of the wide range of actors (organizations) involved in R4D for the SDGs in ESA and the many priority issues.

Based on the literature review and discussions with senior IDRC staff in the Regional Office for Eastern and Southern Africa during the inception meeting, a survey questionnaire was designed to gather both qualitative and quantitative information as discussed in the Annex I.

Lastly, 39 individuals from various organizations (3 from national members of the SGCI, 27 from regional and continental organizations and networks plus think tanks, 2 from international research funders, 3 from policymaking bodies (governments) and 4 from universities/academia) were interviewed as shown in Annex II. The interviews focused on identifying trends in and drivers of developments in R4D over the past decade or so.

4. THE EASTERN AND SOUTHERN AFRICA CONTEXT

4.1 Geopolitical context and economic outlook

The Eastern and Southern Africa (ESA) region comprises of 24 countries that are ecologically, economically, socially, and politically diverse.[24] It is socially diverse, with different cultures, ethnicities, religions and languages and traditional customs. In terms of ecology, these countries are endowed with a variety and abundance of natural resources including minerals, fisheries and marine

[24] Countries in the ESA region are Angola, Botswana, Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Eswatini, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Seychelles, South Africa, South Sudan, Somalia, Uganda, Tanzania, Zambia and Zimbabwe. IDRC supports R4D initiatives involving 21 out of the 24 countries.

resources, forests, and biological diversity in general. According to the International Union for the Conservation of Nature (IUCN), "across the 24 countries - From the Horn of Africa to the Cape and including the Western Indian Ocean Islands, the region contains several centres of endemism where species of birds, mammals and plans reside nowhere else in the world."[25]

The economies of ESA are heavily dependent on natural resources and are diverse in terms of growth rates. Agricultural products are the main export from many East African countries, Ethiopia and Uganda lead the region in coffee exports while Kenya is the largest tea exporter. For countries in Southern Africa, minerals are the biggest exports, including gold and diamonds from South Africa and platinum from Zimbabwe. Tourism is a high-income earner for countries such as Seychelles, Mauritius, Botswana, Kenya, Tanzania, South Africa, Namibia and Zambia. Some blue economy countries (e.g., Seychelles, Mauritius, Namibia, Kenya, South Africa and Tanzania) also depend on export of fish to growth their economies.

Overall, leveraging the potential of natural resources and improving tourism, expanding the blue economy will be key to the ESA countries' economic performance. Investments in newly discovered natural gas reserves in Mozambique and Namibia can increased domestic energy production and access. This will however be conditioned on prudent macroeconomic management and good governance in general.

According to the African Development Bank (2023), East Africa's "growth is estimated to have moderated to 4.2 percent in 2022 from 5.1 percent in 2021 but is projected to recover to the pre-pandemic average above 5.0 percent in 2023 and 2024."[26] Growth of Southern African economies decelerated to about 2.5 percent in 2022 from 4.3 percent in 2021.[27] ESA has some of the world's fastest growing economies. These include Ethiopia, Mozambique and Rwanda. Overall, the region has high gross domestic product (GDP). South Africa is the region's largest economy followed by Angola, Kenya, and Ethiopia. Seychelles and Mauritius are the region's only high-income economies. Despite the relatively good performance, ESA has high levels of poverty and social inequalities. Table 1 provides an overview of economic outlook of the ESA region.

The paradox of the many ESA economies is *high growth with limited human development*. Some of the fastest growing ESA economies (in terms of GDP) have the lowest levels of human development and high prevalence of poverty. According to the United Nations Development Programme (UNDP) Human Development Index 2030[28], most of the ESA countries had HDI below 0.6. For example, in Mozambique one of the fastest growing economies in the world had HDI of about 0.4 in 2021.

Socio-economic inequalities are very pronounced within and across ESA countries. The inequalities are gender-based. According to numerous, including the AfDB and UNECA Africa Gender Index and Component Indices GDP, generally women in ESA lag men in all dimensions (economic, social and representation/empowerment). ESA countries that score very lowly on the 2019 African Gender Index (AGI) are Ethiopia, Eritrea, Mauritius and Eswatini. Major gender challenges in most of the countries include increased violence against women. In some cases, is violence against women is endemic due to negative cultural norms and practices. Data from organizations such as UN WOMEN

[25] https://www.iucn.org/our-work/region/eastern-and-southern-africa

[26] African Development Bank (AfDB) Africa's Macroeconomic Performance and Outlook, January 2023. https://www.afdb.org/en/documents/africas-macroeconomic-performance-and-outlook-january-2023

[27] https://www.afdb.org/en/documents/africas-macroeconomic-performance-and-outlook-january-2023

[28] https://worldpopulationreview.com/country-rankings/hdi-by-country

indicate that, in ESA one in four women has experienced physical or sexual violence in her lifetime. Violence against girls in school is one of the major causes for high school dropout rates for girls.[29]

Table 1: ESA economic outlook

Country	GDP Growth (2023-2024) %
Angola	3.7
Botswana	3.8
Burundi	4.4
Comoros	3.3
Djibouti	5.1
Eritrea	2.9
Ethiopia	6.0
Eswatini	2.8
Kenya	5.4
Lesotho	2.2
Madagascar	5.3
Malawi	3.0
Mauritius	4.8
Mozambique	6.5
Namibia	2.7
Rwanda	7.9
Seychelles	5.2
South Africa	1.6
South Sudan	2.2
Somalia	3.4
Tanzania	5.6
Uganda	5.9
Zambia	4.2
Zimbabwe	2.9

Source: AfDB (2030), *Africa's Macroeconomic Performance and Outlook*, January 2023.

Despite the poor performance in gender equality, the ESA has made some progress in women representation in legislative bodies and engagement in senior government posts. In 2020, four countries in ESA were among the 25 countries globally with the highest number of women in parliament and that have achieved gender balance (i.e., over 40% women's representation). These are Rwanda with 61%, (global lead in women's representation in parliament), South Africa with 46%, Namibia with 42% and Mozambique with 41%.[30]

In terms of political diversity, the ESA countries have different governance regimes (both structures and norms), political and policy cultures and different configurations of non-state actors that influence politics. Some countries (e.g., South Sudan, Ethiopia, Zimbabwe, Eritrea and Mozambique) have been experiencing conflicts and some are just emerging from conflicts. There are different election cycles in the different countries determined by their constitutions. In 2022, Angola and Kenya had presidential and legislative assemblies' elections while Lesotho and Mauritius had local assembly elections. In 2023 and 2024, Djibouti, Zimbabwe, Madagascar and South Sudan will go to various elections. The elections' outcomes often influence political stability of these countries. For

[29] https://africa.unwomen.org/en/where-we-are/eastern-and-southern-africa_africa
[30] https://africa.unwomen.org/en/where-we-are/eastern-and-southern-africa_africa

example, in Kenya the 2022 were disputed and had led to political demonstrations and unrest with irreversible consequences of the fragile economy.

In terms of good governance, there has been some improvement in ESA. Five of the ten countries with the highest nominal GDP per capita in Africa are among those with the highest Overall Governance score in 2021: Mauritius (1st), Seychelles (2nd), Botswana (5th), South Africa (6th), and Namibia (8th).[31] However, "the last three years have seen a wave of democratic backsliding across much of the continent. Governments have been increasingly prone to infringing on rights, curb freedom of expression and association, and impose restrictions on civic space. This trend rapidly accelerated with the pandemic, with many elections being postponed and governments using COVID-19 as an excuse to clamp down on dissent. Despite this, there are some positives with several countries such as Gambia and Seychelles bucking the continental trend. Additionally, in 42 African countries women are seeing greater equality in political and socioeconomic spheres than they were in 2012. However, without a reversal in the uptake of repressive measures, the situation will continue to be a drag on good governance."[32] Table 2 provides ranking of ESA countries according to trends in public participation, inclusivity and respect for human rights. It shows that overall, most ESA countries have governance deficits.

Table 2: Participation, Rights & Inclusion category: 2021 rank, 10-year trend & trend classification (2012-2021)

Country	Rank/54
Angola	36
Botswana	9
Burundi	39
Comoros	32
Djibouti	46
Eritrea	52
Ethiopia	33
Eswatini	44
Kenya	16
Lesotho	15
Madagascar	28
Malawi	18
Mauritius	3
Mozambique	19
Namibia	7
Rwanda	30
Seychelles	1
South Africa	4
South Sudan	53
Somalia	51
Tanzania	26
Uganda	37
Zambia	21
Zimbabwe	36

Source: Mo Ibrahim Foundation, 2030

[31]

[32] Mo Ibrahim Foundation (2023), *2022 Ibrahim Index of African Governance Index Report, p.* 48.

Another two cluster of key megatrends and issues with implications for ESA economies are the surgency of pandemics e.g., COVID19 and epidemics e.g., Ebola, and ecological changes associated with climate change and loss of biological diversity. The COVID19 pandemic has had devastating effects on the economies and livelihoods in ESA countries. Poor people and small and informal businesses, women and the youth are the most significantly affected. In addition to the health-related challenges, the economic and social impacts of the pandemic are significant. Different ESA countries experimented with different strategic intervention to fight the pandemic and some (e.g., South Africa) have focused on building resilience and future pandemic preparedness. As we discuss later, institutions such as the African Capacity Building Foundation (ACBF) and the AfDB are supporting some countries in building capacity to address future pandemics and epidemics.

The loss of ecological integrity manifested in climate change and pollution of freshwater and marine ecosystems is a mega political and policy issue for ESA. A large and growing body of academic and non-academic research show that frequent droughts and deepening desertification in many parts of the ESA region are manifestations of climate change. Frequent devastating floods in some countries (for example in Mozambique, Malawi and parts of Kenya) due to high rainfall are also associated with climate change. Systematic reviews of literature show that there increasing research on climate change in the region. Climate change is considered an existential threat, a potential source of geopolitical tensions and conflicts, and thus a global security issue. It has gained huge political attention with the AU and various regions, including in the ESA Regional Economic Communities (SADC, IGAD, EAC and COMESA). Later in this study trends in R4D focused on climate change are discussed.

Overall, the ESA countries are at different stages and have differentiated capacities to attain the SDGs. A report global report on progress towards the SDGs paints a disheartening picture of most countries have fallen behind schedule. As Table 3 shows the ESA are at different stages in the transition to the SDGs. ESA region and sub-Saharan Africa are unlikely to attain most of the SDGs by 2030. Sub-Saharan Africa is on track to attain SDG12 on responsible consumption and production, and SDG13 on climate action although significant challenges remain. In ESA, only Ethiopia and Mauritius are on track to eradicate poverty (SDG1) though they face significant challenges in attaining the Goal. Most countries in the ESA region are facing significant challenges in attaining Goals pertaining to social inclusion, particularly SDG5 on gender equality. Mauritius and Rwanda are performing well on SDG9 on industry, innovation and infrastructure. The main message is that R4D interventions for the SDGs will have to be country-focused and not necessarily regional though there are commonalities in the needs of the ESA region.

In summary, the geopolitical, social and economic context of the ESA region determines or influences R4D in complex ways. For example, some funders' policies and programming tend to restrict levels of investments or even not invest in countries (e.g., Seychelles) that are considered to high-income based on the World Bank and International Monetary Fund (IMF) criteria even if such countries are in most need of international support to build their national R4D or research and innovation systems. Countries that are politically unstable and/or poorly governed may also face challenges in attracting international R4D financial flows from certain bilateral and multilateral donors.

It is important to recognize the diversity of political economies of ESA countries and how they influence R4D prioritization and funding. Political and policy conditions (e.g., the existence or not of STI policy frameworks and national development visions or plans), and subscription to regional, continental and global sustainability goals determine countries' readiness for R4D.

Table 3: Progress on SDGs in ESA

2022 SDG dashboards by region, income group (levels and trends) and ESA country

Note: Excluding OECD specific indicators. Population-weighted averages. *Source:* Authors' analysis

SOURCE: Sustainable Development Report 2022 https://dashboards.sdgindex.org/

4.2 Overview development and R4D frameworks

Analysis of R4D actors, trends and drivers in ESA must be underpinned by a clear understanding of various regional and national development plans and related policy frameworks for STI in general. Indeed, regional and national plans and policy frameworks set priorities (both development and

R&D ones) that R4D funders, Research organizations (both local and international) and other actors need to focus on or at least take into consideration in their programming. As will discussed later, there is increasing emphasis by African decision-makers and some research funders that R4D should be aligned with regional and national priorities (both developmental and R&D).

The ESA countries are all members of the AU and have adopted Agenda 2063 as well as various related policy frameworks and/or strategic plans on STI or those who implementation require STI and R4D. Agenda 2063 articulates shared aspirations of all member states of the AU. These are:

- Aspiration 1. A prosperous Africa based on inclusive growth and sustainable development.
- Aspiration 2. An integrated continent, politically united and based on the ideals of Pan Africanism and vision of Africa's Renaissance
- Aspiration 3. An Africa of good governance, democracy, respect for human rights, justice and the rule of law.
- Aspiration 4. A peaceful and secure Africa.
- Aspiration 5. Africa with a strong cultural identity, common heritage, values and ethics.
- Aspiration 6. An Africa whose development is people driven, relying on the potential of the African People, particularly its Women and Youth and caring for children; and
- Aspiration 7. Africa as a strong, united, resilient and influential global partner and player.

To attain the aspirations, the following priority areas were identified by member states of the AU: (a) Sustainable and inclusive economic growth (b) Human Capital Development (c) Agriculture/value addition and agro-businesses development (d) Employment generation, especially the youth and females (e) Social Protection (f) Gender / Women development and youth empowerment (g) Good governance including capable institutions (h) Infrastructural development (i) Science, Technology, Innovation (j) Manufacturing-based industrialization (h) Peace and Security and (d) Culture, Arts and Sports.

There are various AU plans and strategies as well as treaties or agreements to give practical expression to the aspirations in Agenda 2063. It is not possible to review all of them in this report. What is clear from mapping out the R4D landscape is that most of the priorities are being addressed or covered by various funders, Research organizations, civil society and governments. The level of intensity of focus on each of the various priorities. For example, peace and security, good governance, women and youth empowerment and agriculture are receiving more R4D attention than manufacturing-led industrialization.

The priority area on STI is implemented through Science, Technology and Innovation Strategy for Africa (STISA-2024) that provides overall policy directions and priority areas for investment in STI. STISA-2024 mission is to "Accelerate Africa's transition to an innovation-led, Knowledge-based Economy" by: (a) "improving STI readiness in Africa in terms of infrastructure, professional and technical competence, and entrepreneurial capacity"; and (b) "implementing specific policies and programs in science, technology and innovation that address societal needs in a holistic and sustainable way." STISA-2024 is one of the AU strategies that have direct link or bearing to R4D. Other frameworks for peace and security, gender equality, health research and innovation, and infrastructure are discussed in the sections covering actors and trends in R4D.

Due to the cross-cutting nature of STI, STISA-2024 is designed to focus on R&D (knowledge), technology and innovation demands of the AU member states, and is a framework for guiding countries in designing their national and regional STI policy frameworks and instruments. STISA-2024 has six priority areas: (1) eradication of hunger and achieving and achieving food security (2) prevention and control of diseases (3) communication (physical and intellectual mobility) (4) protecting our space/space science (5) living together/peace, and (6) wealth creation.

STISA-2024 defines four mutually reinforcing pillars which are prerequisite conditions for its success. These pillars include upgrading and/or building research infrastructure, enhancing technical and professional competencies, innovation and entrepreneurship, and providing an enabling environment for STI development in the African continent. Continental, regional and national programmes will be designed and implemented in sync to ensure that their strategic orientations and pillars, achieve the developmental impact.

Regional Economic Communities (RECs) are recognized as the main loci for the implementation of STISA-2023. Most of them have protocols and programmes for STI. Most of their treaties explicitly recognize the role of STI in the transition to sustainable development as shown in Table 4.

Table 4: Regional treaties on science, technology and innovation

REC	Treaty Provisions on STI
COMESA	Article 100(d) of COMESA calls on member countries to cooperate to promote "industrial research and development, the transfer, adaptation and development of technology, training, management and consultancy services through the establishment of joint industrial support institutions and other infrastructural facilities."
EAC	Article 80(e) of EAC Treaty: "promote industrial research and development and the transfer, acquisition, adaptation and development of modern technology, training, management and consultancy services through the establishment of joint industrial institutions and other infrastructural facilities." In Article 103 of EAC Treaty, member states commit themselves to "promote cooperation in the development of science and technology within the Community through: (a) the joint establishment and support of scientific and technological research and of institutions in the various disciplines of science and technology; and (b) the creation of a conducive environment for the promotion of science and technology within the Community.
ECOWAS	Article 3 of ECOWAS Treaty outlines "harmonization and co-ordination of national policies and the promotion of integration programmes, projects and activities, particularly in food, agriculture and natural resources, ...science, technology..."
SADC	Article 21(d) of SADC Treaty makes explicit reference to member States cooperating in science and technology as one of the major areas necessary for fostering regional development and integration. SADC's Protocol on Education and Training, aims at promoting the development of a common science and technology policy, establishing joint research facilities and regional centres of excellence, and facilitating the movement of scientists in SADC countries

Source: Mugabe, J. (2011) *Science, Technology and Innovation in Africa's Regional Integration: From Rhetoric to Practice*. ACODE Kampala, 2011.

Mugabe (2011)[33] reviews the STI content or provisions in treaties establishing African RECs. He concludes: "African regional economic and trade treaties recognize the importance of STI in promoting regional integration and development. The integration of these considerations into regional agreements is informed by the understanding that individual African countries' economies are small and unable to marshal scientific and technological resources for development. … Cooperation in STI is thus necessary to enable the countries to pool and share their scarce resources such as R&D infrastructure and skilled human resources."[34]

Other key players in the implementation of STISA-2023 are UNESCO, the African Development Bank (AfDB), IDRC, the SGCI, the United Nations Economic Commission for Africa (UNECA) and AUDA-NEPAD, the African Observatory for Science, Technology and Innovation (AOSTI) and of course the AUC and national governments. UNESCO has been instrumental in support the design of a framework for Monitoring and Evaluating STISA-2023 implementation. In 2021, UNECA and the AU supported an online training course on accelerating the implementation of STISA-2023. The AfDB and AUDA-NEPAD have been at the forefront of mobilizing resources and providing technical support to countries and RECs to implement various STISA-2024 or related initiatives. The AUC has established a variety of programmatic and institutional initiatives to promote STI. Over the past decade or so, there has been an enduring AU-EU STI partnership.

Since the adoption of STISA-2024 there have been several major geopolitical, scientific, technological and economic developments as well as challenges such as the COVID19 pandemic and the Russia-Ukraine war that has resulted in food insecurity in different parts of the world and in Africa. On the technological front, there have been rapid developments in fields such as Artificial Intelligence (AI), robotics, genomics and data science. Other key developments relate to the adoption of the African Continental Free Trade Area Agreement (AfCFTA), and various strategies for industrialization, education, health research and innovation. The AfCFTA and some of its protocols (some still under negotiations) have implications for STISA-2024. Overall, STI will play critical roles in the realization of AfCFTA and related strategies for industrialization, health innovation and education.

Other important policy developments that have implications for STISA-2024 and R4D include the adoption of international frameworks such as UNESCO's Recommendation on Ethics of AI, the 2021 UNESCO Recommendation on Open Science. There are policy processes within the World Health Organization (WHO) and the World Trade Organization (WTO) to develop new frameworks related to pandemic preparedness, intellectual property protection and technology transfer.

AfCFTA also has implications for ESA region's development and there are many issues for R4D arising from the Treaty. Its objective is to accelerate structural transformation on the continent (AfCFTA Agreement, Article 3). According to a recent report (UNECA, 2022) "industrialization and infrastructure development, political and macroeconomic stability, public health security, environmental protection, empowerment of women and youth in trade, and holistic and inclusive human development (are) complementary programmes. All these would leverage economies of scale from the large African market, comprising 1.4 billion people and a combined gross domestic product estimated at over $6.7 trillion in purchasing power parity."[35]

[33] Mugabe, J. (2011) *Science, Technology and Innovation in Africa's Regional Integration: From Rhetoric to Practice*. ACODE Kampala, 2011.

[34] Mugabe, J., O., (2011), op. cit., p. 19.

[35] UNECA (2022), *Existential Priorities for the African Continental Free Trade Area*, p. 14. United Nations Economic Commission for Africa, Addis Ababa.

Some of the issues that R4D may focus on are how the AfCFTA can accelerate youth employment and women empowerment, the role of intellectual property protection in harnessing local and indigenous knowledge for innovation, mobility of persons and knowledge sharing and enhancing cross-border trade. There are also questions about trade-climate nexus, and how the AfCFTA can be a framework for climate-smart trade and increased digital transformation of the economies.
The extent to which the AfCFTA focuses on women and youth is a huge policy issue because "over 70 percent of cross-border traders, especially those engaged in informal trade, are women. Understanding their needs and giving them a platform to speak is incredibly important. The youth are Africa's largest composite of human capital. As the youngest continent, Africa needs to invest in ensuring that its youth have credible pathways to engage in productive activities so that they may reap the promise of their dreams and become architects of their own prosperity."[36]

4.3 National readiness for R4D

All countries in the ESA region have long-term development visions and policy frameworks for STI that should guide the setting of priorities for R4D. It is not possible to review all of the development vision states and STI frameworks in this report. What is important is to provide a general overview of trends in development planning and STI policy, and how they impinge on R4D in ESA. Below is a succinct outline of some main trends:

- All countries in the region are aligning or planning to align their development plans to Agenda 2063 and SDGs. Most of them have long-term development vision statements that were adopted prior to Agenda 2036 and the SDGs but there is relatively good alignment in terms of different priorities e.g., climate change, health, food security, drought and desertification, peace and security, good governance and strong institutions, women and youth empowerment, and poverty reduction and economic growth. Depending on the level of economic development and political conditions, different ESA put different emphasis on different SDGs.
- Most of the STI policy frameworks prioritize the need to strengthen R4D ecosystems at national, regional and continental levels. Some national STI policy frameworks (e.g. South Africa's 2019 White Paper on STI, Namibia's 2020-2030 National Policy for Science, Technology and Innovation and Botswana's 2011 National Science and Technology Policy) have explicit policies for promoting international cooperation in R&D. South Africa Decadal Plan for the implementation of the White Papers prioritizes investments in science diplomacy to help leverage R4D to address global health, climate change and just transition challenges as well as enhance inclusive innovation.
- All ESA countries have committed to implementing the AU decision requiring each member state to invest at least 1% of its GDP to R&D. However, none of the countries in the region has achieved this target. Many ESA countries' (including South Africa that has been a continental leader) national gross expenditure on R&D has been declining annually over the past five years or so.
- All ESA countries, except South Africa, have reported or identified weak or lack of research infrastructures as a major impediment to domestic research and innovation and to leveraging international research partnerships. Namibia has designed national research strategic plan.
- Although most ESA countries invoke the NSI or research and innovation systems approach in their policy frameworks and plans, there are very limited systems practices including networking and knowledge sharing within countries. Surprisingly, there is deepening transnational linkages and networking largely under the leadership of some RECs and international funders through initiatives such as SGCI, SAIS programme and the AUDA-

[36] UNDP, AfCFTA and AU (2020), *The Futures Report: Making AfCFTA Work for Women and Youth*, p. 6.

NEPAD African Science, Technology and Innovation Indicators (ASTII) Initiative largely funded by the Swedish International Development Cooperation Agency (Sida).

- Overall, as Table 5 shows, the 24 ESA countries have different levels of preparedness for R4D.

Table 5: ESA Countries' Readiness for R4D

Country	GERD/GDP %	GII Rank (2022)
Angola	0.03 (2016)	127
Botswana	0.25 (2012)	86
Burundi	0.21 (2018)	130
Comoros	N/A	N/A
Djibouti	N/A	N/A
Eritrea	N/A	N/A
Ethiopia	0.27 (2017)	117
Eswatini	0.27 (2015)	N/A
Kenya	0.79 (2010)	88
Lesotho	0.05 (2015)	N/A
Madagascar	0.01 (2017)	106
Malawi	N/A	N/A
Mauritius	0.37 (2021)	45
Mozambique	0.31 (2015)	123
Namibia	0.14 (2010)	96
Rwanda	0.76 (2019)	105
Seychelles	0.21 (2016)	N/A
South Africa	0.61 (2019)	61
South Sudan	N/A	N/A
Somalia	N/A	N/A
Tanzania	0.53 (2013)	103
Uganda	0.48 (2010)	119
Zambia	0.28 (2008)	118
Zimbabwe	N/A	107

SOURCES: UNESCO http://data.uis.unesco.org/index.aspx?queryid=74 ; World Bank https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS; GII: https://www.globalinnovationindex.org/analysis-indicator;

5. ACTORS AND INITIATIVES IN REGIONAL R4D IN EASTERN AND SOUTHERN AFRICA

As noted above, there are considerable differentiated capacities for R4D in ESA. Some countries (e.g., Eritrea, Eswatini, Djibouti, Lesotho, and South Sudan), have relatively weak research infrastructures, shortage of research personnel and very low or limited budgets. Others, e.g., South Africa, Kenya, Rwanda, Mauritius, and Ethiopia have more developed research and innovation systems.[37] The research and innovation capacities of the countries to participate in regional R4D differ and tend to influence funding decisions or priorities of international and regional funders.

There are different and increasingly diverse configurations of actors in R4D and even different R4D systems in ESA. The main actors can be categorized as:

[37]WIPO (2022*), Global Innovation Index 2022: What is the future of innovation-driven growth?* Geneva: WIPO. DOI 10.34667/tind.46596

(a) International funders (both public and private)
(b) Regional funders (often obtaining funding from external international funders and governments of ESA)
(c) Research organizations (think tanks, universities, NGOs, international research centres, private consultancy firms)
(d) Research intermediaries (NGOs and thinks tanks that are contracted by funders to administer funds or help manage calls for research)
(e) Government departments and/or ministries covering various aspects of SDGs, often considered as potential end-users of R4D outputs (e.g., evidence for and in policy)
(f) Communities, social groups and even individuals who expect transformative change, particularly practical solutions to their complex socio-economic and environmental challenges.

Below we map the actors in these different categories using illustrative cases or examples. It is not possible to map all the actors in R4D in ESA in this single short study.

5.1 International funders of R4D in ESA

There has been a remarkable increase in the number of international funders, both public and private, in the ESA R4D systems or landscape over the past decade or so. By international funders we mean external independent government established (e.g., IDRC), bilateral, multilateral and philanthropic donors or supporters of R4D from outside the African continent. According to most interviewees (70% or so) and about 54.7% of survey respondents, international funders' involvement in R4D systems in ESA has increased over the past decade or so. Some of the funders who were identified to have long-term involvement in R4D in ESA are Sida, IDRC, GIZ (former GTZ), the Rockefeller Foundation, Ford Foundation, Carnegie Foundation, the former UK Department for International Development (DFID), the World Bank, the United States Agency for International Development (USAID), the Japanese International Cooperation Agency (JICA), Wellcome Trust and Bill and Melinda Gates Foundation (BMGF). Relatively recent (within the past decade) entrants in the community of R4D funders are South Korea (Korea-Africa Foundation is the main agency for R4D), India (through bilateral STI cooperation with Eritrea) and China as well as private foundations e.g., the Mastercard Foundation. Some Latin American countries (notably Brazil) are funding R4D in Mozambique and Angola. Several United Nations agencies or programmes, e.g., UN Women, UNESCO and UNCTAD has also increased their attention to R4D in the ESA region.

Overall, it is clear from review of reports and the interviews that *there is an increasing number and diversity of funders of R4D in the ESA region*. Two reasons were attributed to this trend. The first is that the ESA countries have set national and regional development priorities and have relatively good (though quality varies from country to country) policy frameworks. The policy environment for R4D has improved and is much better today than twenty years ago or so. One interviewee stated, "Africa and this (ESA) region have done a lot to improve conditions for R&D in terms of formulating STI policies and establishing bodies for coordinating research, including that which funded by foreign international donors."

The second reason for the increasing number and diversity of international funders in the ESA region is that some of these countries are increasingly forging bilateral cooperation in STI with Asian and Latin American countries. According to one interviewee, Taiwan (through its International Cooperation and Development Fund) is perhaps the largest funder of R&D in Eswatini. Countries such as South Africa are leveraging support for regional R4D from Brazil, India, China, Russia through its membership of BRICS. Forums such as India-Africa Summit and the Forum for China-Africa

Cooperation offer the ESA countries with opportunities to leverage more resources for R&D and R4D in general.

According to interviewees (78%), *international philanthropic (private) organizations in R4D in ESA are increasing in number and their impact is getting more pronounced*. Two of the relatively new private foundations mentioned to be with increasing engagement in R4D in ESA include Mastercard Foundation and Bayer Foundation. These two foundations focus on education and youth issues with emphasis on social innovation, and the Bayer Foundation has a programme to strengthen research in health genomics in Sub-Saharan Africa as a whole. Older foundations (in terms of presence in ESA) particularly the Ford Foundation and Rockefeller Foundation have been instrumental in supporting research governance, human rights, social inclusion and environmental law in countries of the ESA region for a relatively long period. The entry of new private foundations and the growing influence of old ones may be due to the increasing recognition of the need for more independently generated evidence. According to some interviewees (about 47%), local actors (particularly governments of ESA countries) have more trust in independent or private funders than in governmental ones. Several, interviewees (about 25%) emphasized the importance of taking account of diversities of private foundations and their own self-interests. One interviewee remarked that foundations from the USA are often driven by corporate interests and focus on priorities set by their home country.

Other key issues raised about the roles of and challenges for international funders of R4D are:

(a) Need to be sensitive to institutional diversities of research organizations and research users in different ESA countries given these countries' differentiated capacities for research and innovation. Funders should not treat ESA as if it is a homogenous region. According to many interviewees (75%) most funders tend to adopt funding and delivery models that are not guided by or based on an understanding of the diverse nature of R4D systems within countries and in the ESA region.

(b) There is a growing tendency of many funders to overuse 'calls' for project proposals as the main instrument for determining what is funded or not, and less emphasis is put on directly soliciting proposals and/or considering unsolicited proposals. Though the 'call for proposals' may enable funders to identify good proposals aligned with specific priorities, and make research competitive, it has potential of leaving or crowding out new research ideas and/or projects that are novel with unanticipated impacts.

(c) Some of the funders' policies and procedures promote crowding out of local researchers. Some funders grantee Northern universities and research institutes as well as private consultancy firms to sub-contract researchers in ESA. The problem with this approach is that it does not help local ownership of R4D and may not help to build local R4D system. Two interviewees emphasized that this approach has high transactions, often does not leave intellectual property with researchers, and in some cases just benefits Northern universities and their researchers to build their publications profile.

(d) There is increasing emphasis on partnerships or collaborations of different types among funders of R4D in ESA. According to about 67% of interviewees, this is a positive trend. Funders mentioned for being at the forefront of promoting collaborative (pooled resources) R4D in ESA are IDRC and Sida. These two funders have accumulated considerable 'social capital' amongst other donors having worked in the ESA region for several decades. Some of the interviewees emphasized the importance of key features for funders' collaboration. They include strong leadership for good governance of the collaboration, and long-term investment based on transparency, trust and accountability. Overall, leadership among funders is crucial for the overall good governance R4D systems in ESA.

(e) There is an increasing emphasis for funders to share knowledge and where possible harmonize their tools for evaluating R4D impact. One framework that is referred to in various

reports and discussions is IDRC's Research Quality (RQ+).[38] UK's Department for Business, Energy & Industrial Strategy report on R4D Indicators identified RQ+ Framework and EU's Horizon 2020 as having novel approaches to designing and measuring key performance indicators (KPIs).

5.2 Development banks and regional specialized funding initiatives

Development banks, in particularly the African Development Bank (AfDB), the Islamic Development Bank (IDB) and the Development Bank of Southern Africa (DBSA) are increasingly playing major roles in R4D in ESA. Of these development banks, the AfDB has become politically and intellectually influential in R4D across Africa in general and in the ESA. Its remit is "to spur sustainable economic development and social progress in its regional member countries (RMCs), thus contributing to poverty reduction."[39] The mobilizes and allocates resources to RMCs for investments in a variety of areas aligned directly to the SDGs. It has become an influential source of policy advice and technical assistance to support RMCs' development efforts. Its strategy plan for 2013–2022 outlined five main channels for the Bank to deliver its work and improve the quality of growth in Africa:

- Infrastructure development
- Regional economic integration
- Private sector development
- Governance and accountability
- Skills and technology

Areas of special emphasis in implementation of the strategic plan are: (a) Fragile states, (b) Agriculture and food security and (c) gender. These are aligned with SDG16, SDG2, SDG5 and SDG9. The Bank has four financial mechanisms available for financing R4D initiatives. These are: (a) African Development Fund (ADF) Loans & Grants — African ADF countries such Kenya can secure loans and grants, (b) Middle Income Country (MIC) Grants to be used to undertake research, (c) ADB Loans — ADB countries can access loans to support the establishment of technopoles and technoparks (d) multinational window used by the bank to support regional cooperation, the mobility of skilled labour, and collaboration in research and technological innovation, and (e) Private Sector Loans — the bank's private sector department provides sovereign guarantees to African governments to enable them secure loans from private sources. In addition, AfDB administers a wide range of trust funds, for example the Japanese Trust Fund, which are sources of 'soft loans' to African countries. For example, the Japanese Trust Fund has been the source of funding for the Education in Sustainable Development in Africa (ESDA) a consortium of African and Japanese universities research on sustainable natural resource management and building capacity in sustainability science related areas.

The Bank has established several in-house research hubs with expertise on a wide range of issues including climate change financing, climate smart agriculture, gender equality with emphasis on women's empowerment. At least 60% of the interviewees identified the AfDB as one of the influential sources of policy ideas on issues of climate change, women empowerment measurement, and transformative agriculture in ESA. According to one interviewee the Bank is well placed to harness and communicate the best available evidence on sustainability challenges and solutions to because of dual roles of funder and research performer, and be of its inter-governmental stature.

[38] McLean, R.K.D and Sen, K. (2018), Research Quality Plus. Making a difference in the real world-A Met-analysis of research for development. IDRC, Canada.

[39] https://www.afdb.org/en/about/mission-strategy

The ISDB[40] is a recent entry into R4D in ESA. It has partnered with UNESCO to support several ESA countries (e.g., Mozambique) to review their research and innovation systems, strengthen capacity of TVET institutions and building research partnerships with Arab research institutes.

The Development Bank of Southern Africa (DBSA)[41] headquartered in Midrand, South Africa is a sub-regional development bank modelled around the AfDB, wholly owned by the Government of South Africa. Its overall objective is to drive inclusive growth and stimulate innovative solutions for the socio-economic transformation of Southern Africa. It mobilizes funding for infrastructure planning and development with emphasis on health, education, human settlements, energy, water and sanitation, digital transformation and transport. To a large extent, DBSA work is focused on SDG9 and considers cross-sectoral issues of social inclusion, gender equality, and green growth (with climate change high on the radar). It funds private companies, universities and SADC to procure and/or develop knowledge that is critical for the region's sustainable development. In 2022, the DBSA invested approximately US$ 170 million in various projects.

There are non-development bank foundations and initiatives that have been established with the support of international funders to administer and disburse funding to R4D projects and programmes in ESA. One of the oldest of these institutions is the African Capacity Building Foundation (ACBF).[42] The ACBF is recognized as the AU's Specialized Agency for Capacity Development. It was established a partnership initiative of the AfDB, UNDP and the World Bank. Several bilateral funders including Canada, Austria, Sweden, UK, USA, Ireland, India, Greece, Netherlands, Norway, Finland and Denmark have supported the ACBF. The ACBF's notable contributions include supporting the setting of policy analysis think tanks in or for several governments including in Rwanda, Kenya, Ethiopia, South Sudan and Uganda. It commissions, through consultancy tendering, research on various sustainable development issues including the impact of COVID19 on women and girls, building STI systems for Africa's transformation, and capacity building in STEM and TVET.

The Science for Africa Foundation (SFA Foundation)[43] is a non-profit, public charity organisation that supports strengthens, and promotes science innovation in Africa. The goal of the SFA Foundation is to address the continent's most pressing developmental needs by generating scientific knowledge that solves problems and informs decision-making. The Foundation is largely in the business of granting making in the domain of global health and supports capacity building for clinical trials, developing excellence in leadership, training and science (DELTAS) and harnessing genomics data to improve biodiversity and agriculture. The SFA Foundation is funded by the BMGF, Wellcome Trust, and UKAid. Most of the programmes and funding currently at the SFA Foundation were originally administered by the African Academy of Sciences (AAS).

The African Academy of Sciences (AAS)[44] is a non-aligned, non-political, not-for-profit pan African organisation whose vision is to see transformed lives on the African continent through science. It is a membership (of elected fellows and affiliates) that recognizes and awards excellence in sciences, including humanities and social sciences. Though its remit is not about or does not cover grant making, over the past decade or so the AAS mobilized and/or attracted significant funding from international funders to award research and training grants. Wellcome Trust, BMGF, Carnegie Corporation of New York (CCNY), and the UK government are some of the international funders that channelled resources through the AAS for various R4D or related initiatives.

[40] https://www.isdb.org/
[41] https://www.dbsa.org/about-us
[42] https://www.acbf-pact.org/who-we-are
[43] https://scienceforafrica.foundation/
[44] https://aasciences.africa/About

The Alliance for Accelerating Excellence in Science in Africa[45], established in 2015, as a partnership of the AAS, the AU Development Agency (AUDA-NEPAD) and several development partners (funders) including the Bill and Melinda Gates Foundation, the UK Wellcome Trust and the former UK Department for International Development (DFID). AESA was endorsed by the African Union. Its remit is to help mobilize funding for R&D and create conditions for scientific excellence in Africa. Since its launch, AESA has mobilized about USD 150 million for its flagship programmes on climate change, health, spurring innovation, building the capacity of scientists and science journalists and strengthening financial governance in research and development. This funding has been provided as competitive grants to African scientists to develop and implement their ideas and to grow their careers. The AESA has been relocated from the AAS to the new Science for Africa Foundation.

Other examples of regional funding initiatives that have relied on foreign funders as key sources of resources include the AUDA-NEPAD programmes for networks of centres of excellence in biosciences, water sciences, and biosafety. In the case of NEPAD African Biosciences Initiative (ABI) launched around 2004 with CAD$ 20 million, most of the resources were expended to establishing sub-regional networks whose main task was to disburse small grants to national research institutes and universities to conduct relatively small short-term projects.

A similar approach prevailed with the African Network of Centres of Excellence in Water Sciences and Technology Development was initiated by NEPAD, following the acknowledgement, at the first AMCOST meeting, of water science and technology as one of the main flagship programmes of NEPAD. The aim is to establish networks of research centres working on water sciences within the five African regions and thereby assess and reinforce STI capacities in Africa. Suitable research institutions are identified through calls launched on the regional level. The initiative is administered by South Africa's Water Research Commission and the then NEPAD Agency and funded by the Government of France through the Ministry of Foreign Affairs. In addition to the European Commission, through its Joint Research Centre, a major partner involved in the implementation of the initiative is the French Institut de Recherche pour le Développement (IRD). Other African partners included the University of Stellenbosch in South Africa and the Abuja-based African Ministerial Commission on Water (AMCOW).

Overall, there are many regional initiatives that have been established by various actors, including funders for purposes of delivering R4D resources to institutions and/or countries in the ESA region. Some of the regional initiatives and/or organizations have had their mandates 'diluted' as they got overwhelmed with grant making responsibilities for which they possess relatively limited capacity. From the interviews, there are concerns that this approach of 'regionalizing' delivery of R4D funds may in the long-term weaken real R4D partnerships between ESA countries and funders' own research systems. One interviewee argued that it is important to separate R4D funding functions from research performance and policy advocacy. His view is that regional organizations such as AAS should focus on strengthening fellows and affiliates' capacity to use their knowledge in policy advice and initiation of new forms of R4D partnerships instead of getting into grant making activities.

Several interviewees (at least 9) raised concern about the potential high transaction costs of international funders sub-contracting regional research organizations and networks to administer R4D grants. One of the nine interviewees held the view that development banks (e.g., AfDB, DBSA, East African Development Bank) and the SGCI as well as other agencies (e.g., SFA Foundation) expressly remitted to engage in grant administration and making should be strengthened. She was of the view that the AU Commission and its technical bodies such as AUDA-NEPAD should be

[45] https://www.aasciences.africa/aesa

strengthened for evidence use and policy implementation. An example given of AU and its structures administering grants was EU funded the African Union Research Grant Programme administered by the AU Department of Human Resources, Science and Technology.

The main point to emphasize is that there is a need to build R4D systems with actors whose functions are well distributed and not mixed up. As we stated earlier, functional innovation systems or R4D systems with clear articulation of different actors based on their differentiated remits and capacities. As we discuss later this is one of the issues that some of the SGCs must grapple with. Some of them have multiple overlapping mandates and/or remits. For the National Commission for Research Science and Technology (NCRST) of Namibia has granting, policy formulation and implementation, and overall system coordination.

5.3 R4D performers and users in ESA

There is a large variety of research organizations (performers)—individuals and agencies that are directly involved in the production of knowledge and innovation for development—and a diverse range of users of knowledge, evidence, technologies and innovations from R4D. In any country and in any region such as ESA there are multiple research organizations (knowledge producers) often in both public and private institutions. Some countries have relatively high populations of researchers while others do not. There is no database of full-time research personnel in ESA. Based on the African Innovation Outlook III (2019) and UNESCO Science Report 2021, mode estimates are that the ESA region has 350,000 full-time personnel with South Africa having the highest number of about 69,000.

Because most of the regional R4D is funded through regional programmes and/or organizations it is prudent to focus on illustrating examples of research organizations that have pronounced presence in the region. From website searches and interviews the landscape of Research organizations has considerably changed over the past decade or so. Research organizations are full in various disciplinary (economics) or broad research domains (governance) or technological fields (biotechnology). Using IDRC, Ford Foundation, Rockefeller Foundation, BMGF, GIZ and several bilateral and multilateral organizations funding R4D and used https://policycommons.net/orgs/research-on-poverty-alleviation/ a resource on influential think tanks, specific regional research organizations were identified to work in most of the 24 countries as shown in Table 6.

In addition to the small number of the above listed internationally rated think tanks, there are thousands of other think tanks and research institutes in various fields and sectors that perform R4D. They include agricultural research institutes, the Consultative Group on International Agricultural Research (CGIAR), health research and innovation centres, industrial development and manufacturing institutes, centres or institutes for research in energy and climate change, and thousands of private firms engaged in R4D at different stages. International Northern universities and foreign consultancy firms are also key R4D actors in the ESA region.

Table 6: Examples of internationally recognized or rated think tanks in ESA [46]

ORGANIZATION	RESEARCH DOMAIN / DISCIPLINE
ACBF	ACBF (African Capacity Building Foundation) undertakes Research and capacity building in many SDGs areas, emphasis on trade and regional integration
ACCORD	The primary aim of ACCORD (African Centre for the Constructive Resolution of Disputes)is to influence political developments by bringing conflict resolution, dialogue and institutional development to the forefront as an alternative to armed violence and protracted conflict. ACCORD specialises conflict management, conflict analysis and conflict prevention. ACCORD intervenes in conflicts through mediation, negotiation, training, research and conflict analysis.
ACTS	ACTS (African Centre for Technology Studies) is an international independent policy research organization focused on STI for sustainable development
AERC	AERC (African Economic Research Consortium) focuses on economic policy analysis and capacity in various economics fields e.g., agricultural economics
APHRC	APHRC (African Population and Health Research Centre) is active in advocacy of gender equality with emphasis on women and girls' empowerment; promotion of women in STEM leadership; building capacities in selected universities to engage in reproductive health research
ATPS Network	African Technology Policy Studies Network specializes in STI policy, climate change financing, public-private sector partnerships
BIDPA	BIDPA (Botswana Institute for Development Policy Analysis) was established in 1995 to provide research support and policy analysis services to key economic ministries and agencies. Its mandate is to promote policy analysis through research and develop local capacity for policy analysis and management through in-service training and fellowship programmes. In 2020, the Lauder Institute of the University of Pennsylvania recognized BIDPA as a Center of Excellence following its ranking as a top think tank in Sub-Saharan Africa for 2017, 2018 and 2019.
CCR	The CCR (Centre for Conflict Resolution) is an independent non-governmental organization based in Cape Town, South Africa. The Centre promotes constructive, creative, and co-operative approaches to conflict resolution in Africa.
CDD	CDD (Centre for Democracy and Development) focuses on promotion of democratic governance
CODESRIA	CODESRIA (Council for the Development of Social Science Research in Africa) was established in 1973. Based in Dakar, Senegal, its aim is to promote, facilitate and disseminate social science research across Africa and create a community where members can work without language, country, age or gender barriers. CODESRIA grants research scholarships and organizes conferences and programmes focused on the social sciences and humanities.
IEA Kenya	IEA (The Institute of Economic Affairs) Kenya was founded in 1994 as a civic forum to promote public policy and efficient management of public finance and economic policies in Kenya.
ISS	ISS (Institute for Security Studies) was founded in 1991. Its mission is to enhance human security to achieve sustainable peace and prosperity in Africa. The non-profit has offices in South Africa, Kenya, Ethiopia and Senegal, and its interventions cover transnational crimes, migration, maritime security and development, peacekeeping, peacebuilding, criminal justice, and conflict/governance analysis. In 2019, ISS was ranked first in Africa by the Global Go To Think Tanks Report for "Think Tanks with Outstanding Policy-Oriented Research Programmes," and the second-best independent Think Tank in Africa.
KIPPRA	KIPPRA (Kenya Institute for Public Policy Research and Analysis) was ranked second top think tank in Sub-Saharan Africa by the Global Go-To Think Tank Index Report 2020.
PSI	PSI (Policy Studies Institute) was founded in November 2018 by the Ethiopian government. It was founded by merging two state-owned think tanks in Ethiopia, Ethiopian Development Research Institute (EDRI) and Policy Study and Research (PSRC)
REPOA Tanzania	Research on Poverty Alleviation (REPOA) is a non-profit, non-governmental organization concerned with poverty and pro-poor growth. REPOA undertakes and facilitates research, conducts and coordinates training, and promotes the development of policy for pro-poor growth and poverty reduction. REPOA"s main thematic research areas include growth and poverty, gender, environment, agriculture, technology, governance, vulnerability, and social protection.
SAIIA	SAIIA (South African Institute of International Affairs) is an independent public policy think tank advancing a well-governed, peaceful, economically sustainable and globally engaged Africa.

[46] Based on https://policycommons.net/orgs/research-on-poverty-alleviation/ and interviews

From the survey and interviews conducted for this study, most of the organizations working in various fields and disciplines in ESA reported that they have explicit policies for R4D. The 17 organizations that participated in the survey reported that they had provisions and priorities for R4D in their strategic plan. Some of them were focused on strengthening knowledge sharing with Northern Research organizations in areas such as climate change and global health. There is increasing emphasis on multi-disciplinary research work. About 53% of the organizations in the survey reported that their research programmes cover basic and applied research, human and social sciences, and policy research for development.

About 76.5% of the respondents to the survey indicated that their organizations were focused on both social development and environmental programmes with emphasis on climate change, biodiversity loss and pollution. According to 17 of the interviewees, the focus or research priorities of most research organizations in the ESA is largely determined by international funders' priorities. One of the interviewees noted that this has "distorting effect on local research agendas" while two interviewees emphasized many countries in ESA need to focus more on social development challenges such as exclusion of women and girls from accessing and using economic assets such as land was a major barrier to sustainable development.

A key challenge identified by at least 75% of interviewees was poor governance of R4D in the ESA attributed to capacities of national research and innovation coordinating agencies, the multiplicity and diversity of Research organizations. Most of ESA countries have established ministries or departments to coordinate STI policy implementation and R&D activities. Some (e.g., Kenya, South Africa, Mozambique) have agencies dedicated to funding national R&D. South Africa's National Research Foundation (NRF) is perhaps the most established granting council in the region. It funds national R&D and some international R&D partnerships.

How most STI agencies and science councils in ESA have had a limited focus on social development and governance issues in their programmes and funding schemes. One interviewee and at least two respondents in the survey outlined the demarcation between STI (R&D) and social development issues where R&D has often been narrowly defined to be basic and applied research in natural sciences, and social development being treated as the preserve of departments of social affairs. Addressing this challenge is in fact one of the inspirations of the SDGs—an integrated set of ambitious global goals. It is a call to building capacity for transdisciplinary research and practice in governments, think tanks, NGOs, science councils and universities as well as private sector.

5.4 African universities' regional initiatives in R4D

African universities' role in the continent's transition to the SDGs and the attainment of the education SDG4 are key issues in R4D in ESA. Universities are critical in implementing programmes for realizing most of the SDGs and have traditionally been the main key Research organizations in ESA R4D systems. However, the past decade or so has seen the erosion of universities' R&D capacities. Reforming university education and research to align them with contemporary demands is a high priority for many governments and funders. According to Zaglul and Sherrard (2005), the problem is that African universities became places to train the labour force not the locus for productive activities..[47] Universities in many ESA countries are confronted with problems of huge

[47] Sherrard, D., and Zaglul, J. (2005), Higher education in economic transformation, p. 34 in Juma, C. (ed), Going for Growth: Science, technology and innovation in Africa. The Smith Institute, London

financial debts, low research productivity due to lack of funds and poor infrastructure for R&D, and myriad of governance deficits.

To address some of the challenges some funders have launched or supported various initiatives including the establishment of networks such as the African Research Universities Association (ARUA), the Southern African Regional Universities Association (SARUA), creation of research chairs at several universities particularly in South Africa, and development of various platforms for knowledge sharing among universities. Some countries e.g., Rwanda took bold steps to merge public universities and allowed the establishment of private ones specializing in certain areas such as global health. Success in university reform and capacity strengthening various from one country to another. In many cases, the political and governance contexts are inimical to transformation of universities in the ESA region.

Despite the challenges, funders such as the World Bank have continued with some bold initiatives. For example, the Bank has invested considerable resources in the Eastern & Southern Africa Higher Education Centers of Excellence (ACEII) project to strengthen selected university research centers to develop globally engaged and collaborative research capacity in the Eastern and Southern Africa region. The ACEII project addresses advanced skills and innovation requirements for the priority sectors in the region. It is doing this through economies of scale in the use of facilities, equipment, and staff in specialized fields to share innovations and good practices in teaching and learning, and to enhance cross-border research networks. The project also enables capacity development to address key institutional inadequacies, such as partnership development with the private sector and competitive scholarships which aims at identifying promising female scholars and developing their capacity as future leaders for the region. These scholars are encouraged to study in an Africa Centers of Excellence (ACE) institution outside their native country in the region, thus promoting regional mobility of female students across the continent. There are tangible benefits of this project: More than 8,000 direct project beneficiaries enrolled in Master's, PhD or short-term programs at the ACEs and one-third of all direct project beneficiaries were female students.[48]

Some universities in some ESA countries, particularly in South Africa, have created innovative institutional arrangements for strengthening their research in key SDG areas such gender, climate change, sustainability science, human rights and innovation studies. They are leveraging different forms of research partnerships to build their research capacities and the Department of Higher Education, and the National Research Foundation (NRF) have created incentives for high quality research. They have impact assessment and quality management frameworks.

The situation in most other countries is different. According to most many interviewees (at least 60%) there is less evidence-based university reform and more short-term interventions to keep public universities afloat. This is not because there are good practices to learn from but because many vested interests around the creation of private universities that get funded through public resources. Bad governance and corruption are standing in the way of university reform in many ESA countries. Some interviewees (about 25%) argued that funders have invested in think tanks and advocacy bodies that attracted high performing researchers from public universities and due to low wages, some university staff are more engaged in private consultancy firms. Our analysis from cases in South Africa and Rwanda shows the converse: that with the sharpening of research foci many funders are engaging more university-based researchers than private consultancy companies. Perhaps, it is an issue or question of further inquiry as how independent think tanks and public universities can build symbiotic linkages or relationship in national and regional R4D systems.

[48] https://www.worldbank.org/en/results/2020/12/14/investing-in-excellence-in-higher-education-for-development-delivering-quality-post-graduate-education-through-the-eastern-southern-africa-higher-education-centers-of-excellence-aceii

Indeed, both think tanks and universities can co-evolve in R4D systems, playing complimentary roles. Independent thinks may have more flexibility to engage in policy advocacy while universities pay more attention to R4D that is aimed at building local R&D expertise (post-graduate and doctoral graduates for R4D) and engage in innovation activities in partnership with private sector.

5.5 Private sector participation in R4D

Participants in the survey and almost all interviews for this study recognize that the private sector (both foreign and domestic) is one of the key stakeholders in economic development, as it is a major contributor to the attainment of SDGs. About 71% of the respondents' organizations in the survey have R4D projects designed and implemented in partnership with the private sector. At least 80% of the interviewees listed key SDGs where the private sector is critical. They include SDG 2(ending hunger), SDG 3(health and wellbeing), SDG5(gender equality), SDG8 (economic growth and employment/decent jobs), SDG9 (industry, innovation and infrastructure) and SDG14 (life under waters, marine and costal resources). This underscores the importance of getting the private sector to be at the forefront of co-designing and co-creating solutions.

The EU-Africa research and innovation partnership provides some examples of policy and political support for private sector increased engagement. Para 61 of the Lisbon Joint Action Strategy (JAS) states: "The involvement of the private sector in health sector development and financing, including through public-private partnerships, should be encouraged and the production and access to generic medicines should be enhanced. Africa and the EU will, in addition, promote further research, particularly for vaccines and new medicines for both major and neglected diseases, and on issues relating to water-borne diseases, as well as on the clinical effectiveness of traditional medicine. Partners will also work towards effective implementation of international health agreements and regulations."

The practice of getting private sector into R4D is slow though changing in the ESA region. In most countries, except South Africa and Rwanda, incentives for businesses to invest in R&D are absent or weak. South Africa and Rwanda have recently used a range of policy instruments including public-private partnerships, functional public procurement, tax incentives and provision of special services to attract vaccine manufacturing ventures. Some countries such as Ethiopia has relaxed certain restrictions to get private sector contribute to the enhancement of digital infrastructure in the country.

There are also examples of philanthropic institutions such as the Wellcome Trust (UK) and the Bill and Melinda Gates Foundation, for-profit companies such as Astrazeneca (UK), GlaxoSmithKline (UK), Novarttis (Switzerland), Sanofi (Switzerland), Merck (USA), and Pfizer (USA) are involved in multilateral and bilateral cooperation health R&I initiatives in ESA, particularly South Africa, Kenya and Uganda.[49] These and others are engaged in a variety of ways including funding R&I activities and as sources of knowledge assets such as patents for drug and vaccine development in Africa. For example, researchers from GlaxoSmithKline are working with African scientists in various projects develop a vaccine against malaria.

Some countries e.g., Botswana have developed strategies for increasing private sector engagement in R&D. The challenge is implementation of such strategies due to weak state capacity and bad governance. For many ESA countries the key issues according to interviewees and review of various reports are:

[49]For examples of companies involved in health R&I partnerships in Africa see for Bvgh (2014), *Accelerating R&D for neglected diseases through global collaborations*. WIPO Re:Search Partnership Stories 2012-2013. BIO Ventures for Global Health (bvgh)

- Most of the private sector is Small and Medium Enterprises (SMEs) with limited capital to invest in long-term R&D ventures. SMEs can be important users of research and need to be strengthened using deliberate public policies to increase their uptake of R4D outputs.
- Joint ventures and other innovative financing mechanisms are in short supply.
- Product Development Partnerships (PDPs), most notable in the pharmaceutical sector, which emerge in response to the failure of the market to produce drugs, vaccines, diagnostics, and health technologies for (infectious) diseases, but there are trust deficits between public and private sectors in many ESA countries.
- Most PDPs are said however to have delivered only incremental innovations and low-hanging fruit, products already in the development pipeline or developed for other markets. PDPs are typically international. The Drugs for Neglected Diseases Initiative (DNDI) is illustrative of PDPs including European and ESA partners. DNDI's partners include universities in Ethiopia, Uganda and South Africa in Africa, as well as universities in the UK, Spain, and Belgium in Europe. An example of an Africa-Europe multilateral partnership within DNDI is the development of a combination therapy for visceral leishmaniasis in East Africa.
- The European and Developing Country Clinical Trials Partnership is a high potential partnership with the private sector. Unlike PDPs, EDCTP operates as an initiative of Article 185 of the Treaty on the Functioning of the European Union enabling the EU to participate in research programmes undertaken jointly by several EU Member States. Like PDPs, EDCTP aims to overcome market failure. Malaria and TB, two of the three focal diseases of EDCTP (the other being HIV/AIDS) are not attractive markets for drug producers. Reluctance in the public sector to use public funds to support the private sector is also partly the reason for weak private sector participation.

Overall, strengthening private sector participation in R4D in ESA is an important issue that requires further analysis and according to most interviewees, R4D funders should partner with regional business councils or chambers of commerce and the RECs to design initiatives that exploit public-private partnerships for SDGs in ESA. Funders can also explore ways and means of strengthening private sector's capacity to engage in transdisciplinary R4D with public sector think tanks and universities.

6. ISSUES AND TRENDS IN STRATEGIC R4D FOCUS

6.1 Gender in R4D: Trends and Drivers

In general, gender issues are prominent in the R4D agenda in the ESA region. The are two aspects to gender in R4D that this study focused on. The first relates what gender issues that are currently being prioritized or addressed in current R4D programmes or initiatives and second is what are the gaps, are how are the different institutional actors are promoting gender equity and equality in employment and development in general. It is important to emphasize that the foci of many actors in the region is on issues pertaining wellbeing of women and girls though there is an appreciation by most (at least 70%) of participants (interviewees and respondents) that the concept of gender is broad encompassing 'sex'—female and male. According to the World Health Organization (WHO) gender "refers to the characteristics of women, men, girls and boys that are socially constructed. This includes norms, behaviours and roles associated with being a woman, man, girl or boy, as well as relationships with each other. As a social construct, gender varies from society to society and can change over time".[50] According to most interviewees and reviews of various

[50] https://www.who.int/health-topics/gender#tab=tab_1

regional R4D actors' programmes in ESA there are many justifications for having 'women and girls' wellbeing' issues high on the research and policy agendas. The justifications include the following:

- Women and girls still face great gender discrimination or barriers than men and boys to accessing basic social and economic assets such as health and education.
- Women and girls are more vulnerable to ecological and socio-economic shocks related to climate change, flooding, loss of biodiversity and related induced conflicts.
- Some of the rapid technological changes are 'insensitive' to social and biological needs of women and girls.
- There is a 'gender technological divide' particularly with digital transformation where majority of women and girls do not have easy access to digital technologies and related infrastructure.
- Women and girls are under-represented in science, technology, engineering and mathematics (STEM).

According to a recent report by the UN Food and Agriculture Organization (FAO, 2030): "While women have gained more access to some resources – such as digital technology and financial services – over the past decade, the gaps are either unchanged or growing in far too many areas, particularly for rural women. For example, since the outbreak of the COVID-19 pandemic, the gap between women's and men's food insecurity has grown to 4.3 percentage points, with significantly higher food insecurity among rural women. Rural women are less likely than rural men to own a mobile phone."[51]

There are numerous studies and action-oriented initiatives to address women and girls' empowerment challenges and attain SDG5. From the survey and interviews, there is evidence that gender issues (particularly the empowerment of women and girls are being increasing being integrated into the R4D agenda. About 64% of organizations (in which the survey's respondents are employed) have integrated gender considerations in their research and capacity building programmes. A review of some of the organizations' annual reports and interviews show that significant budgets are allocated to R4D on women and girls' empowerment and innovations to empower women to engage in economic activities such as agriculture, aquaculture and agro-processing. There is also growing emphasis on action-oriented research on gender e.g., promotion of gender budgeting by some funders and Research organizations.[52] Organizations such OXFAM, IDRC, FAO and UN-WOMEN supporting projects on gender budgeting in Ethiopia, Malawi, Kenya and other countries in ESA. Some interviewees (at least six) emphasized gender budgeting and use of public procurement are some of the most powerful policy instruments[53] for ensuring women empowerment but noted political and social cultures are still barriers to the use of such instruments.

There are significant gaps between research on gender and the attainment of gender equality as a practice. However, there is progress on gender focused R4D in ESA. Overall, the survey shows that:

- A growing number of organizations have explicit policy and procedures on gender, particularly those for increasing participation and protection of women in R4D projects and/or programmes.
- Gender issues are increasingly being integrated or covered in their R4D programmes of many organizations in the region.

[51] FAO (2023) *The status of women in agrifood systems*. Rome. https://doi.org/10.4060/cc5343en

[52] Gender budgeting is the application of gender mainstreaming in budgeting at different levels of governance including national, regional and municipal levels.

[53] We use the notion policy instrument to mean techniques that decision-makers (including funders) to ensure that specific policy goals are attained, or policies are implemented.

- There has been deliberate effort by many R4D actors to link or build connections between women empowerment considerations to other sustainable development objectives such as climate action, food and nutritional security and decent employment.

From the interviews and review of various reports, there is an increasing number of funders of gender research, with emphasis on issues of women and girls' empowerment. Gender equality in general and women's social, economic, and political rights are now being researched within the broader framework of human rights. According to one interviewee and review of reports by IDRC and FAO among others, there has been a remarkable shift in gender studies from a narrow conceptualization and linear approach to systemic inquiry into various dimensions of rights, including aspects related to resource tenure, access to policy and political spaces, and impacts of ecological destruction on the health and social well-being of women e.g., gender sensitive climate smart agriculture.

Different funders are using and/or promoting the use of different policy instruments to enhance action on gender issues. Many are requiring R4D actors (including think tanks, NGOs and universities) have explicit policies and procedures on gender. Overall, there is a growing body of empirical evidence on how best to transition to SDG5 (gender equality) with emphasis on women and girls' empowerment. There are, however, challenges associated governments' ESA having weak capacity to use the evidence, weak political will, or capital to implement gender policies, and entrenched socio-cultural norms against women empowerment at various levels of governance in different countries. One interview emphasized the need to inquire more into barriers to gender policy implementation and weak enforcement of gender laws by ESA governments. He was of the view that in some countries (e.g., Rwanda, South Africa and some extent Namibia) its political and executive leadership that drive good performance in the transition to SDG5. Where such leadership lacks or is weak, it is often difficult to unlock social, religious and structural barriers to gender equality. Perhaps, inquiry into the political economy of gender policymaking and implementation is one of the areas that required more R4D.

Another issue that should be considered is strengthening the capacities of legislative bodies to procure and use the rich data generated by various organizations such as APHRC and UN Women. According to some interviewees (at least 7), local and national legislative assemblies have limited capacity to use available data and evidence generally to legislate women and girls' empowerment.

6.2 Indigenous peoples, people with disabilities and Human Rights in R4D

ESA countries have subscribed or signed to a wide range of international, continental and regional agreements on human rights and various environmental and cultural treaties that aim at promoting the rights of indigenous peoples (communities) and their cultural as well as ecological rights. There are various AU conventions for the protection of cultural heritage and indigenous people's rights. The ESA countries are parties to the UN Convention on Biological Diversity and the Protocol on Access to Genetic Resource and Benefit-Sharing. There are also protocols that require research institutions to exercise ethical practices in access and use of human subjects and participation of local communities in R4D.

The survey shows that there is relatively slow progress on institutionalizing or domesticating indigenous people knowledge and human rights protocols. Relatively few organizations have institutional policy and/or procedures for protecting and promoting social, economic and ecological rights of indigenous and/or traditional peoples (or communities) in countries in which you work. However, many organizations recognize the urgency of R4D on instituting regimes for access to and

sharing of benefits from genetic resources; assessing the impact of climate change on the rights of indigenous/traditional peoples; inquiry into the role of indigenous and/or traditional knowledge in ecological restoration and sustainable management of natural resources; assessing the impact of modern technologies on the rights of indigenous/traditional peoples; securing land tenure or rights of the peoples or communities; inquiry into the role of indigenous and/or traditional knowledge in ecological restoration and sustainable management of natural resources; assessing the impact of modern technologies on the rights of indigenous/traditional peoples; securing land tenure or rights of the peoples or communities; and documentation of the languages and knowledge systems of indigenous communities.

There is consensus from the interviews and review of various reports that the number of human rights institutions has increased in the region.[54] They include think tanks and advocacy (watchdog) agencies on human rights. However, the institutions or agencies operate in diverse social and political contexts, have differentiated capacities to effectively engage in research, advocacy and practices of human rights in different countries. In Eastern Africa, human rights organizations have relatively limited political space to work in countries such as Eritrea, Ethiopia, South Sudan, Rwanda and Uganda while in Southern Africa human rights organizations are more active and many of them are actually based in universities or work in collaboration with universities' departments of human rights law and political science. One interviewee observed that in Eastern Africa it is almost impossible for public universities to develop and implement research on human rights. Some public universities have tried to embed human rights research into environmental law programmes.

Another important R4D issue pertains to research and innovation for improving conditions for people living with various biological and physical disabilities. Organizations are expected to design and implement their own policies and procedures for conducive working environments for people with disabilities. From the survey, few organizations in the region have deliberate institutional policy and procedures for protecting the rights of and creating favourable working environments for personnel with disabilities.

There are also relatively programmes that are focused on R4D activities that are purposefully aimed at addressing problems/challenges that people with disabilities face. Public STI policies of most countries in ESA have no explicit provisions on R&D and innovation to address challenges of persons with disabilities and inclusive innovation in general. A few RSA countries (e.g., Namibia and South Africa) have policies for inclusive innovation, and even these do not deliberately emphasize the importance of R&D and innovation on challenges of persons with disabilities.

6.3 A wasted demographic dividend? R4D issues and questions

The demographic dividend is a concept that generally used to economic growth resulting from a change in the age structure of a country's population. The change in age structure brought about by a decline in fertility and mortality rates. Africa's current youthfulness, in terms of the human population, is considered as a dividend. In 2017, young people aged between 15-24 years were about 225 million and expected to increase by 42 percent by 2030.[55] In ESA, the youth is expected to about 350 million. The view is that this youthful population boom will accelerate economic

[54] Heyns, C., and Killander, M., (2016), *Compendium of Key Human Rights Documents of the African Union* (Sixth Edition). Pretoria University Law Press (PULP)

[55] UNFPA (2017), The Demographic Dividend Atlas for Africa: Tracking the Potential for a Demographic Dividend. https://www.unfpa.org/sites/default/files/resource-pdf/UNFPA_African_Atlas_KW_RS_SZ.pdf

growth. There is very scant economic analysis to sustain the assertion—that a high youth population will be the source of growth in the region in absence of appropriate political, economic and social structures. According to some interviewees (at least 30%) the demographic dividend as espoused by many African countries does not consider megatrends such climate change, pandemic, geopolitical conflicts and other threats to the sustainable of the ESA region. As the COVID19 pandemic showed, pandemic and other megatrends can disrupt youth development. Disruptions in schooling and training, food insecurity, rising youth unemployment and many social development challenges are caused by such negative trends.

The AU has proclaimed and adopted policy declarations on the African youth and the African Youth Charter, ratified by 29 member states (at least 11 from ESA) and signed by 40, is a comprehensive framework defines the rights and obligations of young people. It aims at the promotion of youth at national, regional, and continental levels. However, the AU has not secured budgetary allocations sufficient to launch evidence-informed youth programmes. According two interviewees, there just a paucity of evidenced-based analysis on how the continent can attain aspirations of high growth economy driven by its youthfulness.

Therefore, it is important to stress that the dividend is not automatic. As Ross (2014) noted: "while demographic pressures are eased wherever fertility falls, some countries will take better advantage of that than others. Some countries will act to capitalize upon the released resources and use them effectively, but others will not. Then, in time, when the window of opportunity closes, those that do not take advantage of the demographic dividend will face renewed pressures in a position that is weaker than ever."[56]

Based on the survey for this study, the following policy issues need to be carefully considered in the discourse on the ESA (and Africa's) demographic dividend potentials:

(a) What schemes are instituted to mentor young people, including increasing their direct participation in R4D through various capacity development initiatives.
(b) How to address various social, health and economic barriers to youth participation in development, and the kinds of R4D that would help to develop solutions to these challenges.
(c) What kinds of educational and training systems will help to quickly develop the range of skills needed for knowledge-intensive economies and business in the age of rapid technological change.

According to many interviewees, some funders are making choices e.g., increased investment in TVET and increased expenditure on university education not based on ESA countries foresighted skills needs but driven by funders' own supply and demand dynamics.

6.4 Sustainability science in R4D: Key Actors and Foci in ESA

Sustainability science—generally defined as the production of new knowledge on different possible sustainability transitions and/or pathways is key part of post 2015 R4D. Helping countries and companies to make wise choices on which plural sustainability pathways to take and how to govern different transitions in energy, water and food systems required organized research programmes and capacities that are currently in short supply in ESA.

[56] Ross, J. (2004), Understanding the Demographic Dividend. http://www.policyproject.com/pubs/generalreport/Demo_Div.pdf

There are very few research organizations and/or programmes devoted to sustainability science in ESA. Bibliometric analysis[57] and reviews of universities' research portfolios show that the following universities have established sustainability science centres and capacities through partnerships with Northern universities:

- University of Cape Town, several sustainability transitions and sustainability-oriented innovation programmes
- University of Stellenbosch, school/center for sustainability studies
- University of Pretoria, Future Africa centre for transdisciplinary sustainability science and transformative
- University of Johannesburg, Trilateral Chair on Sustainable Development and 4IR; and
- Witwatersrand University, centre for global change and transition studies

There is need for R4D funders and other actors to explore the possibility of supporting the establishment of a research network on sustainability science with ARUA, SARUA and other universities' networks in the region.

6.5 Fourth Industrial Revolution and Open Science

The Fourth Industrial Revolution (4IR) —encompassing the convergence of novel and emerging technologies resulting in the fusion of the physical, biological, and digital or cyber worlds—offers numerous opportunities and challenges for developed and ESA countries to forge innovation-driven R4D. Despite this, technologies associated with the 4IR that are being applied in Africa include the Internet of Things (IoT), Blockchain, Artificial Intelligence (AI), robotics, 3D printing, nanotechnology, biotechnology, cloud computing, and big data, amongst others. Various attempts are being made to leverage these 4IR technologies towards sustainable development in Africa.

The 4IR technologies have three key characteristics. First, they are emerging or new and have capacity to drive rapid convergence and increase complexity. Second, they are pervasive; they have wider applications across sectors or spheres of society and economies. And finally, they are increasingly knowledge and information intensive, especially as they are driven or based on the growth of scientific knowledge in various physical, biological, and engineering fields. The application of 4IR technologies generally disrupt and transform the economic, social, cultural, environmental, and political facets of nations. As such, 4IR technologies offer challenges and opportunities to humanity. There is growing interest in how to harness 4IR technologies for Africa's sustainable development imperatives.

The AU, through the Science, Technology and Innovation Strategy for Africa (STISA-2024), explicitly recognizes the transformative and disruptive nature of 4IR technologies. It established a High-Level Panel on New and Emerging Technologies (APET) to advise African governments on best mechanisms to harness 4IR opportunities while at the same time addressing any of its negative disruptive forces.

The 4IR priority setting is needed to systematically identify and validate the key areas and technologies that must be prioritized for investments. The priority setting process uses inputs from scientists, experts, and existing literature. Following identification and validation of priority areas, different stakeholders will be engaged and mobilized. Advocacy work aimed at influencing

[57] See Mugabe, J., Jauhiainen, J., and Mbaya, M. (2021), A Status Review of Sustainability-Oriented Innovation in Africa: Trends in Research, Policy and Practice. University of Pretoria, GSTM and University of Turk, Finland, working paper.

investment decisions of African governments, scientific institutions and partners will facilitate the necessary buy-in and impact investments decisions and outcomes.

IDRC, Sida and several funders are already supporting regional programmes and networks on the 4IR, with more focus on AI in agriculture, health and climate change. According to all interviewees, this is a brave move and sign of leadership in R4D. These efforts, however, need to be accompanied by strengthening countries' national readiness to effectively engage in Al and 4IR in general. Key to this is building political constituencies for and public confidence in the technologies through technology assessments and foresights. Some of the interviewees (three) recommended that to ensure that there is adequate regulatory framework and is used, R4D funders and experts should support countries to develop appropriate legislation aligned to the AU AI strategy that is currently be developed and UNESCO Recommendation on the Ethics of AI.

Related to the R4D opportunities emerging with 4IR, open science is changing the modes of knowledge production and research management in general. Open science is expected to expand the space for citizens' participation in R4D, facilitate data sharing and create conditions for greater transparency in the management of the quality of knowledge production. UNESCO was mandated and has developed the UNESCO Recommendation on Open Science adopted by the 193 Member States. The Recommendation builds on the UNESCO Strategy on Open Access to Scientific Information and Research and the new UNESCO Recommendation on Open Educational Resources.

There are already open science initiatives in Africa. They include the African Open Science Platform[58] (AOSP) was established in 2017 with an aim to position African scientists at the cutting edge of data intensive science by stimulating interactivity and creating opportunity through the development of efficiencies of scale, building critical mass through shared capacities, and amplifying impact through a commonality of purpose. The AOSP is hosted by the National Research Foundation and is supported by the South African Department of Science and Innovation, the International Science Council, CODATA, the Academy of Science of South Africa, Bibliotheca Alexandria and other prominent regional networks.

Most interviewees for this study did not have adequate understanding how open science will affect R4D and the nature of frameworks that countries and institutions in ESA should adopted. There is a general appreciation of open science and organizations that participated in the survey provide some examples of how they are using open science to enhance knowledge sharing and participatory R4D.

6.6 Digital rights issues in R4D

Digital transformation poses both opportunities and challenges in the sustainable development agenda. Digital civic space can enlarge the protection and promotion of human rights and to enhance innovation and sustainable development. Millions of people in ESA are enjoying access to pluralistic information and exercising their right to freedom of expression because of various digital spaces. While there are concrete efforts to make internet safer for thousands of democracy actors and contributed to building vibrant digital economies. To ensure that digital transformation enables sustainable development, there is need for R4D in ESA to focus on issues such as building the capacity of actors to research on and advocate digital accessibility and equity, and to raise awareness of how access, affordability, and technology-related gaps affect the inclusion of marginalised communities in ESA.

[58] https://aosp.org.za/

6.7 Evolving roles of regional economic and political integration

As stated earlier, ESA countries belong to different RECs—EAC, IGAD, SADC and COMESA. These RECs were initially established to foster collaboration in trade and peace and security. There are still important vehicles for these roles, largely convening and facilitating countries' interactions. However, over the past decade or so RECs have become knowledge producers and knowledge brokers. Recent studies, for example UNECA (2022),[59] show that some RECs are building their own in-house knowledge infrastructures in their secretariats. For example, the EAC has the East African Commission on Science, Technology and Innovation to be the source advise on R&D policy and to spur regional knowledge production for a variety of sustainable development objectives. The SADC Secretariat has in-house expertise in science diplomacy and STI policy that makes it possible to engage in the EU-Africa research and innovation partnership dialogues. Indeed, no longer do RECs have to only rely on think tanks' advice but are armed for discourse and policy experimentation. This is important because the relationships between RECs and other R4D actors are changing from ones of RECs being just knowledge consumers to active know sharers.

According to some respondents in the survey, there are more actors exploring more enduring knowledge sharing and exchange partnerships with RECs. Many research organizations are participating in RECs programmes. They recognize that RECs offer appropriate platforms for exploiting economies of scale in R&D and in policy discourses with governments and private sector. Funders can help to strengthen RECs' to be the loci for R4D policy harmonization, helping ESA countries to exploit economies of scale in knowledge production and use for sustainable development.

7. EMERGING ISSUES AND RECOMMENDATIONS

7.1 Policy trends, gaps and drivers

The past decade or so witnessed reforms in policies pertaining to R4D in both funder countries or organizations and ESA countries. In general, *there is increasing convergence between donor (funders) and receipt countries' policies for or related to R4D*. The are two drivers of *R4D policy convergence*. The first is there is greater effort to ensure alignment between funders' priorities and those of many countries (and regional and sub-regional) in ESA. This is happening because both funders (particularly public ones) and ESA countries (using AU, RECs and sub-regional bodies) have established various common or joint forums for research and innovation priority setting. Examples include the AU-EU High-Level Policy Dialogue on Science, Technology and Innovation7 (HLPD on STI), the SGCI, the UN Commission on Science and Technology for Development (CSTD), the Global Forum of Funders (GFF) and the World Science Forum (WSF). The challenge is that some ESA countries have limited capacities to participate in these forums to articulate their national and regional research and innovation priorities. *Capacity for science diplomacy is thus a key need of ESA countries.*

The second driver of policy convergence is that all the ESA countries have some national development and STI policy frameworks in which they articulate their R&D and, in some cases, R4D priorities. Though some of are outdated (as in the cases of Kenya, Tanzania, Eretria, Botswana, South Sudan, Zimbabwe and Mozambique[60] as examples), the STI policy frameworks are considered by funders as important for articulation of national priorities. Some donors use STI policy frameworks and national development plans of ESA countries to formulate their R4D funding priorities, and

[59] UNECA (2022), *The Existential Threats to the African Continental Free Trade Area*, op. cit.

[60] With the support of the SGCI Mozambique has a draft new STI policy framework that will be considered by Cabinet by end of June 2023. It has explicit provisions on international cooperation in STI and national R&D priorities that funders may consider investing in.

some ESA countries use them in negotiating bilateral STI and development cooperation agreements. For example, South Africa has the largest number (at least 18) of bilateral STI arrangements with developed countries and the EU. South Sudan is starting to engage developed and emerging economic in bilateral cooperation focusing on education and STI. *Support to ESA countries to review and revise their development and STI policies to align them with the SDGs and Agenda 2063 will help to foster R4D in the region.*

Another important trend in and a driver of R4D in ESA is *increasing policy learning*. Some donor countries (e.g., Canada, Finland, South Korea and Japan) encourage and support some ESA countries to engage in benchmarking missions to learn how dynamic national research and innovation systems are configured and governed. Policy learning, not policy transfer, is about increased understanding by policymakers of best policy ideas and practices that occurs when they compare and synthesize different countries' policy processes to their own. Finland through the Southern Africa Innovation Support Programme (SAIS) has supported several projects in Botswana, Zambia and Namibia to encourage policy learning. According to one interviewee, Namibia's is reconfiguring its national research and innovation system based on the benchmarking missions and policy learning supported by SAIS, and it has integrated R4D in its National Science, Technology and Innovation Policy (2020-2030) and National Action Plan for the implementation of policy. Overall*, funders should encourage and support ESA countries to engage more in STI policy learning.*

The policy environment for R4D has improved in the ESA region in the last decade or so. But there are still policy related challenges to be addressed collectively by all actors and stakeholders in R4D. They include weak capacities in many ESA countries to effectively engage in R4D, including limited interactions between Research organizations and decision-makers particularly legislatures, low levels of STI (and R&D) policy literacy within key government departments, weak ownership of R4D initiatives or projects in some countries and sub-regions, and some funders' constantly changing priorities and procedures. The SGCI is the appropriate platform already helping countries to address weaknesses in their national and regional R4D systems. More countries in ESA should be encouraged to join the SGCI.

7.2 Technological trends and drivers

Technological developments associated with 4IR and digital transformation pose both challenges and opportunities for ESA countries that are not technologically ready. However, they are key drivers for new STI pathways or trajectories for the SDGs. Digitalization and open science will less costs of participatory ESA-based and led R4D. The challenges pertain to strengthening ESA countries to fasten digitalization of research infrastructures and data as well as learning to participate in open science enterprises. *Funders can help ESA countries to build regulatory frameworks for governing new technologies and open science.*

7.3 Engage RECs in R4D

The RECs in ESA are undergoing remarkable structural and cognitive innovation. They will not stay as the old bureaucratic structures politically designed to stand in the way of alternative development policy. They are being reconfigured to actors in the knowledge production and policy innovation spheres. International funders and think tanks have tended to avoid RECs because of high transition costs in bringing them to R4D systems, where traditionally the roles were defined narrowly around regulatory oversight or just convening sovereign states. A careful analysis shows that these organizations are geared to be active co-creators in R4D systems.

7.4 New modes of R4D funding and delivery

The survey and interviews show that actors in ESA R4D systems recognize that sustainable development challenges faced globally and nationally are complex and the SDGs and Agenda 2063 require more integrated systemic and non-linear approaches to research and innovation. There is ample evidence that multi-sectoral transdisciplinary modes of research and innovation are urgently required. The challenges are that in many ESA countries understanding of and capacity for transdisciplinary research practices are limited. It is recommended that funders and the SGCI as well as governments should explore ways and means of transforming R4D systems to harness the power of transdisciplinarity. Related to this, there is need to build regional networks of sustainability science drawing lessons from international best practices. Digital transformation, open science and a variety of other instruments and mechanisms are increasingly enhancing opportunities for impactful R4D in the ESA region.

CONCLUSION

This study shows that the ESA region in which IDRC operates has a diverse landscape of R4D systems—national and regional—with many actors and STI policy frameworks. Over the past decade or so there has been considerable change in the landscape with increasing numbers and diversity of actors focusing on research targeting various developmental challenges of the countries in the region. Overall, the policy and political conditions for R4D are favourable as most countries have adopted long-term development visions or plans as well as STI (with R&D) policy frameworks that recognize the importance of R4D. However, there are challenges related to uptake of knowledge outputs and innovations (social, technical and organizational), weak capacities of many national STI systems to build linkages between private and public sectors, limited domestic investment in R&D, and the organizational sustainability of independent think tanks. These challenges can be addressed by tapping opportunities emerging with stronger RECs, greater or more funders' collaboration with national science councils through the SGCI and similar institutional arrangements, open science and digital transformation of economic and R4D systems in the ESA region. IDRC and other funders of R4D should help countries in the region to tap these opportunities. They need to be flexible to continuously learn and adjust their R4D priorities and funding approaches taking into account the diversity of the political and policy cultures of the countries.

ANNEX I: SURVEY OVERVIEW AND SELECTED RESPONSES

Summary

IDRC Survey of the Research for Development (R4D) Landscape in Eastern and Southern Africa (ESA)

Date Created: Wednesday, April 19, 2023
Responses captured as of Friday, May 20th, 2023
Total Responses: 18 unique (three sets were from the same organization but findings are reflected as 17 institutions)

Synthesis

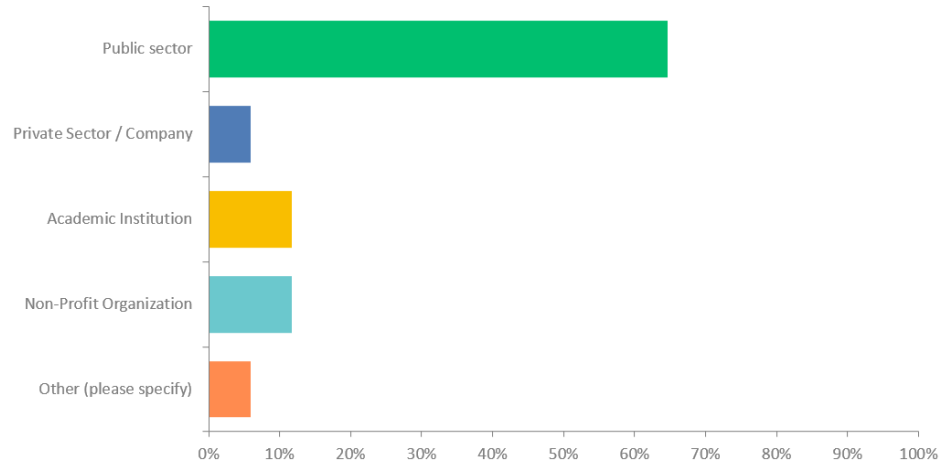
The survey questionnaire, administered online and sent to 53 individuals in various organizations involved in various aspects of R4D (actors in R4D systems). Questions covered aspects such as the respondents' organization's remit in R4D, opinions or views on key trends in and drivers of R4D in ESA (since 2014/2015 when Agenda 2063 and the SDGs as well as the AU STISA-2024 were adopted), strengths and weaknesses of regional and sub-regional R4D systems in ESA, and what measures various actors should take to strengthen the governance and impact of R4D systems in the region. The response rate was about 28%, as 15 out the 53 institutions had completed and submitted the survey by 20 May 2023. One institution had two respondents (the Principal Research Officer and the Executive Director) while two organizations had multiple responses (each was treated as a separate institution) leading to a total of 18 individual responses spanning 17 institutions. The responding 17 institutions in the survey had the following attributes:

- 11 public institutions; 2 academic; 2 non-profit; 1 think tank (also identified as non-profit); and 1 private sector / company
    - ACTS (multiple responses)
    - Africa Rice Center
    - APHRC
    - CIDRI-Africa
    - Division of Science, Technology and Innovation, Ministry of Investment Entrepreneurship in Industry – Seychelles (multiple responses)
    - East African Business Council
    - Fundo Nacional de Investigação - Mozambique
    - Human Sciences Research Council – South Africa
    - Ministry of communications, Knowledge and Technology - Botswana
    - NCRST – Namibia (multiple responses)
    - National Science and Technology Council - Zambia
    - State Department for Higher Education and Research - Kenya
    - Tanzania Commission for Science and Technology
    - Uganda National Council for Science and Technology
    - University of Namibia

- 9 of them focused on three core areas: both basic and applied R&D in the natural sciences; humanities and social sciences R&D; and Policy Research for Development (the remainder focused on or two of these core areas)
- A wide variety of organizational focus: 6 research institutes; 5 policy agencies; 3 STI related institutions (advocacy, incubation, resource mobilization, coordination, advisory, promotion, regulation); 1 advocacy; 1 funding agency (not focused specifically on universities)
- All 17 had an organization strategy or strategic plan with explicit provisions on R4D
- 12 had a single country where the organization works (Namibia 3; Kenya 1; Seychelles 2; Uganda 1; Zambia 1; Tanzania 1; Botswana 1; South Africa 1; Mozambique 1) while the remaining 4 were in multiple African countries (Eastern Africa 1; S.S Africa 2; Africa 2) – note that the two institutions indicated S.S. Africa focus also indicated focus that was country specific (Kenya 1, South Africa 1) and regional (Southern Africa)
- The ranked sector focus for projects and/or programmes for the 17 organizations was as follows:
    - Environmental issues (climate change, biodiversity and pollution) (13)
    - Social development (13)
    - Crop agriculture (food and nutritional security) (12)
    - Human health (11)
    - Water and sanitation (10)
    - Fisheries and/or marine resources (10)
    - Economics/economic development (10)
    - Livestock or animal health (9)
    - Other (4): Policy and funding functions; STI measurement and innovation studies; Regulating tax regimes; and cross cutting research at the interface of STI and society

Q4: Type of organization (public or private)

Answered: 17 Skipped: 0



Powered by SurveyMonkey

Q4: Type of organization (public or private)

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Public sector	64.71%	11
Private Sector / Company	5.88%	1
Academic Institution	11.76%	2
Non-Profit Organization	11.76%	2
Other (please specify)	5.88%	1
TOTAL		17

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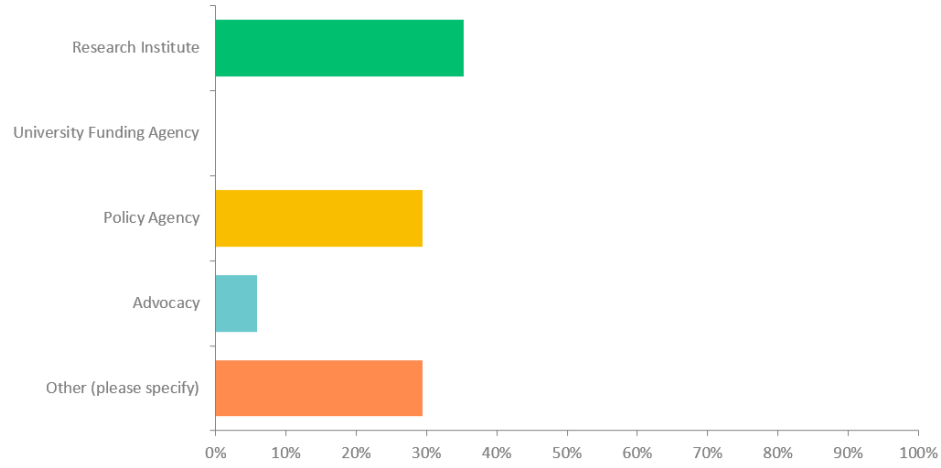
Other (please specify):
Think Tank

Q7: Remit / Focus of your organization

Answered: 17 Skipped: 0



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Q7: Remit / Focus of your organization

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Research Institute	35.29%	6
University Funding Agency	0%	0
Policy Agency	29.41%	5
Advocacy	5.88%	1
Other (please specify)	29.41%	5
TOTAL		17

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Other

- SCIENCE, TECHNOLOGY AND INNOVATION ADVOCACY
- Promotion, Regulation of R&D, Resource Mobilisation, Coordination and Advisory on S&T
- Research, Technology and Innovation
- Science Technology and Innovation, Policy, advocacy and Incubation
- Funding agency

Q49

Save as

What are the main drivers of the trends in R4D in ESA?

Answered: 10 Skipped: 8

- National development plans
- interventions that support the harnessing and use RSTI to address contemporary societal challenges of food and nutritional insecurity, diseases and poor health, water and energy insecurity, climate change and environmental degradation, and sustainable use and management of the Blue Economy.
- Policy shifts, emergence of diseases, universities tend to have adequately trained human resources.
- Global trends seem to have much impact on how R4D is progressing.
- 1. Funding 2. Economic and political 3. Environment
- the narrative towards social justice is shifting to greater acceptability given the growing inequalities, poverty and vagaries of climate change and the threat of pandemics
- Available of funds
- Donor funding
- -The global social and sustainability dynamics like health, climate change and digitalization; gender and social inclusion; globalization etc
- Digitalization and climate change (added May 20th 2023)

ANNEX II: LIST OF INTERVIEWEE's ORGANIZATIONS

1. Association of Food Security and Nutrition, Mozambique
2. African Institute for Development Policy (AFIED)
3. Association of African Universities (AAU)
4. African Continental Free Trade Agreement (AfCFTA), Advisor Secretariat
5. African Development Bank (AfDB)
6. African Union Development Agency (AUDA-NEPAD) (2 interviewees)
7. African Population and Health Research Centre (APHRC)
8. African Technology Policy Studies (ATPS)
9. Bill and Melinda Gates Foundation
10. Centre for Strategic and Policy Studies, Sudan
11. Consultative Group for International Agricultural Research (CGIAR)-East and Southern Africa
12. Development Bank of Southern Africa (DBSA)
13. Department of Research, Science and Technology (DRST), Botswana
14. Division of Science, Technology and Innovation (DSTI), Seychelles
15. East African Science and Technology Commission (EASTCO)
16. Economic and Social Research Foundation, Tanzania
17. Economic Policy Research Centre, Uganda
18. Education for Sustainable Development in Africa (ESDA), Zambia
19. Heritage Institute of Public Policy
20. International Centre for Insect Physiology and Ecology (ICIPE)
21. Inter-Universities Council of East Africa (IUCE)
22. National Advisory Council on Innovation (NACI), South Africa
23. National Commission for Research, Science and Technology (NCRST), Namibia
24. National Research Foundation (NRF), South Africa (2 interviewees)
25. National Research Fund (FNI), Mozambique
26. Organization for Social and Economic Research in Africa (OSERIA)
27. Ethiopian Policy Studies Institute, Ethiopia
28. United Nations Conference on Trade and Development (UNCTAD)
29. United Nations Economic Commission for Africa (UNECA)
30. University of Namibia (UNAM)
31. University of Pretoria (2 interviewees)
32. University of Cape Town, Business School
33. University of Dar es Salaam
34. Science for Africa (SFA) Foundation
35. Southern Africa Development Community (SADC), Secretariat
36. Suud Institute, South Sudan