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New Approaches for Funding Research and Innovation in Africa

African Technology Policy Studies Network (ATPS) Technopolicy Brief No. 50

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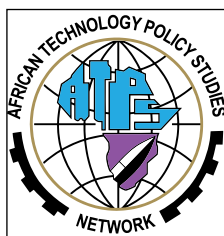
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African Technology Policy Studies Network (ATPS)



The African Technology Policy Studies Network (ATPS) is a transdisciplinary network of researchers, policymakers, private sector actors and the civil society promoting the generation, dissemination, use and mastery of Science, Technology and Innovations (STI) for African development, environmental sustainability and global inclusion. In collaboration with like-minded institutions, ATPS provides platforms for regional and international research and knowledge sharing in order to build Africa's capabilities in STI policy research, policymaking and implementation for sustainable development.



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About Science Granting Councils Initiative

The Science Granting Councils Initiative in Sub-Saharan Africa (SGCI) seeks to strengthen capacities of Science Granting Councils (SGCs) in Eastern, Southern, Central and West Africa in order to support research and evidence-based policies that will contribute to economic and social development. It is jointly funded by the United Kingdom's Department for International Development (DFID), Canada's International Development Research Centre (IDRC), and South Africa's National Research Foundation (NRF).

The objectives of SGCI are to strengthen the ability of participating SGCs to 1) manage research; 2) design and monitor research programmes, and to formulate and implement policies based on the use of robust science, technology and innovation (STI) indicators; 3) support knowledge transfer to the private sector; and 4) establish partnerships with one another, and with other science system actors. The implementation of these objectives is achieved through regional training courses, individualised on-site training sessions, on-line training, webinars and, collaborative research. The SGCI works with 15 councils in Kenya, Rwanda, Uganda, Tanzania, Ethiopia, Cote d'Ivoire, Burkina Faso, Senegal, Ghana, Zambia, Mozambique, Botswana, Malawi, Namibia and Zimbabwe.

The SGCI's principle outputs include 1) more effective research management practices among Councils, 2) strengthened ability of Councils to design and monitor research programmes, and to formulate and implement policies based on the use of robust science technology and innovation indicators, 3) increased knowledge transfer to the private sector and 4) increasingly coordinated and networked Councils. More effective Councils are expected to strengthen national science systems, and ultimately lead to nationally-led research that contributes to development in participating African countries.

About the African Technology Policy Studies Network (ATPS)

The African Technology Policy Studies Network (ATPS) is a trans-disciplinary network of researchers, policymakers, private sector actors and the civil society promoting the generation, dissemination, use and mastery of Science, Technology and Innovations (STI) for African development, environmental sustainability and global inclusion. ATPS has over 1,300 members and 3000 stakeholders in over 51 countries in 5 continents with institutional partnerships worldwide. We implement our programs through members in national chapters established in 30 countries (27 in Africa and 3 Diaspora chapters in the Australia, United States of America, and United Kingdom). In collaboration with like-minded institutions, ATPS provides platforms for regional and international research and knowledge sharing in order to build Africa's capabilities in STI policy research, policymaking and implementation for sustainable development.

About Scinnovent Centre

The Scinnovent Centre is a science, technology and innovation (STI) policy think tank registered in Kenya as a not-for-profit company. Their preliminary concern is that despite advancements in science, technology and innovation (STI), poverty levels in Africa are increasing; environment degradation is worsening; the ecosystem has become more fragile; sustainability has been compromised and livelihoods threatened.

So they ask three big questions: Why have the developments in science, technology and innovation not made any significant difference in African development? Why have STI policies not translated into practical change on the ground? How come pockets of success piloted across countries have not scaled?

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Key Messages

- The overarching message of this policy brief is that Africa needs consistent, sufficient, relevant and sustainable funding for research and innovation.
- Innovative funding models based on new coalitions between the public, private and non-profit sectors is required to support seamlessly the different stages of research, translation and innovation value chain.
- African countries have developed some innovative and dynamic new funding models, and more can be done to adopt and deploy other regions' funding models to mitigate decreasing traditional sources of funding for research and innovation.
- New and innovative funding approaches models developed leverage to a large extent on partnerships, co-funding and multi-disciplinary arrangements
- The new funding approaches have brought greater standardisation of research applications, better resource tracking and accountability among recipients and strengthened the research-policy interface.
- There are context-specific and context-transcending historical, technical, social, political and economic factors that stakeholders in the research and innovation ecosystem need to address if they are to optimise funding of research and innovation.

1.0 Introduction

This policy brief is situated in the backdrop of declining or stagnant national and international research funding sources and the increasing need for new models for funding research and innovation. African countries face an urgent need to industrialise and achieve rapid economic growth to improve the livelihoods of citizens and attain robust infrastructure that supports health, energy, environmental and food security as well as full employment leveraging the demographic dividend highlighted in Agenda 2063. Appropriation of new knowledge generated by contextualised research and innovation is a key driver of sustainable and inclusive socio-economic development. However, research and innovation are resource-intensive, depending largely on sustainable and focused funding buttressed by an innovation ecosystem purposively designed to harness innovations and turn them into useful products and services for solving societal problems. Many African countries do not have these conditions in place. Given the aforementioned, funding of research and innovation in Africa urgently requires new models that take a deliberate systemic approach to building coalitions of agents and actors in innovation systems (at national, sectoral, regional and technological levels), policy and governance designs and architectures and funders that support appropriate emerging technologies and innovations.

The key roles that science, technology and innovation (STI) play in driving economic growth and development through enhanced industrial activities and competitiveness backed by increased production efficiencies is widely acknowledged in Africa (Oyeyinka et al, 2018; Chataway et al., 2009; Juma 2016; Ozor, 2015).

African countries committed to raising domestic research expenditure to at least '1% of gross domestic product' (GDP) (Lagos Plan of Action, 1980). However, most countries are failing to fulfil this commitment and calls for increased funding have grown. For health, governments agreed in the Algiers Declaration to allocate 5% of the National Health Budget to health research systems and few are meeting this target (Nabyonga et al, 2018). Yet, commitment to deploying STI to strengthen economies is not lacking. The AU's Agenda 2063 'The Africa We Want' aspires for a prosperous Africa imbued with means and resources to drive sustainable development and long-term stewardship of resources, where African people have a high standard of living, quality of life, sound health and well-being and assured health security (AUC, 2015). In order to deliver Agenda 2063, the Science, Technology and Innovation Strategy for Africa, STISA-2024 was developed, and it identifies research and innovation as enablers for achieving sustained growth, competitiveness and economic transformation (AUC, 2014). STISA-2024 calls for continuous embedding of STI in six priority areas: eradicating hunger and ensuring nutrition and food security; prevention and control of diseases and ensuring wellbeing; communication (physical and intellectual mobility); protecting our space; living together; and wealth creation. STISA-2024 recognises that the continent needs to adopt and adapt existing and emerging technologies to accelerate transition into innovation-led and knowledge-based economies in the continent.

The national, regional and continental STI policy agendas in sub-Saharan Africa (SSA) has become more prominent in the recent years (UNESCO, 2016). Various surveys on African countries having S&T or STI policies show a gradual increase from none between 1960 and 1980, to 13 out of 17 in 2010 (Mouton et al,2014). Countries have adopted STI policies and institutional developments in support of these initiatives at sub-regional levels (UNESCO 2016) and national level in SSA (AOSTI 2013).

These developments are occurring within the context of adopting Sustainable Development Goals (SDGs), which include specific reference to STI within SDG 17 (UNGA 2015), in contrast to absence of explicit reference to STI in the Millennium Development Goals (MDGs). Some argue that this may have hampered efforts to pursue STI capacity building in preceding years. Accompanying these policy developments has been an increase in the number of donors interested, or active, in supporting STI in Africa compared with the support of just a few during the 1990s (AOSTI 2013).

However, while more than two-thirds of African countries have moved to design and adopt STI policies and strategies a majority of the countries still lack the requisite capacity to leverage and benefit from investment in STI (Oyeyinka et al, 2018). Most countries have not solved the challenge of sustainably funding research and innovation and as a result they are failing to effectively generate and deploy knowledge and technological innovations for socioeconomic growth. Harnessing new and/or improved products and services for economic sectors such as agriculture, mining, manufacturing, health and infrastructure, among others are important for economic growth. African countries have an opportunity to avoid technology and development lock-in and path dependencies by leapfrogging infrastructure and industry challenges of pioneer economies by carefully integrating their transition to knowledge-based economies with achievement of SDGs and leveraging their endowments in natural resources and an imminent demographic dividend. This is possible through context-specific and locally grounded generation of new knowledge from research and innovation to produce economically useful goods and services. Funding these research and innovation endeavours requires designing sectoral and national policies and strategies that purposively target investing in local capabilities and institutional architectures that support scientific knowledge generation and its appropriation.

It is in within this context and with the aim to inform current debates, reviews and re-organization of investment in African research and innovation, that this policy brief identifies “new approaches, mechanisms,

schemes or models for funding research and innovation in Africa” paying particular attention to lessons learnt and potential applicability in African settings.

Research and innovation is a function of knowledge-sharing and lesson-drawing, therefore policy and practice processes on research and innovation in Africa can benefit from experiences elsewhere.

The study on which this brief is based was guided by five key research questions:

1. How important is the funding of research and innovation among African countries and what is the evidence to demonstrate the level of importance?
2. What are the new and innovative funding approaches (schemes, models and mechanisms) that have been applied across the world and what lessons could be drawn for African countries?
3. What historical and current factors facilitate or constrain the implementation of the funding approaches and how have/can the gains be enhanced or the challenges resolved?
4. What institutional reforms accompanied the new approaches and how could Africa re-position its own institutional architecture for enhanced research and innovation funding?
5. How are other broader issues pertinent to research and innovation broadly being taken into consideration towards more efficient and effective funding for research and innovation?

2.0 Context of the Policy Issue

The policy issue tackled by this brief is that of funding for research and innovation. We set this issue within a wider context of the innovation principle which argues that innovation is the “single most important driver of societal prosperity and is indispensable for sustainable development and economic growth” (ERF, 2015). The principle underscores the important role that knowledge and innovation generation, translation, and commercialisation play especially as countries transition to the knowledge-based economy (KBE). This is important for African countries, which need to rapidly industrialise and achieve inclusive and sustainable economic development. Many African countries face immense problems of large proportions of unemployed youths. Young people (15 to 24 years) constitute about 37% of the working age population, but account for more than 60% of all unemployed people in Africa. Effective research and innovation funding approaches therefore, should result in mutually reinforcing and complementary investments in R&D and innovation which will in turn result in multiple impacts from small entrepreneurial initiatives in high technology industries with the concomitant employment of millions of workers. However, generation and translation of research and innovation into useful economic growth depends on sustained and focused investment.

Depending on the stage of activity on the research-innovation-commercialisation spectrum, investment approaches range from government investment into research and innovation as a public good.

This is what Mazzucato (2011) calls the entrepreneurial state; philanthropy and other social investors as well as the state in the “valley of death”; to commercially-driven financial institutions funding entrepreneurship. This policy brief is based on a study which sought to identify and analyse exemplar case studies of new approaches to funding research and innovation from African countries and across the world. The intention is to demonstrate the funding mechanisms and models, the institutional architecture as well as policy and strategy environments that the case studies crystallise and can be contextualised into African countries setting.. This brief argues that models have economic, geographic and other political economy complexities, thus a direct juxtaposition would lead to failure. What this brief does is to unpack the rationale behind the funding mechanisms and models so that African governments, Science Granting Councils, the private sector, philanthropic organisations and foundations, amongst others, can learn from elsewhere in their separate and collective efforts to sustainably fund research and innovation in the continent.

We consider research as the robust knowledge generation activities undertaken by a broad range of actors using the scientific method. Among the research performing actors are universities, research institutes, private, public sector and informal sector players. Recognising this broad range of players in the research terrain is important for developing policies, strategies and funding mechanisms that harness and synergise the potential of these knowledge generators and others in innovation. In this brief, we adopt the OECD/Eurostat (2005) definition of innovation as the introduction of new or significantly improved products (goods or services), processes, organizational methods, and marketing methods in internal business practices or in the open marketplace.

3.0 Methodology

Research informing this policy brief was conducted using mixed methods. Between July and December 2018, we did literature reviews covering documents from national science granting councils (SGCs)/commissions and other funding agencies. We then interviewed representatives from the 15-country African Science Granting Councils Initiative , and expert stakeholders from key African science policy institutions and African researchers in the diaspora and Africans working in key research, academic and policy institutions. Given the complexity and expanse of literature and practices on research and innovation funding across the World, it is impossible to discuss all models, approaches and mechanisms in this document. Consequently, this brief explores and discusses some examples of new or innovative funding models and mechanisms that may be adopted to sustainably fund research and innovation in African countries. The discussion contextualise these models and mechanisms into different African settings in mind.

4.0 Key findings and general recommendations

The following key messages and recommendations are drawn from the study, presented in line with the five broad research questions presented above.

4.1 HOW IMPORTANT IS THE FUNDING OF RESEARCH AND INNOVATION AMONG AFRICAN COUNTRIES AND WHAT IS THE EVIDENCE TO DEMONSTRATE THE LEVEL OF IMPORTANCE?

Key messages

The importance of research and innovation is rated between medium and high among the SGCI countries. Across most African countries, the importance of research and innovation is generally rated as increasing as demonstrated by investment in institutional and policy provisions for STI instituted in the last few years.

Recommendation 4.1.1: Beyond tactical addressing of current socio-economic challenges, African governments need to develop unifying long-range and operationable national ideologies on the role of research and innovation modelled around the impending demographic dividend and leveraging the continent's unique resource endowment for economic progress.

An example is how Japan attained universal health coverage in the early 1960s, way ahead of the rest of the world by defining access to health as a 'nation building' imperative.

Recommendation 4.1.2: As part of their mandate to support and manage research programmes, SGCs should assist researchers to generate research and innovation impact evidence and sustained relevance which will result into political will and commitment to fund research and innovation. There is a lot of data generated by various agencies, e.g. African Science Technology and Innovation Indicators (ASTII), which can be utilized more for decision-making at national and sectoral levels.

Recommendation 4.1.3: For the purposes of defining research and innovation policy objectives and identifying appropriate approaches for funding, it is important for different stages of the research and innovation value to be mapped out (by sector where possible) from basic research to products. This will enable identification of entry points for different funding options. SGCs should lead this as part of their objective to strengthen research and evidence-based policies.

4.2 WHAT ARE THE NEW AND INNOVATIVE FUNDING APPROACHES (SCHEMES, MODELS OR MECHANISMS) THAT HAVE BEEN APPLIED ACROSS THE WORLD AND WHAT LESSONS COULD BE DRAWN FOR AFRICAN COUNTRIES?

Key messages

New dynamic funding models have been developed, adopted and deployed in countries and sectors to deal with realities of decreasing funding for research and innovation from traditional sources (see Annex 1). These models which encompass partnerships, co-funding and multi-disciplinary approaches, seek to ensure context-driven, efficient and effective utilisation of resources.

Recommendation 4.2.1: In light of the reality that different countries and sectors may work best with particular funding approaches, there is need for accommodation of diverse funding models and means of optimising and assessing their impact.

SGCs and line ministries should work closely to come up with robust procedures for identifying and consolidating desired sector outcomes that policymaking should focus.

Recommendation 4.2.3: Access to and deployment of effective approaches for funding research and innovation require strong leadership and oversight from governments and SGCs, especially with respect to identifying and balancing the disparate requirements of different sectors and areas of application with their points of commonality.

4.3 WHAT HISTORICAL AND CURRENT FACTORS FACILITATE OR CONSTRAIN THE IMPLEMENTATION OF THE FUNDING APPROACHES AND HOW HAVE/CAN THE GAINS BE ENHANCED OR THE CHALLENGES RESOLVED?

Key messages

Challenges stalk the expansion and sustainable deployment of new funding models. For instance, political will remains insufficient and not acted upon, while urgent attention needs to be paid to persistent limited government financial resources, unfavourable institutional traditions, policy incoherence across sectors, mismatch between research priorities and developmental challenges, lack of long-term policy planning, rapid technological changes and poor choices of strategic partnerships.

Recommendation 4.3 1: SGCs should commission an on-going review of best practice at sectoral, national and international levels to consolidate knowledge about how deployment and implementation of STI policies, research and innovation approaches can be optimised. The review should include the use of existing and new funding approaches, and should include details about how a specific industry or component of the research and innovation value chain can engage with upstream or downstream processes.

4.4 WHAT INSTITUTIONAL REFORMS ACCOMPANIED THE NEW APPROACHES AND HOW COULD AFRICA RE-POSITION ITS OWN INSTITUTIONAL ARCHITECTURE FOR ENHANCED RESEARCH AND INNOVATION FUNDING?

Key messages

New funding approaches were reported to have brought more standardisation of research applications, better resource tracking and accountability among recipients and stronger research-policy institutions.

Recommendation 4.4.1: Leveraging their access to global knowledge resources, SGCs should help countries develop or reconfigure their STI policies to be not only forward-looking and agile, but also how they influence funding approaches/models and other interventions towards strategic goals. Strategies for funding research and innovation should align with key policies such as national industrial, health, agricultural and education strategies and other national developmental visions.

Recommendation 4.4.2: SGCs should help countries to establish consolidated national knowledge platforms on research and innovation. Generation and sharing of knowledge is integral of research and innovation processes. This can be more cohesively and efficiently achieved within the research and innovation ecosystems and greater benefits will accrue to SGCs, researchers, decision-makers as well as entrepreneurs and actors in the research and innovation systems.

4.5 HOW ARE OTHER BROADER ISSUES PERTINENT TO RESEARCH AND INNOVATION BROADLY BEING TAKEN INTO CONSIDERATION TOWARDS MORE EFFICIENT AND EFFECTIVE FUNDING FOR RESEARCH AND INNOVATION?

Key messages

It is undoubted that African countries' goals of economic development driven by research and innovation are in line with trends elsewhere. There are however, context-specific and context-transcending technical, social, political and economic issues that stakeholders in the research and innovation ecosystem need to be aware of and to consider in order to optimise use of research and innovation resources.

Recommendation 4.5.1: STI policies and research and innovation funding models will be more effective when underpinned by an understanding of the interdependent political, social, technical and economic factors that affect them. SGCs and governments should use their considerable convening power to regularly bring together research, business, regulator, user and different other communities at national level to explore funding approaches that best promote the values and interests of African countries in a global context.

We present below key messages and general policy recommendations above targeting four key actors.

Table 1: Specific policy recommendations for key actors

Policy Actor	Policy Issue	Recommended Action
African Union(AU) & Regional Economic Communities (REC)	Increasing, sustaining and operationalising political will.	There is an urgent need for committed funding by AU and RECs for continental and regional programmes such as Agenda2063 and STISA 2024.
	Honouring 1% GDP to STI commitment by national governments	National governments need to explore innovative ways to expedite meeting and sustaining the long overdue 1% of GDP commitment to R&D. With the global average above 2%, African countries need to rump up their commitments if progression to knowledge based economy (KBE) is to be realised.
Science granting councils(SGCs)	Generate and document evidence of R&I impact	As part of their mandate to support and manage research programmes, SGCs should assist researchers to generate research and innovation impact evidence and sustained relevance which will result in political will and commitment to funding research and innovation.
	Map out research and innovation ecosystems	As part of their objective of strengthening research and evidence-based policies, SGCs should lead processes of mapping out different stages of the research and innovation value chain. It is important to define research and innovation policy objectives and identify appropriate approaches for funding research and innovation.

Policy Actor	Policy Issue	Recommended Action
Private and non-profit sectors	Increase levels and relevance of funding and activities.	This could be achieved through working with national and local governments, as well as academia in co-designing policies and R&I responses that are aligned to sectoral and national developmental objectives.
	Harness and leverage financial resources and partnership models.	Sector to innovatively seek and deploy resources at their disposal for strengthening sectoral and national research and innovation ecosystems.
Development partners	Support countries to reconfigure the R&I systems	Leveraging their access to global knowledge resources, development partners should help countries to develop or reconfigure their STI policies to not only forward-looking and agile, but also how they influence funding approaches and other interventions towards strategic goals, and stimulate demand for research and innovation.

5.0 Conclusion

This policy brief highlights that dynamic new funding models have been developed, adopted and deployed in countries and sectors to deal with the realities of decreasing traditional funding for research and innovation sources. These models, encompassing partnerships, co-funding and multi-disciplinary approaches, seek to ensure context-driven, efficient and effective utilisation of scarce resources. Challenges ranging from insufficient political will to lack of implementation plans and uncoordinated approaches to STI were reported to be stalling the expansion and sustainable deployment of the new funding models. This policy brief advances a number of recommendations on how science granting councils, the African Union and regional economic communities, national governments, private and non-profit sectors as well as development partners can leverage their access to global intellectual, financial resources and convening power to further strengthen availability of capabilities and funding for different stages of the research and innovation value chain.

Appendices

APPENDIX 1: OLD AND NEW (GREEN) FUNDING APPROACHES FOR RESEARCH AND INNOVATION

Funder	What is funded	Funding Mechanism	Rationale
Government	Basic Research Applied Research Translational Research Commercialisation Entrepreneurship (SMEs)	Grants and grand challenges Public institution co-funding on interdisciplinary and multidisciplinary programmes Innovation brokerage Formation of national research funding consortia Co-funding with SGCI in the Region Investment in high-end research programmes, incl. Chairs (240 in SA) and Centres of Excellence, with 15-year funding horizons	Traditionally governments have funded basic, applied and translational research as investment in economic growth and development. These are deemed public goods.
Private Sector	Applied Research Commercialisation	Retained profits and borrowing for capital markets Corporate Social Responsibility	Profit driven motives
Public Private Partnerships	Applied Research Commercialisation	Equity and project funding	Solving market failure issues
Impact Investors	Commercialisation	Equity or debt	Solving market failure with a focus on social goods

Funder	What is funded	Funding Mechanism	Rationale
Capital Markets	Commercialisation	Equity	Attractive return on investment in the venture
Crowdfunding	Research and commercialisation	Equity	Social investment because of market failure
Local and International collaborative research grants	Research	Grants	Scarcity of local funding for research in many African nations
Private sector	Take-over of applied research after proof of concept, safety and efficacy	Patent buyouts	Innovators either selling off patents to fund more innovation or researchers not interested in entrepreneurship
Charities	Basic and applied research as well as clinical trials	Grants and co-funding academia and SMEs working neglected areas	These tend to be niche areas such as rare diseases where market failure is common
Cities or regions	Land, labour and utilities	Grants given as incentives to firms that relocate to a city or region targeting industrial development	Attracting particular industrial activities to a particular city or region to boost economic activity and contribute to rejuvenation of de-industrialised places

References

- Africa Health Strategy 2016-2030. Available at https://au.int/sites/default/files/documents/24098-au_ahs_strategy_clean.pdf (accessed 07 Sept, 2018).
- AOSTI 2013. Science, technology, innovation and policy-making in Africa: An assessment of capacity needs and priorities, AOSTI Working Paper No. 2.
- ATPS (2017). African Technology Policy Studies Network (ATPS), Technopolicy Newsletter Issue 011, ATPS Publications, Nairobi, Kenya
- AUC (2014). Science, technology and innovation strategy for Africa 2024, African Union Commission, Addis Ababa, Ethiopia.
- AUC (2015). Agenda 2063: The Africa we want. A shared strategic framework for inclusive growth and sustainable development: First ten-year implementation plan 2014-2023, African Union Commission, Addis Ababa, Ethiopia.
- European Risk Forum (ERF) (2015) The Innovation Principle – Overview. (http://www.riskforum.eu/uploads/2/5/7/1/25710097/innovation_principle_one_pager_5_march_2015.pdf)
- Edquist, C (1997). Systems of innovation. Technologies, institutions and organisations. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship. Available at SSRN: <https://ssrn.com/abstract=1496222>.

- Juma, C (2016). *Gales of Creative Destruction, in Innovation and Its Enemies: Why people Resist New Technologies*, Oxford University Press
- Mouton, J., (2008). *Africa's Science Decline: The Challenge of Building Scientific Institutions*, *Harvard International Review*, 30 (3), 46-51.
- National Science Board (2012). *Research and development, innovation and the science and engineering workforce*, National Science Foundation, USA
- OECD. (2016). *Start-up Latin America 2016: Building an Innovative Future*. Development Centre Studies, OECD Publishing, Paris, France. doi: <http://dx.doi.org/10.1787/9789264265660-en>
- OECD. (2013). *Start-up Latin America: Promoting Innovation in the Region*. Development Centre Studies. OECD Publishing, Paris, France. Retrieved 03 11, 2018, from http://www.oecd.org/dev/americas/Eng_complete%20Start%20Up%20Latin%20America%20pocket%20edition.pdf
- Ozor, Nicholas (2015) *Increasing Opportunities for Financing of Research: Lessons for the Demand Side*. Paper presented during an international symposium organized on the theme: "New science, technology and innovation funding mechanisms in Africa" and held from 9-11 December in Dakar, Senegal.
- Oyeyinka- Oyeleran, Banji, Bertha Vallejo, Banke Abejirin, Shruti Vasudev, Nicholas Ozor and Maurice Bolo (2018). *Towards Effective Public-Private Partnerships in Research and Innovation: A Perspective for African Science Granting Councils*, African Technology Policy Studies (ATPS), Kenya
- UIS, (2016) *How Much Does Your Country Invest in Research and Development (R&D)?*, UNESCO Institute for Statistics (UIS). <https://sdg.uis.unesco.org/2016/09/14/how-much-does-your-country-invest-in-research-and-development-rd/>. accessed 08 Sept, 2018

UNGA (2015). Transforming our world: the 2030 Agenda for Sustainable Development, UN General Assembly, New York, USA.

UNESCO (2016). UNESCO Science Report: Towards 2030 (2nd Ed.) United Nations Scientific and Cultural Organisation, Paris, France.

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- Tracking Effective Indigenous Adaptation Strategies on Impacts of Climate Variability on Food Security and Health of Subsistence Farmers in Tanzania By Riziki Silas Shemdoe, (ATPS Technopolicy Brief No. 31)
- Harnessing Wind Energy for Climate Change Adaptation and Food Security in Coastal Regions of Ghana: A Policy Perspective By Mahu Seth Agbeve; (ATPS TechnoPolicy Brief No. 30.)



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