

AFRICAN INNOVATION ECOSYSTEMS STUDY (AIESYS)

Output 2

Output 2: report containing recommendations for ways to support innovation ecosystem facilitation, addressing gaps, challenges and blockages building on existing strengths, together with a presentation to aid communication of the results.

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Key Terms

Accelerator¹**: Facilities, short-term funding and support. Accelerator is broadly defined by BriterBridges and AfriLabs (2019) as a “structure that offers cohort-based and fixed term programmes (usually between 3-6-9 months) to support growth stage ventures to achieve scalability and self-sufficiency, by offering advisory services, mentorship, workshops, networks and usually investments in cash or in-kind”.

Active Tech Hub**: Tech Hub with active digital presence over the past two quarters.

Co-working spaces**: Facilities but not specific support programmes. As defined by BriterBridges and AfriLabs (2019), a co-working space is a “shared physical workspace that provides office facilities and a community to start-ups, small companies and independent workers, offering reasonable and flexible contracts for its users and encouraging peer-learning, networking capacity development, and collaboration”.

Ecosystem*²: A dynamic framework consisting of a set of stakeholders-start-ups, hubs, investors, academic institutions, public institutions, corporations- who interact and engage with each other to seize new opportunities, support innovation and strengthen the overall business environment for entities at different stages, sectors, and geographical locations.

Entrepreneurial or business ecosystem**: The urban and sub-urban dimension, for instance of economic and innovation activities, interactions between actors and socio-institutional environment. Drawing on a generic definition by (Audretsch et al., 2019): “...organized attempts to establish environments that are conducive to increasing the success for newly established ventures”.

Fablabs**: Digital fabrication laboratories. Defined by Fablabs.io, a Fab Lab is a “place to play, to create, to mentor and to invent: a place for learning and innovation...”

Hackathon*: A tech-focused event taking place across a set of timeframes which can usually span between one day to a week, and that gathers specialists in computer programming, digital creation, technology or software development to collaborate on specific ideas or concepts to find solutions to a problem or to design, develop and create minimum viable products (MVPs). As defined by Eric Ries, MVP is the “version of a new product which allows a team to collect the maximum amount of validated learning about customers with the least effort”

Hackerspace and Makerspace*: A physical facility or lab fitted with machinery, technological tools and other equipment to help communities and individuals co-create and explore ideas, create prototypes and text products, as well as develop technical skills and knowledge.

¹ **As defined by Dosso in Daniels et al. (2021) and BriterBridges (2019)

² * As defined by AfriLabs and BriterBridges (2019)

Hub*: A centre, structure or network comprising of actors supporting or facilitating the development of an environment conducive to entrepreneurship or innovation. Cities are also often defined as hubs when they represent important nodes for business and investment.

Incubator:** Facilities, in-kind support at idea/early-stage. Incubator is broadly defined by BriterBridges and AfriLabs (2019) as a “support structure that helps early-stage start-ups transform from idea to venture, by offering advisory services, resources, workshops and hands-on training that guide entrepreneurs in defining and refining their business models and value propositions with the goal of becoming sustainable business. They [incubators] sometimes have a limited pool of cash to support businesses”.

Innovation: Viewed through the lenses of NSI conception, ‘Innovation’ is defined as “an interactive learning process” (Lundvall, 2010, p. 340). Innovation starts with a good idea, but necessarily includes the creation of new products, tools or processes that are tested and taken up and used by their target audiences.

Innovation city: a geographic concentration of different and specialized innovation clusters, such industrial clusters (Otsuka and Sonobe, 2018) business incubators, and knowledge clusters (a concentration of universities and research organization), with the aim to facilitate development strategy of a city, a country or a region. However, the terms ‘innovation city’ and ‘innovation hub’ tend to be used interchangeably. For instance, the Kigali Innovation City (KIC) is being developed as pan-African tech innovation hub³.

Innovation cluster: As defined by Porter (1998), a Cluster is a concentration of interconnected and competing firms and organisations, producing similar or related products and/or services in a specific geographical location. These actors form an Innovation Cluster when they cooperate to allow the flow of knowledge and/or technology through formal or informal interactions at individual or organizational level.

Innovation Ecosystem: All of the different players involved in innovation process - such as governments, people, businesses, activities and products - can be described as an “innovation ecosystem”. Like ecosystems in nature, “innovation ecosystems” are complex, dynamic and continually evolving. Generically defined by Granstrand and Holgersson (2020): “the evolving set of actors, activities, and artefacts, and the institutions and relations ... that are important for the innovative performance of an actor or a population of actors”. The ability of actors’ collaborative networks to adapt themselves to a non-linear environment, within a particular innovation ecosystem, implies that “they assume certain features of complex adaptive systems-agility, self-organization, self-governance, and synergy effects” (Nataliya Smorodinskaya *et al.*, 2017).

³ <https://www.africa50.com/investing-for-growth/projects-investments/kigali-innovation-city/>
[Accessed:20.04.2021]

National Innovation System (NIS) or National System of Innovation (NSI):

“The elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge... and are either located within or rooted inside the borders of a nation state” (Lundvall, 2010, p. 2). NSI is one of the most commonly used frameworks in the study of innovation policy in high income countries (HICs) and low income countries alike (Daniels et al., 2017). Aside from NSI, innovation systems can have regional, sectoral, and (or) technological delineations. They can also focus on economic bottom of the pyramid (BoP) end users and social issues e.g. through conceptualisations such as inclusive innovation, social innovation and frugal innovation (Chataway et al., 2014).

Technology (Tech) Hubs:** active organisation with physical address, providing facilities, financial or in-kind support to tech-entrepreneurs, or tech start-ups.

Technology Parks or Techno parks: Defined by Wdowiarz-Bilska (2019): “Building complexes fulfilling functions of services, offices, laboratories, and industries, located in landscape arranged areas” in urban setting. The term ‘Technology park’ is in most instances used synonymously as other terms which describe innovation centres such as: science park, science and technology park, research park, techno-polis and city of science. Techno parks are also broadly viewed as “vehicles for university-industry cooperation” (Daniels et al., 2017).

List of Abbreviations

AIESyS: African Innovation Ecosystems Study
ARIPO: African Regional Intellectual Property Organization
ASSAf: Academy of Science of South Africa
ATPS: African Technology Policy Studies Network
AU: African Union
BICs: Biotechnology innovation centres, South Africa
BIH: Botswana's Innovation Hub
BMZ: German government's Federal Ministry for Economic Cooperation and Development
CSIR: Council for Scientific and Industrial Research, South Africa
DRST: *Department of Research, Science & Tech, Botswana*
DSI: Department of Science and Innovation, South Africa
DTIC: Department of Trade Industry and Competition, South Africa
eBIA: e-Protect Biogas and Integrated Agriculture Initiative, Nigeria
EIP: Enterprise Investment Programme, South Africa
FCDO: The Foreign, Commonwealth and Development Office
GDG: Google Developer Groups
GDP: Gross Domestic Product
GERD: Government Expenditure on R&D
GESP: Growth and Employment Strategy Paper, 2010-2020, Cameroon
GII: Global Innovation Index
GIRC-Centre: Ghana Innovation and Research Commercialisation Centre
GITEX: Gulf Information Technology Exhibition
GoSA: Government of South Africa
HSRC: Human Sciences Research Council, South Africa
ICT: Information and Communication Technology
IDC: Industrial Development Corporation, South Africa
IGP: Innovation Grant Program, Zambia
IOM: Organization for Migration
MESTI: Ministry of Environment, Science Technology and Innovation, Ghana
MICF: Malawi Innovation Challenge Fund
MINEDUB: Ministry of Basic Education, Cameroon
MINEFP: Ministry of Employment and Vocational Training, Cameroon
MINESEC: Ministry of Secondary Education, Cameroon
MINESUP: Ministry of Higher Education, Cameroon
MINSEP: Ministry of sports and physical education, Cameroon
MSMEs: Small and Medium-sized Enterprises
MUST: Malawi University of Science and Technology
NACI: National Advisory Council on Innovation, South Africa
NCRST: National Commission on Research, Science and technology, Namibia
NCST: National Commission for Science and Technology, Malawi
NEF: National Empowerment Fund, South Africa
NEPAD: New Partnership for Africa's Development
NGO: Non-governmental organisation
NISIR: National Institute for Scientific and Industrial Research, Zambia
NPRST: National Policy on Research, Science and Technology 1999, Namibia

NRSC: National Remote Sensing Centre, Zambia
NSI: National Systems of Innovation
NSTC: National Science and Technology Council, Zambia
NSTP: National Science and Technology Policy, Malawi
NTBC: National Technology Business Centre, Zambia
NUST: Namibia University of Science and Technology
NWSW: North West and South West
OIF: Organisation Internationale de la Francophonie
OSIWA: Open Society Initiative for West Africa
PCSF: Technology Commercialisation Development Fund, South Africa
PLC: Patent Laws Coalition, South Africa
PPP: Public-Private Partnership
PSDP: Malawi Government's Private Sector Development Project
R&D: Research and Development
SADC: Southern African Development Community
SAIS: Southern Africa Innovation Support Programme
SALGA: South African Local Government Association
SAMRC: South African Medical Research Council, South Africa
SANBIO: Southern African Network on Biosciences
SARIMA: Southern African Research and Innovation Management Association
SAVP: Southern African Venture Partnership
SDGs: Sustainable Development Goals
SEDA: Small Enterprise Development Agency, South Africa
Sida: Swedish International Development Cooperation Agency
SME: Small and Medium-sized Enterprise
SSA: Sub-Saharan Africa
STEM: Science, Technology, Engineering and Mathematics
STI: Science, Technology and Innovation
STP: SEDA's Technology Program, South Africa
TDF: Technology Development Fund, South Africa
THRIP: Technology for Human Resource Industry Programme, South Africa
TIA: Technology Innovation Agency, South Africa
UCL STEaPP: University College London, Department of Science, Technology, Engineering and Public Policy
UNDP: *United Nations Development Program*
UNESCO: United Nations Educational, Scientific and Cultural Organisation
UR: University of Rwanda
WIPO: World Intellectual Property Organisation
YIN: Young Innovators Nigeria
YTIP: Youth Technology Innovation Programme, South Africa
ZICTA: Zambia Information and Communications Technology Authority

Executive summary and key recommendations

Output 2 is the second report of the African Innovation Ecosystems Study (AIESyS). The study seeks to better understand the range of existing innovation ecosystem support interventions and programmes in Southern and West Africa. It takes a wide approach to innovation ecosystems and explicitly includes work beyond the more commonly reported digital and financial sectors and innovations. It focuses on innovation ecosystems and support initiatives in 10 African countries: South Africa, Angola, Botswana, Namibia, Malawi, Zambia and Zimbabwe in Southern Africa; and Nigeria, Ghana and Cameroon in West Africa, with a view to identify best practice, gaps and opportunities for the design of potential interventions to improve ecosystem facilitation methodologies. It also seeks to identify collaboration and partnership opportunities for a wide range of national, regional and global development partners and stakeholders across the region.

- **Output 1:** explores the nature of contemporary innovation ecosystems by synthesising what has been documented and through primary data collection to set out the context and framing for Output 2 of the study.
- **Output 2:** provides recommendations for ways to support innovation ecosystem facilitation at and beyond country level, addressing gaps, challenges and blockages and focussing on building on existing strengths.

Output 2 consists of two parts: 1) Gaps, challenges, existing strengths and country-level recommendations - which sets out the key issues facing innovation ecosystems in the ten AIESyS study countries - and, 2) Cross-border and system-wide recommendations - which explores insights around facilitation beyond country level and provides specific recommendations for the Foreign, Commonwealth and Development Office.

The overall structure of Output 2 is heavily influenced by the review of literature (policies, programmes, reports and academic papers) undertaken in Output 1, while the insights presented throughout are based upon data collected in an anonymous, online survey, covering a wide range of ecosystem actors across the 10 countries, and semi-structured interviews conducted with key stakeholders working in and across different innovation ecosystems. The details of these are covered in the 'Methodology' section of Output 1 and summarised in the 'Methodology' section of this report.

Gaps, challenges, existing strengths and country-level recommendations

The figures below are based on aggregated responses to the AIESyS survey, representing 68 respondents. Figure 1 presents a summary of the key challenges, gaps and blockages identified in country-level innovation ecosystems. It is clear that most respondents, even those who provided positive perspectives on the innovation ecosystems that they are involved with, saw the gaps, challenges and blockages as being numerous and located across a wide range of physical, economic and social spaces. Lack of government support, limited uptake of innovations by stakeholders,

poor resource pooling and inadequate or limited digital infrastructure were seen as highly challenging across all of the countries surveyed, though medium to high scores appear across all named categories. Respondents from Malawi, Namibia and Zambia scored all categories as highly challenging.

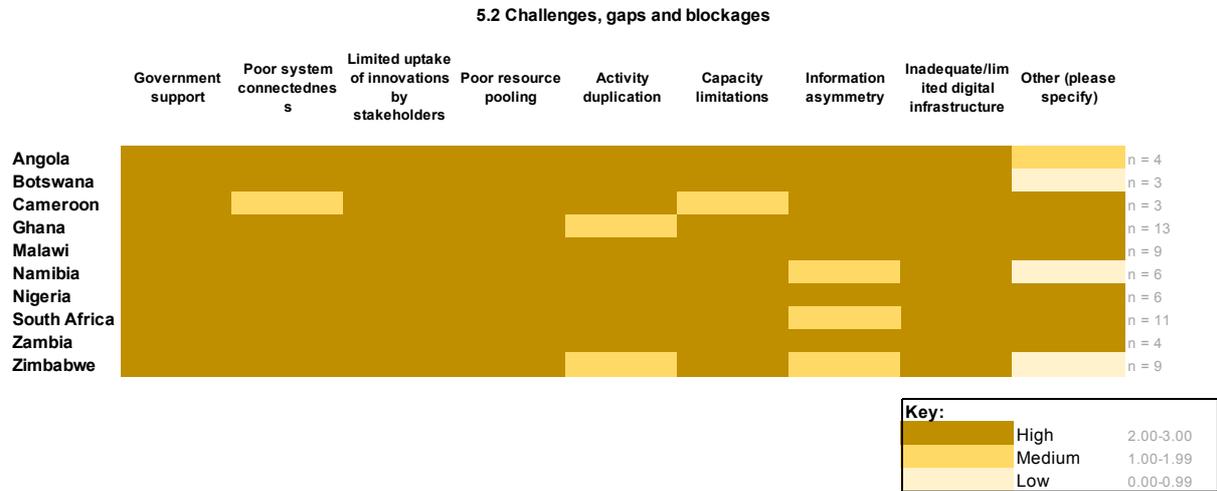


Figure 1: Heatmap of challenges, gaps and blockages identified at country-level by survey participants

Figure 2 presents a summary of ways to address challenges, gaps and blockages identified by participants in the AIESyS survey. As in Figure 1, medium to high scores appear across all named categories, with regulation and non-monetary incentives being the only categories without consistently high scores. Respondents from Cameroon, Namibia and South Africa scored all categories as having high potential to address ecosystem challenges.



Figure 2: Heatmap of ways to address challenges, gaps and blockages identified at country-level by survey participants

The summaries on the following pages provide an overview at country-level of gaps, challenges, strengths and recommendations. They are based on data from the AIESyS survey and insights from interviews with key stakeholders.

Within these summaries, the use of the phrases: 'government-led/funded', 'stakeholder-led/funded' and 'private sector driven' refers to activities enabled predominantly, but not necessarily solely, by the direct or indirect support of these different actors. This could be through direct funding or financial support, creation of enabling environments through policies or market mechanisms, or other kinds of support and facilitation. These phrases set out to identify the key drivers and points of momentum, but do not seek to downplay the importance of the interaction between these different enablers in supporting robust and diverse innovation ecosystems.

Southern Africa

Angola

Among the strengths for innovation ecosystems in Angola is the country's involvement in a number of international and regional organisations which support activities related to science, technology and innovation (STI) and the existence of streamlined processes for setting up companies, as well as a simplified legal framework which facilitates foreign investment. However, there is a lack of funding for innovation and the research and development (R&D) workforce is weak with no R&D personnel in the private sector. A lack of strategy to achieve STI policy goals and incentives to promote R&D and innovation in the private sector are also among the identified gaps.

Although there are no “real” innovation hubs, or similarly labelled formal ecosystems, supporting innovative activities, the innovation ecosystems present are facilitated by market opportunities, partnerships and diversifying sources of funding such as angel investors. A public incubator also exists mainly providing space for working, but no access to expertise, markets, funding or legal and accounting support. The accessibility of seed funding is a real issue alongside a lack of policies facilitating the entry of new players into the market. The ecosystems are further weakened by the issues of corruption, lack of transparency and general state of the national economy. Low invention transfer to industry is mainly attributed to poor infrastructure and incentives for the private sector to invest in start-ups.

These gaps can be addressed by providing capacity-building support for ecosystem actors, strengthening governance and accountability mechanisms, developing public sector capabilities around stakeholder engagement, improving the quality, governance and financing of education, improving the supply of and demand for R&D in the private sector, and formulating policies that are more conducive for small and medium-sized enterprises (SMEs) and that build a system in the long-term.

Botswana

Botswana is one of Africa's most stable and democratic countries with a strong innovation culture, though there is still room for improvement. The government plays an important role in the development of the national innovation ecosystem. The country has identified diversification as one of its strategic priorities, and in an effort to reduce dependence on the mining sector, the 11th National Development Plan outlines Botswana's Vision 2036, the theme of which is 'Inclusive Growth for the Realisation of Sustainable Employment Creation and Poverty Reduction'⁴.

Following the transition of the administration following the 2019 general election, there appears to be limited continuity of explicit national policies on innovation and

⁴ This theme will be realised through the implementation of six national priorities, namely: developing diversified sources of economic growth; human capital development; social development; sustainable use of national resources; consolidation of good governance and strengthening of national security; and implementation of an effective monitoring and evaluation system; Source: [Tralac](#).

its encompassing ecosystem. The lack of continuity has resulted in the failure of some key innovation activities including the failure of several government-initiated hubs (agriculture, diamond, health, education & transport hub). This is alongside the absence of funding, regulations and other legal instruments, resources and expertise necessary to develop a functioning innovation ecosystem. In addition, innovation activities by various stakeholders within the national innovation ecosystem take place in isolation, with limited interaction and coordination, resulting in the replication of innovation activities.

Despite Botswana's goal of moving to a knowledge-based economy, minimal investment has been provided for research and development models, the development of localised knowledge transfer and the strengthening of intellectual property rights in the country. Gender imbalance in its innovation ecosystem remains a major concern, with low representation of women in its key technology and innovation areas.

Malawi

The key issue for Malawi's national innovation ecosystem stems from the fact that despite the existence of many activities pertaining to innovation within the country, these initiatives are currently dispersed and fragmented. This is largely due to the strong presence of international actors within the innovation ecosystem, many of which run short-term programs without ensuring synergy with other parallel, preceding, or subsequent projects. This has a significant impact on sustainability and coherence within the overall innovation ecosystem. The fragmented nature of the ecosystem also has an impact on its' visibility, limiting the ability of innovators within the country to identify how to develop their ideas and bring them to market, as well as of investors' view of Malawi as an attractive destination for investment.

Progress must be made towards increasing synergies across the activities of ecosystem actors, including through the provision of clear national objectives and regulations. It is also important to drive efforts to increase the impact and sustainability of donor-funded programs by applying lessons learned from successful projects, namely within the agricultural sector, which focus on the importance of local buy-in and local ownership.

Namibia

The emphasis on information and communications technology (ICT) infrastructure reflects a strength of Namibia's innovation system, which greatly contributes to creating a conducive environment for innovation alongside the government's relatively high spending on health and education. The country also benefits from having a dedicated fund for STI activities and placing a higher education institution (Namibia University of Science and Technology) as a focal point to foster innovation. However, the country suffers from a lack of a coherent overarching policy framework for its national innovation system and poor capabilities in policy implementation. Weak workforce and capabilities in coordination, governance and standardisation lead to poor innovation implementation in the public sector and its uptake by stakeholders. Low R&D spending and STI activities in the private sector is attributed to the weak linkages between academia and industry.

Having both local and international actors facilitates the innovation ecosystem through knowledge exchange and co-learning while the innovative and entrepreneurial capacity of the workforce is built through university degrees, training programmes and other initiatives. Nevertheless, innovation and entrepreneurial ecosystems don't really exist outside the higher education system due to reasons including a lack of policy instruments incentivising such activities and the inaccessibility of seed funding. The uptake of innovations at large scales is also a challenge due to poor infrastructure.

These challenges can be overcome through capacity-building for digital skills, coordination and governance in the public sector as well as improving the capacities in policy design and implementation. The country would benefit from policies and policy instruments aimed at promoting demand for R&D and innovation, improving the accessibility of funding, and strengthening the links between academia and industry. Promoting participation in more regional innovation programmes would also increase access to different funding opportunities as well as access to support and larger markets.

South Africa

South Africa exhibits an extensive and diversified mix of government-led/funded as well as stakeholder-led/funded innovation ecosystems and facilitation mechanisms. Private sector, NGOs, partnership support, and international support were marked as facilitators of the innovation ecosystem by various respondents. The South African Business Innovation Survey, 2014-2016 highlighted that innovation was pervasive across all sectors, but especially in engineering and technology, manufacturing, and trade.

Biotechnology has been identified as a priority area for development in South Africa since the publication by the then Department of Science and Technology (DST) (now known as the Department of Science and Innovation DSI), of the National Biotechnology Strategy (DST 2001), and the National Research and Development Strategy (DST 2002). These were followed by the 10-year Innovation Plan (DST 2008), which states that 'over the next decade South Africa must work to become a world leader in biotechnology' and, more recently, by the Bio-economy Strategy (DST 2014), which seeks to incorporate all sectors in the South African economy to harness bio-innovation for economic growth and social development. (Morris, E.J et al., 2016). More recent developments include the 2019 White Paper on Science and Technology and efforts relating to the development of a new decadal plan – (including the 2018 Foresight Study by the National Advisory Council on Innovation (NACI), which reports to the DSI. In 2020 the DSI launched the Bioeconomy SA Portal to improve the exchange of information among bio-innovation stakeholders and thereby stimulate communication, improve cohesion and promote collaboration. Maintaining fit for purpose regulations regarding new bioproducts and ensuring robust and appropriate institutional structures to support this sector are key recommendations.

Given South Africa's long history of racial discrimination and the resulting impact on the distribution of economic resources, the country continues to be afflicted by high

levels of discrimination and inequality in the delivery of key resources, such as education. Aligning education with the requirements and skills needed for broad spectrum innovation and ‘demystifying’ innovations for new entrants is a key recommendation.

Zambia

A key inhibitor to the growth of Zambia’s innovation ecosystem includes the lack of a formalised multi-sector, collaborative and unified approach to innovation. The Zambian government has taken decisive steps towards strengthening national innovation ecosystem development, including through the role of the National Technology Business Centre - NTBC (SAIS programme National Focal Point) in driving forth a National Innovation Initiative in 2020, and the development of a STI Policy and Implementation Plan in 2020. However, shortcomings with regards to the government’s role in driving national innovation include lack of an incentive regime and regulatory factors to stimulate entrepreneurship, and the exclusion of the Ministry of Commerce, Trade and Industry – as well as the private sector – as implementing institutions of the STI Policy 2020.

The active role of technology hubs in Zambia intends to account for shortcomings with regards to government support for innovation. For example, BongoHive has been working alongside national institutions such as the Central Bank, ZICTA (Zambia’s ICT Regulator) and the Securities and Exchange Commission (capital markets regulator) to help them develop innovation strategies and regulatory frameworks that fill gaps in the current system with regards to what is needed by the entrepreneurs.

It is therefore important that progress is made to strengthen multi-stakeholder involvement in innovation support initiatives in Zambia, which will not only serve in driving economic development, but will also crucially improve the country’s standing as an attractive investment destination within the region.

Zimbabwe

Zimbabwe exhibits a mixture of government-led/funded as well as stakeholder-led/funded innovation ecosystems and facilitation mechanisms. Among the strengths of Zimbabwe’s innovation system is the existence of the country’s Science, Technology and Innovation Policy in place as of 2002 and revised in 2012, with the overall vision to “make science and technology an integral part of individual and national development.”⁵ The country also has in place policy formulation and implementation for skills training/ development to promote ST&I.

Limitations against the success of these initiatives, as well as the innovation ecosystem at large, includes the country’s regulatory environment – particularly when it comes to intellectual property regulations – as well as financing for innovation from the government and private sector.

⁵ <https://www.healthresearchweb.org/files/Zimbawesciencetechpolicydocumentnew.pdf>

For progress to be achieved, it is important that efforts are focused on increasing synergies between the government, industry and academia, and establishing a strong regulatory environment that is conducive to innovation. This will allow Zimbabwe to tap into its strong human capital base, and its innovative potential. It is equally important to build a culture of innovation within the country, to increase collaboration across a broader range of sectors than is currently the case.

West Africa

Cameroon

The majority of innovation ecosystems and facilitation mechanisms in Cameroon are private sector led with support from international actors. The epicentre of Cameroon's innovation ecosystem is Silicon Mountain, in Buea in the south, which received an estimated 1.92 billion CFA francs (\$ 20.6 million) from the Ministry of Scientific Research and Innovation's budget.

As noted in Output 1, Cameroon performed below average, in comparison to other SSA countries, in four of the seven Global Innovation Index (GII) 2020 (WIPO, 2020) pillars: Institutions, Infrastructure, Market sophistication and Creative outputs. There appears to be little government support and policy that is directly geared toward fostering an innovation ecosystem. Additionally, corruption and political tensions, particularly, The Anglophone Crisis⁶, have stifled innovation in Cameroon.

Ghana

Ghana benefits from the political will for developing a national STI system, which is supported by a policy framework with a systematic approach including sector-specific policies and management strategies for STI activities. Ghana's linkages with international partners also attract initiatives and projects to the country supporting innovation ecosystems. Still, the country suffers from governance and coordination challenges due to a lack of implementation strategies. This leads to poor implementation of policy goals such as the involvement of the private sector as partners and financial contributors. Governmental involvement for innovative activities in the private sector and civil society is also weak manifesting itself as poor support and funding opportunities.

The governmental support for the innovation ecosystem, which is nascent in nature, has gained momentum following the publication of the National STI Policy in 2017 and launch of the Ghana Innovation and Research Commercialization (GIRC-Centre) in 2018. This is alongside several parallel efforts in Ghana such as creating the relevant policy environment and supporting small and medium-sized enterprises (SMEs) development and private sector growth. The government's successful policies on digitalisation provides an exemplary framework for the adoption and scaling of innovations in other sectors. The innovation ecosystems also enjoy collaborations and interactions in between each other. However, these ecosystems suffer from agenda-setting by external funders and a lack of coordination limiting

⁶ <https://www.hrw.org/world-report/2020/country-chapters/cameroon#>
[Accessed:22.04.2021]

their collaborative potential to address local needs. Poor integration of innovations into existing structures also impedes the uptake of innovative solutions.

Recommendations to facilitate the innovation ecosystems include formulating policies that integrate the role of innovation hubs into the national innovation system, capacity-building for both the public and private sector for the successful implementation and integration of innovations within existing structures, and creating an implementation plan for the national STI policy. Innovation hubs can also benefit from capacity-building support to improve their impact.

Nigeria

Nigeria exhibits a mixture of government-led/funded as well as stakeholder-led/funded innovation ecosystems and facilitation mechanisms. However, its innovation ecosystem appears to be primarily private sector driven, with some federal and government state support. There are some challenges with policy coherence and political will, and regulations and policies that have been implemented are sometimes contradictory to the visions and strategic goals outlined within the STI policies.

The country enjoys access to international and regional funding for technological innovation and the presence of varied technology and innovation hubs with significant business sophistication, funding and partnerships. However, deliberate mechanisms for facilitation of innovation ecosystems were said to be still lacking.

Collaboration and knowledge sharing among universities and between universities and the private sector were also highlighted as issues needing attention, with recommendations for further support here. Gender imbalance in the different sectors involved in innovation is also a major gap, with recommendations for gender mainstreaming in STI policies

Cross-border and system-wide recommendations

- Facilitating cross-border work

Survey and interview respondents highlighted a number of key factors in facilitating cross-border work (full tables in Appendices and AIESyS Data Summary). These include:

- **Funding** - focussing on increased funding and providing appropriate funding conditions
- **Knowledge exchange** - including flows of people, knowledge and resources
- **Indigenous and local knowledge** - bridging the divide between science and 'accepted' local knowledge systems,
- **Governance, support and leadership** –importance of leadership, corporate and public sector good governance
- **Leveraging existing bodies and networks** – to work with those already in the field, rather than duplicating effort
-

- Recommendations for FCDO

Survey and interview respondents provided views around the role that FCDO can play in supporting innovation ecosystems (full tables in Appendices and AIESyS Data Summary). These views include:

- **Regionally focused programmes** - working across neighbouring countries
- **Stakeholder engagement** - to identify reputable and experienced in-country partners
- **Capacity building** - support development of local capacity
- **Cultural sensitivity** - deeply appreciate differences in values and approaches, and ensure that innovation can be supported / approached appropriately
- **Education** – about what innovation is and what it can do
- **Understanding innovation ecosystems** - conducting further work to understand existing systems
- **Partnerships and governance** – facilitating relationships between the Private Sector, Government, Academia and Development Partners
- **General recommendations**

General recommendations derived from survey and interview responses, which complement and expand those provided in the preceding sections include:

- **Research** – further research in to the nature and function of innovation ecosystems
 - **Thematic diversification** – a diversity of topical areas are well positioned for facilitation
 - **Portfolios of support** – meaningfully bringing together a range of different actors is key in ecosystem facilitation
 - **Innovation ecosystem literacy** – literacy around innovation in general and innovation ecosystems in particular could be improved
 - **Performance indicators** – opportunities to understand how well perceived performance indicators map on to a range of development outcomes
 - **Ecosystem actors** – development finance and international development organisations are seen as valuable actors, alongside government / policymakers, industry / entrepreneur, spin-off and collaborative space organisations
 - **Supporting environment** – funding, access to markets and partnerships could provide key points of focus for future work in ecosystem facilitation
 - **Monitoring, Evaluation and Learning (MEL)** – MEL activities were relatively limited, and could be a key future area to explore and expand effective ecosystem facilitation
-

Context

The past year has seen momentous societal change economically and socially as a result of personal, national and global health experiences in the face of the COVID-19 pandemic. For policy makers and other actors in innovation systems, the pandemic has exposed many underlying challenges which countries have been trying to address through innovation, necessitating the need to rethink the organisation and deployment of these systems. In particular, there are many contextual realities which are coming to the fore, including confirmation of the complexity of the systems, multiplicity of actors and their diverging/converging influences and interests in the systems, the limits and decline of traditional models of change and impact, and the need to rapidly diversify and enrich networks of values-aligned partnerships across sectors. The need to hold actors to account is also increasing as fundamental in the delivery of high-quality systemic change and impact.

It is in this backdrop that this **scoping study on innovation ecosystems and facilitation mechanisms in Southern and Western Africa** is timely from both empirical and operational standpoints. Drawing from literature, covered in Output 1 of this study, the **innovation ecosystems concept** emphasises that innovation now means not only technological innovation but, in a broader notion, an “ecosystem” (environment) conducive to the generation of ideas and their implementation in the form of new products, services, and processes in the global marketplace (WEF, 2015). As covered in Output 1, literature further describes this approach with three important details: the wider-scope of innovation, the innovation-conducive environment, and various studies on ecosystems, emphasizing the temporal, spatial and contextual nature of innovation.

The observation that economic phenomena, and innovation in particular are spatially delineated is not new: see, for example, Alfred Marshall’s “industrial districts” at the end of the 19th century, Joseph Schumpeter’s “innovation clusters,” Eric Dahmen’s “development blocks,” Francois Perroux’s “development and growth poles” in the 1950s, and, more recently, economic geographers’ and economists’ industrial and high-technology agglomerations and “new economic geography.” Local innovation is of particular interest both because innovation has its foundations in microeconomic (local) processes (proximity, networks, density, diversity). The connection between local innovation and successful contribution to national development and integration into international markets provides localities with a strong rationale for developing strategies for increasing innovation in targeted sites—special economic zones, science parks, clusters, and even cities (Zeng, 2015).

This study builds on these realities, and the now widely accepted notion that innovation is crucial for increasing productivity, economic growth and advancing livelihoods. Further, while the non-linear and networked nature of innovation has been influential in organising and explaining innovation at national, regional and sectoral levels, this study is anchored on innovation ecosystems thinking, as a departure point and recognition since the 2000s of these dynamic and agile collaborative ways of understanding and organizing innovation that enjoy self-governance as a necessary prerequisite for interactive innovation (Banwell et al., 2012).

Overall Objective

The overall objective of this Africa Innovation Ecosystems Study (AIESyS) is to provide a synthesis of innovation ecosystem development and support initiatives in 10 African countries: South Africa, Angola, Botswana, Namibia, Malawi, Zambia and Zimbabwe in Southern Africa; and Nigeria, Ghana and Cameroon in West Africa. It intends to support planning to improve ecosystem facilitation efforts across multiple national and regional stakeholders. The work took a wide approach to innovation ecosystems, including work beyond digital and financial sectors and innovations. Ultimately the aim is to identify ways to achieve better-connected ecosystems that deliver improved uptake of innovations and outcomes for stakeholders and best practice approaches to strengthening networks for facilitating cross-border innovation partnerships across the regions.

Methodology

Output 1 of this study provided a synthesis of existing innovation ecosystem support and development initiatives in Southern and West Africa in identified countries through a comprehensive literature review and the inputs/views of key stakeholders in the region. The following methodology for collection and analysis of secondary data was deployed for Output 1:

Box 1: Data collection for Output 1

Review

- Review of literature (policies, programmes, reports and academic papers)
- Survey of innovation ecosystem actors

Analysis and reporting

- Analysis of collected data
- Quantitative – numerical and statistical analysis regarding value, extent and function of innovation ecosystem
- Qualitative – content and thematic analysis to understand how innovation ecosystems are currently understood, used and supported
- Stakeholder mapping
- Network mapping of a selection country-level innovation ecosystems

Output 2 (this report), builds on Output 1 to provide an analysis of gaps, challenges and existing strengths and make recommendations on potential facilitation mechanisms/activities to strengthen the ecosystem, which can include specific aspects of the ecosystem elements and/or particular thematic areas. This output is based on primary data which was collected through an online survey (via Opinio) and semi-structured interviews with key stakeholders in the targeted countries and cognate organisations outside the study regions. The following is a summary of the methodology deployed for this Output:

Box 2: Data collection for Output 2**Review**

- Review of literature (policies, programmes, reports and academic papers)

Survey and interviews

- To gather views and experiences from a wide range of people involved in innovation ecosystems. Survey consisted of multiple choice and written-response questions, while interviews used a semi-structured checklist.

Analysis and reporting

Analysis of collected data

- Quantitative – numerical and statistical analysis regarding value, extent and function of innovation ecosystem
- Qualitative – content and thematic analysis to understand how innovation ecosystems are currently understood, used and supported
- Analysis of strengths and weaknesses at country-level
- Analysis of opportunities for regional / other ecosystem facilitation

Country selection

In accordance with the terms of reference for the study, and as justified from both objective and subjective perspectives in Output 1, this work draws from an analysis of innovation ecosystems in the 10 countries in Table 1 below. This Table also includes the number of respondents from each study country and elsewhere who contributed to the study.

Table 1: Study regions, countries and number of respondents

Region	Country	Survey Respondents	Interviews
West Africa	Ghana	13	3
	Nigeria	6	1
	Cameroon	3	2
Southern Africa	Angola	4	1
	Botswana	3	3
	Malawi	9	1
	Namibia	6	0
	South Africa	11	1
	Zambia	4	1
	Zimbabwe	9	2
Total respondents		68**	15

** Our target was to get 50 respondents from the study countries, an average of 5 per country. Further, we had 15 respondents from outside the study regions (from USA, DR Congo, Uganda and others who did not reveal their location). This input is integrated in our analysis and discussion of findings.

Innovation ecosystem strengths, gaps and recommendations

Table 2 gives a broad summary of the strengths, gaps and recommendations around the innovations as established from the views of key stakeholders.

Table 2: Innovation ecosystem strengths, gaps and recommendations

System Component			
	Strengths	Gaps	Recommendations*
Innovation systems	<ul style="list-style-type: none"> Political will Short- and long-range policy goals, including Sustainable Development Goals (SDGs) 	<ul style="list-style-type: none"> Institutional and administrative instruments Policy action aligned to local needs and realities 	<ul style="list-style-type: none"> Strengthen public sector capabilities for policy formulation, coherence, implementation and predictability over time
Supporting innovation systems	<ul style="list-style-type: none"> Multiple actors in the arena General purpose technologies (ICTs) available 	<ul style="list-style-type: none"> Actor coordination mechanisms Collaborative capacities 	<ul style="list-style-type: none"> Create, link and capacitate partnerships Document and disseminate activities, data & knowledge on innovation ecosystems
Facilitation mechanisms	<ul style="list-style-type: none"> Local and external lessons and models available 	<ul style="list-style-type: none"> Long term funding Accountability mechanisms Good alignment of mechanisms with local contexts 	<ul style="list-style-type: none"> Provide and consolidate financial support Cultivate and support home-grown entrepreneurship

*NB: There is need to consider multi-scalar approaches in implementation of some of the recommendations, for example within regions in countries, at sectoral levels, national or cross-national levels. We will unpack some of these dimensions in the following sections. Those cells marked in grey are not included in the analysis below.

Limitations to the study

AIESyS provides a detailed overview of innovation ecosystems through the combination of insights drawn from the public domain, survey responses and interviews with key stakeholders. All activities were conducted online, due to the constraints of the COVID-19 pandemic. There are some notable limitations to this approach, the most significant being that materials on innovation ecosystem facilitation were not always easily searchable in the online environment or identifiable or accessible on the digital platforms of key stakeholders. Surveys and interviews sought to snowball the overall sample size of the study and bring to light activities with limited digital footprint, though this representation cannot be comprehensive.

Gaps, challenges, existing strengths and country-level recommendations

The following sections summarise the insights from our literature review, stakeholder survey and interviews at country-level. The insights are presented as outlined in Box 3 below.

Box 3: Format of country-level insights

Summary and recommendations on potential facilitation mechanisms / activities

1. Innovation Systems

- Strengths
- Gaps

2. Supporting Innovation Ecosystems

- Strengths
- Gaps

3. Facilitation Mechanisms

- Recommendations

Southern Africa

Angola

Summary and recommendations on potential facilitation mechanisms / activities

Angola currently lacks “real” innovation hubs supporting innovative activities, although there is a fairly active innovation ecosystem facilitated by market opportunities, partnerships and diversifying sources of funding such as angel investors. A public incubator also exists mainly providing space for working, but no access to expertise, markets, funding or legal and accounting support. The accessibility of seed funding is a real issue alongside a lack of policies facilitating the entry of new players into the market. The ecosystems are further weakened by the issues of corruption, lack of transparency and general state of the national economy. Low invention transfer to industry is mainly attributed to poor infrastructure and incentives for the private sector to invest in start-ups.

These gaps can be addressed by providing capacity-building support for ecosystem actors, strengthening governance and accountability mechanisms, developing public sector capabilities around stakeholder engagement, improving the quality, governance and financing of education, improving the supply of and demand for R&D in the private sector, and formulating policies that are more conducive for SMEs and that build a system in the long-term.

1. Innovation Systems

Strengths

Among the strengths is the fact that Angola is **involved in a number of international and regional organisations** which support activities related to STI. Several STI and development projects are undertaken in partnership with these initiatives, an example being the Science and Technology Development Project by the African Development Bank. The country also enjoys simple and **streamed lined processes for setting up companies**, and **a legal framework which is simplified** to facilitate foreign investment in companies. The facilitation of company registration and legal support are provided through Guichê Único, which plays an active part in the entrepreneurial ecosystem. The impact of this simplified process was confirmed in secondary data by the high percentage of innovative firms in Angola⁷, and from primary data in our survey and interviews:

“One of the best examples is the start-up TUPUCA, that innovated in delivering food with new kind of services using Internet.” (AIESyS Survey, March 2021)

“Another innovation is linked with the start-up M`LEVA that innovated in transport of Taxi in Luanda city, using cell phones and Internet.” (AIESyS Survey, March 2021)

⁷ https://au.int/sites/default/files/documents/38122-doc-ai0_3rd_edition_final_eng_repro.pdf

Gaps

Among the gaps identified from both secondary and primary data sources is the **lack of funding for innovation broadly and for innovation clusters**. This is unsurprising in a backdrop where R&D and higher education expenditure by the government is low. Angola's R&D expenditure is currently the lowest in Africa along with Lesotho, at only 0.01% of GDP while its expenditure on higher education is 0.013% of GDP⁸. Consequently, R&D activities in the public sector are poor. The existing R&D activities concentrate on the agricultural sector as part of the government's efforts in diversifying the oil-based economy through agricultural development while such activities in other sectors are very limited.

Another gap is that Angola's **R&D workforce is weak and mostly concentrated in higher education and government** while there are no R&D personnel in business and private non-profit sectors⁹. Related gaps include the **lack of clear links between the tech ecosystem, government or industry with academia**, a scenario which is likely due to inadequate workforce and R&D activities in universities and research institutions. **There are also no measures or incentives to promote R&D and innovation** within the private sector. There are, however, efforts to improve the workforce through the National Policy for Science, Technology and Innovation (2011) puts emphasis on the promotion of training of human resources and increasing the capacity of higher education and research institutions. The Government also released a National Plan for Training Professionals in 2013 and aims to generate 100 PhDs by 2024 from its new Centre of Excellence for Science Applied to Sustainability¹⁰. Still, the number of researchers per million habitants is the lowest in the region (7 per million) along with Democratic Republic of Congo¹¹.

The above notwithstanding, our secondary and primary data reveals that there is no strategy document detailing **how the policy goals set in the national STI policy would be achieved**. The national policy for STI highlights certain policy instruments, and the National Development Plan details certain goals and specific actions relevant to the given period. However, there is no strategy outlining how science, technology and innovation would contribute to the **diversification of the economy and creating room for more actors**, which is currently a pressing need for the country. One interview respondent made the observations below:

“Mechanisms to incorporate the voices of different actors into policy and regulatory processes are inadequate. Stakeholder engagement during policymaking isn't effective” (AIESyS Interview, March 2021)

2. Supporting Innovation Ecosystems

Strengths

The strengths of Angola's innovation ecosystem are multifaceted, including vast **market opportunities, different forms of partnership and (lately), diversifying**

⁸ Ibid.

⁹ Ibid.

¹⁰ <https://unesdoc.unesco.org/ark:/48223/pf0000235406>

¹¹ Ibid.

sources of funding (AIESyS Survey, March 2021). Public funding is also available for large projects, while government initiatives such as competitions for start-ups exist which provide market exposure and mentorship, but no funding (AIESyS Interview, March 2021). A **public incubator** exists showing the government's efforts in supporting private sector growth as highlighted in its development plans. It is called "National Institute to Support Small and Medium Enterprises" (INAPEM) and provides mainly **space for working**. In the area of funding, a small group of business **angel investors** exists which acts as the only reliable source for financing start-ups. There is a potential for more angel investors investing in start-ups (AIESyS Interview, March 2021)

Gaps

Among the gaps is the fact that although public funding for large projects is available from the government, **seed funding for start-ups does not exist**, and according to one respondent, this is due to funding initiatives being "disconnected from reality" and **not being "relevant to the capabilities or needs of the start-ups"**. An example given was of this misalignment was of the government investing in start-ups with a minimum amount of US\$1M along with a requirement for the entrepreneur to put 40% of that amount upfront, which many entrepreneurs in the country Angola cannot do.

It was also bemoaned that there were **no "real" innovation hubs** that provide **support services and linkages within the innovation ecosystem**. The hubs that exist only provide **co-working spaces**. Even the government's incubator (INAPEM) does not provide **access to expertise, market access, funding, legal and accounting support**. This is mostly due to a lack of capabilities to provide support within both the public and private sectors. Although some supportive initiatives are provided by financial institutions, these are focused on innovations within the financial sector only (AIESyS Interview, March 2021). The lack of capabilities to support the actors within the ecosystem might have manifested itself as:

"very low effectiveness for transferring inventions to industry, lack of understanding of real business and entrepreneurial necessities" (AIESyS Survey, March 2021).

Lack of policies **facilitating the entry of new players** into the market, perpetuates monopolies in various sectors, especially the financial services sector.

Issues of **corruption, lack of transparency and general state of the national economy** were also highlighted as contributory factors for the weaknesses in the innovation ecosystem. In fact, the lack of **effective governance and accountability mechanisms** is a real issue in Angola. Angola ranks low on the Corruption Perceptions Index (142nd out of 179)¹². Angola's only innovation hub, African Innovation Foundation, which also used to provide a makerspace called Fabrica de Sabao, had to shut down after its founder was found to be using the hub for money laundering¹³.

Meanwhile, **infrastructure such as internet services**, which would allow the scaling of innovative solutions is unavailable to everyone. This partly explains the low

¹² <https://www.transparency.org/en/cpi/2020/index/nzl>

¹³ <https://www.theguardian.com/world/2017/nov/07/angola-sovereign-wealth-fund-jean-claude-bastos-de-morais-paradise-papers>

effectiveness of **invention transfer to industry**. According to one interviewee, this is exacerbated by the fact that the private sector **lacks incentives** such as tax credits and exemptions for investing in start-ups as the success of start-ups is very limited due to various reasons and therefore companies prefer investing in treasury bonds or real estate. Other related reasons for the failure of start-ups include the lack of an **enabling business environment**. In fact, Angola ranks 177th out of 190 in World Bank's Ease of Doing Business Rankings¹⁴. It scores the worst in "enforcing contracts" (186th), "getting credit" (185th) and "trading across borders" (174th).

3. Facilitation Mechanisms

Recommendations

Below are some recommendations for harnessing or building strengths to address gaps and explore opportunities in Angola's innovation ecosystems

- **Capacity-building support** for innovation ecosystem actors across the entire value chain. Especially for support providers who should have the capabilities to support the new actors in the ecosystem.
- Need to **strengthen governance and accountability mechanisms** such as public financial management, anti-corruption and accountability institutions. Capacity building to improve the government's **capability in big data analytics** can help identify fraudulent activities as well as improving the mechanism needed to give all stakeholders a voice.
- Support the development of **public sector capabilities around stakeholder engagement**. This might not only improve the policies and regulations that enable an innovative environment within specific sectors but also allow tailoring of the existing funding and support mechanisms according to the needs of the stakeholders.
- Work with policymakers to make the financial sector **policies more conducive for medium and small enterprises** and to improve the accessibility of credit and microfinance products from formal financial institutions.
- **Promote investment** as an "angel" both within Angola, and also abroad to attract Angolans living abroad and seeking investment opportunities in Angola.
- Work with policymakers to **improve the supply of and demand for R&D** within the private sector.
- Provide the Ministry of Education and Higher Education with strategic assistance regarding the **quality, governance and financing of education** to train the workforce capable in STI in fields relevant to the country's need.
- Assist policymakers in formulating and planning **long-term system building policies** to insert R&D and innovation within various sector.

Case study / Example

Angola Innovation Ecosystem Case Study: Bantu Makers

¹⁴ <https://www.doingbusiness.org/en/rankings>

Bantu Makers is a start-up studio founded in 2017. They specialise in digital innovative solutions to improve financial inclusion through digital inclusion. They have helped build three ventures so far:

1. DEYA: A crowdfunding platform with a mission to democratize access to finance through crowdfunding so that anyone anywhere in the world can help finance or donate to a cause or a project.
2. Salo: An online platform to connect employees with employers to reduce the numbers in informal employment as well as providing services to formalise other aspects of doing business.
3. An initiative still in development to solve the problem of real time digital payments that impedes the scaling up of businesses due to the unavailability of online options for payments.

DEYA has been a successful initiative due to its experienced team who knew how to navigate within Angola's entrepreneurial ecosystem and the support it received from the private sector. It has secured its first round of pre-seed financing through fund raising to help it further develop its platform and start generating revenue.¹

Despite its potential to address an important need in the society, Salo isn't an active platform anymore mainly due to a lack of financial resources. The initiative was funded through personal savings which were not sufficient to keep the platform running beyond the "valley of death". Funding through financial institutions or the public sector was not an available option.

Bantu Maker's third initiative on digital payments is currently facing challenges in entering a market with a monopoly and manoeuvring around unfriendly regulations about digital payments as well as slow bureaucratic processes.

One of the main barriers to implementation of these digital innovations which would ultimately facilitate further innovation has been the inaccessibility of internet and smartphones to many people in Angola. In response to this, Bantu Makers are now partnering with the first mobile factory in the country to improve accessibility. However, the team in Bantu Makers is still struggling with securing investment and partnerships within the private sector and accessing financial or other types of support from the public sector.

Facilitating mechanisms

- Crowdfunding
- Partnership with industry
- Mission-oriented initiatives
- Specialisation in digital technologies

Source: AIESyS Interview, March 2021

Botswana

Summary and recommendations on potential facilitation mechanisms / activities

In contrast to the situation in Angola, the majority of innovation ecosystems and facilitation mechanisms in Botswana are government-led and government-funded. The state driven approach to innovation aligns with Botswana's national STI policies and its 11th National Development Plan which outlines Vision 2036 goals, where an emphasis is placed on Botswana's aim to transition from a resource-based economy to a knowledge-based economy. The key **facilitation mechanism in Botswana's state-driven innovation ecosystem is the establishment and development of parastatals overseen by varied government ministries**. A key parastatal being the **Botswana Innovation Hub**, an innovative and networked organisation that promotes and fosters science, technology, entrepreneurship and commercialisation. Strengths of Botswana's innovation ecosystem includes political stability, political will to develop a fully functioning innovation ecosystem, the existence of fully developed national STI policies and a high expenditure on education that has catalysed education access at all levels.

However, some challenges persist. Following the transition of an administration, there appears to be limited continuity of national policies on innovation and its encompassing ecosystem. The lack of continuity has resulted in the failure of some key innovation activities including the failure of several government-initiated hubs (agriculture, diamond, health, education and transport hub). This, alongside the absence of funding, regulations and other legal instruments, resources and expertise necessary to develop a functioning innovation ecosystem. In addition, innovation activities by various stakeholders within the national innovation ecosystem take place in isolation, with limited interaction and coordination, resulting in the replication of innovation activities. Despite Botswana's goal of moving to a knowledge-based economy, minimal investment has been provided for research and development models, the development of localised knowledge transfer and the strengthening of intellectual property rights in the country. Gender imbalance in its innovation ecosystem remains a major concern, with low representation of women in its key technology and innovation areas.

1. Innovation Systems

GII report 2020, ranks Botswana as 5th among the 26 economies in Sub-Saharan Africa (SSA). Additionally, Botswana, ranks 30th among the 37 upper middle-income group economies and ranks 5th among the 26 economies in SSA. Yet, relative to its GDP, Botswana is performing below expectations for its level of development.

Strengths

- *Political stability and will*

Botswana is one of Africa's most stable and democratic countries. It has achieved this status through the adoption of prudent policies and legislation that promote political stability, zero tolerance for all forms of corruption, and by adhering to the principles of good governance and equitable distribution of its natural wealth, especially diamonds.

As such, GII 2020 report indicates that Botswana shows institutional strengths in the indicators of political and operational stability (21) and rule of law (43) (GII Report, 2020).

- *Existence of national policies on STI*

In Botswana, the government plays an important role in the development of its national innovation ecosystem. Thus, in an effort to reduce dependence on the mining sector, the National Development Plan (2009-2016) identified economic diversification as one of Botswana's main strategic priorities. To deliver on this priority, the government concluded that the most effective way to stimulate economic growth is to strengthen the role of research and development in fuelling entrepreneurship and private sector growth. This led to the development of the National Policy on Research, Science, Technology and Innovation (2011) and implementation plan (2012). The policy outlines its goals to develop a co-ordinated and integrated approach to STI planning and implementation. In addition, to the aim to launch regular participatory foresight exercises, and the strengthening of institutional structures responsible for policy monitoring and implementation. The establishment of national STI policies was considered to be a strength by an AIESyS Survey respondent who noted:

“ strengths ... definitely rafting of national policies on stem, research & innovation; party to international treaties on STEM; respect and support of intellectual property laws and IKS (authority set up to manage that)” (AIESyS Survey March 2021).

However, in a reflection showing contestation of views about the ecosystem, another interviewee focused on linkages, noting that:

‘... on the importance of linkages in the innovation system, our policies are a bit behind. The last review was between 2009 to 2011. We need to have one set agenda when it comes to tech and innovation in the country. Innovation is an expensive process, so we need to have the funding to match around that’, (AIESyS Interviewee March 2021)

- *Education*

Botswana's government has aggressively reprioritised its economic strategies to focus on building a strong private sector as well as public institutions. Hence, in SSA Africa, Botswana ranks 1st in education spending (1) and strength in government funding/pupil (7). The high expenditure on education has facilitated access to education at all levels, and consequently a clear increase in the country's literacy rate. In addition to improving educational access, Botswana has also put in place policy measures to enhance the quality of education through the Education and Training Strategy Sector Plan. Nevertheless, Botswana exhibits weaknesses in the indicators Global R &D companies (42) and QS university ranking (77) while concerns about declining education standards persist.

One interviewee stated that the pandemic had *‘accelerated the use of ICT in their daily processes in companies and organisations, especially in key sectors such as education and health’*, while interviewee acknowledged the need for *‘certain training on the harmonisation of innovation activities and education campaigns.’* Relatedly, a survey respondent pointed to the fact that the *Government is warming up to the idea of a knowledge-based economy (AIESyS Survey, 2021)*

- *Innovation culture*

All our interviewees were emphatic that Botswana had a strong innovation culture, which had room for improvement, with one interviewee noting that as an organisation, they had *'managed to cultivate the culture of innovation amongst our graduates and unemployed youths. They are able to put bread into their table through their innovative ideas because they want to migrate from a resource-based economy to a Knowledge-based economy.'* Also noted were strengths in *"entrepreneurship training and mentoring"*, while another noted *I think [while] there has been more [and important] focus on funding innovation activities from the youth start-up, [but] we are really behind when it comes to R&D from academia and institutions'.*

The areas with active innovation ecosystems include: biotechnology (agricultural and health technologies); Information Communications Technology and ICT enabled services; clean tech; mining technologies; and indigenous knowledge systems (creams, edibles and other models based on IKS ideas)

Gaps

Our secondary and primary data revealed gaps in a number of areas, including the following:

- *Business Sophistication*

Botswana's business sophistication (99) displays strengths in the indicators firms offering formal training (15) and GERD financed by abroad GDP (34). However, business sophistication (99): demonstrates weaknesses in the sub-pillar knowledge absorption (130) and in the indicators patent families (101) and research talent (79). Concurring, one interviewee noted, *'The issue of intellectual property is lacking in discussions pertaining to innovation and innovation ecosystems. However, it is central to obtaining a good innovation ecosystem. So, protecting designs and patent is important in converting to a peer knowledge-based system.'*

- *Linkages in the Innovation Ecosystem*

Linkages among actors and activities were highlighted to be a problem, with an **interviewee** remarking: *'However, we have a really big problem in terms of our linkages in the ecosystem because you will find that there are great activities happening however there is still a siloed approach and mentality towards innovation activities from govt, from private sector, and from academia. The interviewee elaborated further that 'there are all of these great activities happening, but the problem is that these are all happening in silos. I think that through the co-creation platform this is what we have been preaching but unfortunately, they are all happening in silos, we really need to improve on our linkages, and this will assist our knowledge flows to support the innovation process nationally'; before noting, 'there is a UNDP programme assisting one of our ministries, I think it's the Ministry of Gender on the representation of women and gender mainstreaming of policies and laws. However, these are all happening in isolation and the fundamental aspect of the innovation system is having a systematic approach to these companies coming together'.*

Another interviewee noted the *'need to have the support of the industry' as part of ensuring linkages*.

2. Supporting Innovation Ecosystems

Strengths

Botswana evidences the prerequisite stakeholders, essential to developing a functional innovation ecosystem. This includes varied regional and national actors, with minimal involvement of internationals. Regionally, the Southern African Network on Biosciences (SANBIO), The NEPAD initiative, and the Southern Africa Innovation Support Programme (SAIS) funded by the Finnish Government (AIESyS survey). In addition, an AIESyS survey respondent emphasised the critical role of SARIMA and ARIPO for capacity building. One interviewee mentioned tax incentives as a strength, but that there was need for more, *'our main selling point is tax rebates and tax dispensation. However, beyond that, potential international companies are asking what else we offer'*.

Gaps

Among the gaps were the need for **continuous and systemic capacity building to enable a functional national innovation ecosystem**. An interviewee noted, among others that, the need for *'Protection of IP rights for innovators. Access to local & regional markets for products, with a deliberate plan to protect the new entrants in the tech space. Capacity building along the nodes of a functional national innovation ecosystem [also needed]'*. These aspects should also include **building competencies among decision-makers with one interviewee noting:**

'Building competency within those that are making key decision when it comes to innovation because for example, the fourth industrial revolution is a buzzword and everyone is talking about it and referencing it but the truth of the matter is that within our context (developing) you have decision makers being presented with all this information and making decisions at different levels and not just the highest level but also at directorship level where they are expected to know and understand these phenomena but nobody is really giving them the time of day to understand what these are in basic terms and how they relate to us nationally in terms of our agenda'; further elaborating

'So we need to be able to build competencies at various levels of decision-making especially from a government perspective because we need our innovation ecosystem to be responsive even in terms of regulation and I think this is why I am mentioning that regulation is behind and chasing innovation. Where you have a responsive ecosystem in terms of their actors and their roles it makes it more efficient for us as actors to support the innovation and innovators – funding, competencies in terms of regulation and responsiveness, to the efficiency of our local innovation system'.

The need for **appropriate monitoring and evaluation tools for STI activities** was also highlighted as a gap, and that this was a result of inadequacies in the necessary policies and strategies for institutionalisation and implementation of this requirement. One survey respondent noted:

‘Through the design, compilation and management of an M&E tool on the national ecosystem, the Department of Research, Science & Tech (DRST) should be able to be abreast of all national science & engineering activities nationally, thus be able to design & implement necessary policies and strategies for these activities to benefit the country’s progression to a knowledge-based economy. Lack of skilled human resources (the government doesn’t retain skilled labour ... well due to low pay) has negatively impacted on this noble mandate of the DRST (AIESyS Survey March 2021).

One interviewee noted that with the right kind of **prioritisation, and drawing of lessons from other sectors of the economy**, Botswana could have a **‘robust monitoring and evaluation that feeds into the highest level’**. An interviewee further noted.

‘There is an example I always give, we as a county really value farming and we value cattle because it is a big component of our culture and livelihood in terms of our history as a country. Recently there has been a campaign by the Botswana police because there was a rise in stock or cattle theft. The Botswana police then came up with a campaign for the public to give them tip offs. Stealing one goat or cow one gets 10 or 12 years in prison and there has been such a decline because there was such commitment, not only from the policy perspective but from implementation and the law supporting the prosecution of those who were stealing livestock. It has been such a success and I will then say that it can be done in any area, if we have the same investment, the drive and the support ... [for example] when it comes to having equal representation of females in the tech sector. We can do it and we have proven we can do it. If at all we want to achieve this knowledge economy, we need to have this right infrastructure. If we don’t have the government approach, there is always going to be certain bottlenecks at certain levels of the innovation ecosystem’.

Weak linkages between academia/researchers and industry was highlighted as a major and persistent gap by our interviewees. There is need for universities to conduct research that is relevant for the private sector’s needs, and for the private sector to fund universities in order for this to happen. The two sectors have needs and competencies which need to be synergised. An interviewee noted the importance of

‘... involvement of university industry partnerships because we are trying to develop the tech and certain competencies from a private sector perspective and we can only do that when Universities produce value to our private sector and the private sector in return wants these R&D outputs commercialised and are able to feed in through funding back into the research institutions. I think there has been more focus on funding and innovation activities from the youth start-up, but we are really behind when it comes from R&D from academia and institutions’.

Lack of adequate research (R&D) funding was also highlighted, and how this negatively affects the generation and deployment of appropriate and locally-relevant knowledge into the innovation ecosystems. One interviewee emphasised that *‘funding research is key ... because research exponentially contributes and forms a basis to other innovation coming up to the market or providing that knowledge base that*

innovators can use to better develop products and innovative services’. Operational funding was also highlighted as a key issue as currently there was a general ‘lack of resources, recruiting and retaining the skills to run the other hubs’.

Gender imbalance was another major challenge in the Botswana innovation ecosystem, with a 70/30 male:female ratio for leadership and composition of a majority of the youth-led ICT based start-ups (according to one interviewee). Policy implementation needs to happen for this imbalance to be addressed;

- *“Reason being that as a country we have set out a national vision called Vision 2036 and it speaks about achieving a knowledge-based economy and prosperity for all. However, we see a low representation of females within these key areas of technology and innovation and I believe that we are at a crossroad where we can get it right from a policy and implementation perspective but we sort of have to coordinate efforts and define the goal within gender, diversity and inclusivity in terms of our map going forward; ... big need for us to create an enabling environment for young women, girls, female and professionals in the world of work (AIESyS Interview March 2021).*

Infrastructure is also key for operationalising, upscaling and sustaining innovation. Internet connectivity was highlighted as one of the key and basic technological infrastructures needed, in addition to other physical and non-physical infrastructures. *‘We need to go back to the basic infrastructure not just technological, and ask broadly ... do we have the right infrastructure to support innovation? (AIESyS Interview March 2021)*

Political will and policy continuity were also highlighted as areas needing attention. This covered a wide range of issues impacting innovation ecosystems from policy consistency beyond different administrations, having mechanisms to domesticate and embed provisions from regional and international agreements, to cross-sectoral alignment. One interviewee noted, *‘there is an evident misalignment between the different layers of actions or decision making. If decisions from the top does not align with what is happening on the ground or with institutions, that are supposed to implement, then it becomes a problem. Even interactions with a cross-national space are also a problem’.*

3. Facilitation mechanisms

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in Botswana’s innovation ecosystems:

- Provide financial resources to support the national innovation ecosystem
- Facilitate partnerships to support the activities of the ecosystem
- Share expertise and provide training to develop national STI capabilities
- Support the development of robust monitoring and evaluation of STI Policies
- Ensure that innovators intellectual property rights are protected
- Support the development of gender mainstreaming in STI policies

Case study / example

Botswana Innovation Hub

Botswana's Innovation Hub (BIH) is depicted as an innovative and networked organisation that promotes and fosters science, technology, entrepreneurship and commercialisation. This is done through supporting start-ups and existing local companies as well as attracting international companies and institutions to develop and grow competitive technology driven and knowledge-based businesses. BIH vision centres around supporting the national innovation ecosystem to enhance Botswana's competitiveness.

BIH falls under the Ministry of Tertiary Education Research, Science and Technology with a governance structure that accounts for stakeholders from diverse disciplines. As a parastatal of the Government of Botswana, BIH is primarily government-funded, through the Botswana Innovation Fund, with key stakeholders appointed by the Ministry to serve as part of the funds committee members, responsible for overseeing the implementation of the fund.

The **mechanisms** facilitating interactions with BIH include:

- Botswana's Science, Technology and Innovation Policies (STI). This includes the National Development Plan 11 (2017-2023); the National Policy on Research, Science, Technology and Innovation (2011) and Implementation Plan (2012) as well as its Vision 2036 Agenda, that defines the aspirations and goals of Botswana. The presence of such policies and agendas, supplemented by international treaties on STEM has been considered to be a key strength of the Botswana's innovation ecosystem (AIESyS survey).
- Equally, BIH has membership options, in which start-ups and innovators can sign up to be part of a knowledge exchange network and will be able to receive funding via the Hub.
- BIH also makes calls for proposals to innovative entities in the nation. This includes calls for the Indigenous Knowledge Programme, Go-to-Market Programme alongside other regional and international calls including the Southern African Innovation Support (SAIS) programme in Botswana.
- BIH also focuses on identifying and facilitating the location of research and innovation-born enterprises in the hub that will contribute to the economic diversification and technology transfer.

These facilitation mechanisms enabled BIH to address the challenges that the Covid-19 pandemic raised for the nation's innovation ecosystem. They worked with pandemic innovators and provided Covid-19 funding calls used to fund medical devices apps, that linked patient with doctors in rural areas and linking them with the clinic.

Source: <https://www.bih.co.bw/>

Malawi

Summary and recommendations on potential facilitation mechanisms / activities

Malawi exhibits a mixture of government-led/funded as well as stakeholder-led/funded innovation ecosystems and facilitation mechanisms. In Southern African countries, aside from South Africa and Botswana, it has been noted that governments in general play a relatively small role in national innovation ecosystem development; this includes from the policy implementation and governance side, with development of innovation ecosystems primarily being driven by “the private sector” with “no major innovation being achieved from the government perspective.”¹⁵ This is also true from a funding perspective, with lack funding from governments being “a major issue as far as innovation is concerned”.¹⁶

1. Innovation Systems

Strengths

The country has a **National Science and Technology Policy (NSTP)** in place as of 2002, which is implemented by the National Commission for Science and Technology (NCST). The NSTP sets out to:

- “Encourage local scientists and technologists to publish results of their research work in local journals whose publication would be supported by Government;
- Develop science disciplines in the university system that would lead to the establishment of journals specific to those disciplines;
- Establish and strengthen professional associations and societies to enhance discipline-oriented R&D.”¹⁷

There was reference by one of the survey respondents that the ‘government of Malawi had fulfilled its **commitment to spend 1% of GDP on R&D** – one of the highest ratios in Africa – despite being low in real terms¹⁸ --- this was negated by one of our interviewees who mentioned that this commitment has not been met by member states: “Remember that the commitment of the member states of the 1% GDP. We are not yet there.” Meanwhile, Malawi has a **good scientific publication rate**, relative to population size¹⁹.

Development organisations play a strong funding, coordination and catalytic role in the innovation system, particularly “within the agri-space, because Malawi has such a strong agriculture-based economy”²⁰. Feed the Future Innovation Lab, a USAID-led initiative, has had notable impact in Malawi; while in other sectors, the African Drone and Data Academy, a UNICEF-led initiative and Nest360, a Rice

¹⁵ AIESyS Interview March 2021

¹⁶ AIESyS Interview March 2021

¹⁷ <https://www.ncst.mw/wp-content/uploads/2014/03/State-of-ST-Companion-doc.pdf>

¹⁸ <https://en.unesco.org/news/unesco-maps-research-and-innovation-malawi?language=en>

¹⁹ <https://en.unesco.org/news/unesco-maps-research-and-innovation-malawi?language=en>

²⁰ Interview and AIESyS survey

University, USA-led initiative are also playing notable roles in **data and knowledge generation, skills development and networking**.

Gaps

Among the persistent gaps is the fact that Malawi's national innovation **ecosystem is currently fragmented, limiting cohesiveness and the ability of innovators to contribute** to the system. One respondent noted the prevalence of many segregated initiatives, lack of **coordination to represent one cohesive national system** of innovation; "from an innovation perspective there's quite a few things happening, but they're all at the moment very disconnected."²¹ A survey respondent highlighted "**poor system connectedness** - lack of awareness of resources for aspiring innovators, and no pull through or support for potential innovations through the innovation value chain from idea to market" (AIESyS Survey March 2021).

The **regulatory environment** was also said to be **poor particularly from the implementation perspective**. One interviewee noted that "[with regards to a new Intellectual Property Regulatory framework] "They [government] were working on one when I spoke to them about a year ago, and I haven't really seen or heard anything about it. Because obviously if **it's in place but not visible**, people carry on as if it's not there."²² Relatedly, a general lack of government support "in the form of **conducive regulatory and policy environment and funding for early stage development** before private sector interest is one of the gaps" (AIESyS Survey March 2021).

There was also mention of "very **poor visibility of the innovation ecosystem** in Malawi", and that here is "a lot of building of the ecosystem that needs to happen."²³ Many engineering students, for example, "had **no idea where to go** after a certain point in developing an idea, and they didn't know who out there has **expertise and resources to help them**."²⁴ This is not helped by the fact that there's generally a **poor presence of Malawi's innovation actors online**, and it is difficult to find information on innovation activities in general due to "too many silos" and fragmented initiatives.²⁵ When it comes to young STEM graduates, it was highlighted that there is not a strong entrepreneurial mindset, due to the value placed on job security in the culture of Malawi; "there's a lot of fear of failure, and failure is generally seen in a negative context rather than a learning opportunity."²⁶

Lack of **funding for private sector innovation** was also highlighted as a major constraint, exacerbated by the fact that 'some of the start-up enablers (incubators/accelerators etc) have **poor business models**, lack of experienced human resources - business and technical" (AIESyS Survey March 2021). This led to gaps when it comes to **capacity to take innovative ideas to market**, summed up by one respondent: " [no] transfer of inventions from research organisations to industry/market - lack of appropriate research & innovation management skills, lack of

²¹ Interview

²² Interview

²³ Interview

²⁴ Interview

²⁵ Interview

²⁶ Interview

established strong manufacturing industry, no access to appropriate funding - pre-seed, seed etc.” (AIESyS Survey March 2021). This is all couched in the reality that Malawi does not have a strong manufacturing industry, so “there’s always a challenge as to who takes up the technologies or ideas to the market.”²⁷

2. Supporting Innovation Ecosystems

Strengths

Among the strengths in support for innovation ecosystems is the fact that Malawi is member to a range of **regional initiatives or networks that support innovation**, including: African Union, Southern African Development Community, African Technology Policy Studies (ATPS) Network, AfriLabs, IST-Africa, African Regional Intellectual Property Organisation (ARIPO) and AfricanBrains, among others. There is a strong international donor funding community in Malawi. There is recognition that there is “definitely the spirit – **entrepreneurial spirit**” in Malawi, presenting an opportunity to “develop that entrepreneurial mindset” in order to capitalize on the innovative capacity of the population.²⁸ Work is currently being carried out by research institutions such as “University of Malawi, the Polytechnic, and Malawi University of Science and Technology (MUST),” who partnered with Rice 360 (Rice University, USA) “to adopt invention education within their system, essentially to try and encourage this entrepreneurial thinking amongst their students.”²⁹

The existence of many collaborations and partnerships, e.g. with the partners mentioned above, was also resulting, among others, in “**invention education** adoption by the engineering faculties at research organisations in partnership with an international research organisation” (AIESyS Survey March 2021). **Avenues for funding** are also emerging from these collaborations, for example, the Malawi Innovation Challenge Fund (MICF) was (established as an operational tool of the Malawi Government’s Private Sector Development Project (PSDP)), is supported by the UNDP, UK Aid, and KFW, and provides **grant finance for innovative initiatives** in the agricultural, manufacturing and logistics sectors of Malawi.

Gaps

Among the gaps in innovation ecosystem support is how the innovation funding landscape is currently inadequate through **lack of long-term, multi-sectoral and local contributions**. Innovation and entrepreneurship in Malawi are primarily donor-funded, which presents a challenge when it comes to **issues of sustainability**. As one respondent noted, “because Malawi has such a huge donor population”, programs are generally run for approximately 2-3 years before a new, similar program is introduced by a different donor; “there’s this **discontinuity** when projects come and go, and the impact then is very little because there’s **no synergy** across these projects.”³⁰ Lack of access to financing for MSMEs was highlighted as a specific circumstance resulting from this kind of funding landscape³¹.

²⁷ Interview

²⁸ Interview

²⁹ Interview

³⁰ Interview

³¹ <https://unctad.org/news/tanzania-malawi-prepare-reap-benefits-digital-economy>

Poor internet connectivity due to weak infrastructure is a persistent and pervasive challenge. In Malawi there is a low level of internet access and use (15% of the population in 2019)³², “data is expensive”³³, IT skills among the workforce are generally weak³⁴ and there is a low technology adaptation by firms³⁵. Meanwhile, existence of a **poor regulatory environment** was highlighted as an instance of lack of appropriate governance infrastructures for innovation³⁶ and lack government policy support broadly, as one respondent noted, “without government policies to support the ecosystem, many efforts can end up with no results due to lack of this support.” (AIESyS Survey March 2021)

3. Facilitation Mechanisms

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in Malawi’s innovation ecosystems

- Develop a national database on all current initiatives contributing to, or operating within, the national innovation system in order to address knowledge gaps and ensure that interventions are sustainable and add value to the overall ecosystem.
- Integrate the term ‘innovation ecosystem’ in national policy in order for clear objectives to be established.
- Sustainable funding mechanisms for private sector R&D.
- Encourage local buy-in/ local ownership (including by government, private sector, communities) over innovation ecosystem interventions to ensure sustainability of impact.
- Establish a new national innovation system strategy/ policy framework.
- Establish a coordinating body/ coordination mechanisms to ensure synergy across innovation system interventions and actors.
- Strengthen national infrastructure (physical and technological) - in particular must develop ICT infrastructure and increase technology adoption i.e. internet and phone use.
- Improve regulatory environment – less ‘red tape’ to encourage the emergence of new companies and initiatives.
- Monitor and assess progress on educational reforms.
- Better financing for MSMEs.
- Leadership development, addressing corruption, developing a local manufacturing industry, local value-addition of primary products will address some of the challenges.” (AIESyS Survey 2021)
- Aid in the establishment of a regional market/open market in SSA to advance the potential of businesses scaling and growing beyond national borders.

³² <https://datareportal.com/reports/digital-2020-malawi#:~:text=There%20were%202.81%20million%20internet,at%2015%25%20in%20January%202020>

³³ Interview

³⁴ <https://unctad.org/news/tanzania-malawi-prepare-reap-benefits-digital-economy>

³⁵ <https://unctad.org/news/tanzania-malawi-prepare-reap-benefits-digital-economy>

³⁶ <https://unctad.org/news/tanzania-malawi-prepare-reap-benefits-digital-economy>

Case study / example**Feed the Future Innovation Lab, USAID**

The Feed the Future Innovation Lab is led by the United States Government Global Hunger and Food Security Initiative, which is an initiative of USAID. This program, which focuses on “fostering smart, quality growth of groundnuts”¹ has been reported as one example of a highly impactful innovation initiative in Malawi. Successful and meaningful outcomes of this initiative include the introduction of a “Peanut Buying Point in a Box” kit through a joint initiative between the Feed the Future Innovation Lab and partners, including American innovators.¹ The aim of this kit is to increase the quality of peanut produce by providing farmers with mechanisms to combat aflatoxin levels.¹ Prior to the introduction of this innovation, aflatoxin in peanuts due to poor storage was one of the key challenges for Malawi’s agricultural sector, as “you can’t then export that crop.”¹ This is an example of a donor-led program that targeted an existing need, with a simple technology that can be easily adopted and used by local farmers. It is innovation projects like this that have a meaningful and sustainable impact on the ground, and “are definitely examples you can learn from.”¹

Source: [Feed The Future](#)

Namibia

Summary and recommendations on potential facilitation mechanisms / activities

Namibia exhibits a mixture of government-led/funded as well as stakeholder-led/funded innovation ecosystems and facilitation mechanisms. Nevertheless, innovation and entrepreneurial ecosystems do not really exist outside the higher education system due to reasons including a lack of policy instruments incentivising such activities and the inaccessibility of seed funding. The uptake of innovations at large scales is also a challenge due to poor infrastructure.

These challenges can be overcome through capacity-building for digital skills, coordination and governance in the public sector as well as improving capacities in policy design and implementation. The country would benefit from policies and policy instruments aimed at promoting demand for R&D and innovation, improving the accessibility of funding, and strengthening the links between academia and industry. Promoting participation in more regional innovation programmes would also increase access to different funding opportunities as well as access to support and larger markets.

1. Innovation Systems

Strengths

The strengths of Namibia's innovation ecosystems lie in digital health systems, with **ICT infrastructure, strategy documents and plans** being put in place towards an **institutional digital health information systems ecosystem**. There is an emphasis put on improving ICT infrastructure, promoting their use and integrating them in different sectors on various policy and strategy documents. If bottlenecks, such as human capital and infrastructure can be resolved, digitalising components of different sectors will greatly contribute towards **creating and maintaining a conducive environment for innovation** in the country. In line with this thrust, the country has relatively **high spending on health and education**.

The existence of an agency, the **National Commission on Research, Science and technology (NCRST)**, for STI **policy formulation, coordination and regulation** is another key strength of Namibia's ecosystem. There is a dedicated National Research, Science and Technology Fund, administered by NCRST to support STI activities. Meanwhile, the government funds and supports innovation through Namibia University of Science and Technology which accommodates innovative labs, a centre for enterprise development, a tech innovation lab and an institute for business innovation. Having these within an academic institution creates opportunities for current students or recent graduates to pursue innovative activities with support and guidance as well as academic input when necessary.

Gaps

Although Namibia has developed a number of policy frameworks and plans to address various challenges surrounding science, technology and innovation, its National Policy

on Research, Science and Technology 1999 (NPRST) focuses on **linear linkages between R&D and innovation**, and does not include a clear conceptual framework for a national innovation system. The NPRST was formulated in 1999, and the goals set in this policy are still not achieved, indicating **low capacities in policy implementation**. The research and innovation strategies set in the National Development Plan 5 do not outline any specific policy instruments to reach the desired outcomes. This indicates that poor policy implementation is likely to be driven by **poor capabilities in designing policy instruments**.

The country also faces the problem of a **weak workforce** not just for the institutional digital health information ecosystem agenda, but across other facets of the economy. For instance, the overall weak workforce manifests itself in the shortage of skilled technical personnel within Ministries leading to poor implementation of innovations, such as the adoption of institutional digital health information systems, which results in the duplication of efforts due to qualified staff having to quality check³⁷. In fact, on GII 2020³⁸, Namibia scores the worst in the “human capital & research” pillar ranking 115th out of 130 countries. Its tertiary education was found to be especially weak for its income group.

There are also **broader governance challenges** which lead to the duplication of efforts and poor implementation of innovations at larger scales due to issues related to disintegration. In the case of institutional digital health information systems, a **lack of coordination between ministries and donors** leads to duplication between vertical and horizontal programmes as donors are usually interested in specific issues³⁹. Lack of clear **frameworks and guidance to drive integration** leads to a lack of understanding of “why” and “how” to implement innovations within sectors. Finally, inadequate standardisation following the adoption of an innovation at a small scale results in incompatibility at a larger scale, as well as causing duplication, which negatively impacts the uptake of innovations at larger scale by different stakeholders. Below are some reflections from our primary data on these issues:

“There is fragmentation: resource-rich programmes such as the institutional digital health information systems ecosystem, are pushing their own agenda (AIESyS Survey March 2021 Respondent), with further emphasis that in modernising the health sector ... the sector work in isolation is not open to new way of doing things.”

Another manifestation of fragmentation is that **linkages between academia and industry are weak**. For instance, although the Namibia University of Science and Technology accommodates the Namibia Business Innovation Centre, and the Inclusive and Collaborative Local tech Innovation Hub, the partnerships that emerge to execute projects do not have many actors from the Namibian private sector. This hinders the targeting of **R&D agendas at the needs and priorities** of the private sector as well as improving the numbers of R&D personnel in the business sector. Currently, only 7% of R&D personnel works in the business sector⁴⁰. Investment in R&D activities is concentrated mainly in the government and higher education, while

³⁷ <https://www.ajol.info/index.php/ejhd/article/view/182590>

³⁸ https://www.wipo.int/global_innovation_index/en/2020/

³⁹ <https://www.ajol.info/index.php/ejhd/article/view/182590>

⁴⁰ https://au.int/sites/default/files/documents/38122-doc-aio_3rd_edition_final_eng_repro.pdf

such activities are low in the business and private non-profit sector, only accounting for 11% and 8% of GERD respectively⁴¹. Businesses also do not invest much in their own R&D activities nor do they get funded from external sources⁴².

2. Supporting Innovation Ecosystems

Strengths

Among the favourable factors for innovation ecosystems in Namibia is the presence of **multiple actors in the arena, providing opportunities for co-learning and lesson drawing**. The country also has access to local and international models and knowledge bases. For example, the Southern Africa Innovation Support (SAIS) programme's management office is in Windhoek and the NCRST is a strategic implementing partner.

Namibia's Industrial Policy **recognises the need for training and development programmes** for SME entrepreneurs as well as the promotion of knowledge partnerships and links between education, business, research and innovation. In line with this, Namibia University of Science and Technology offers a "Bachelor of Entrepreneurship", The Ministry of Industrialization, Trade and SME Development has launched a "Entrepreneurship Capacity-Building Programme" and the University of Namibia has a "Business School".

Gaps

Among the gaps in innovation ecosystem support is the fact that the **number of innovation hubs is very low** and there isn't an established ecosystem outside the innovation cluster situated in the Namibia University of Science and Technology.

"There is need to support Innovation Hubs mostly financial support. Although capacities in terms of improving their programmes is also key. In addition, research in this sector is evidently not available, hence it is difficult to work in this sector in Southern Africa." (AIESyS Survey Respondent)

Meanwhile, despite a policy focus on ICT, the tech industry is still behind compared to other African countries. The Namibian economy have **very low numbers of tech companies** providing services in different sectors. One of the main reasons for this is the inaccessibility of funding for start-ups from the formal financial institutions while, as one respondent noted,

"Local VC funds are anachronistic typically looking to fund companies with proven track records and tangible assets. Digital intangible assets and start-ups are poorly understood from a valuation perspective and deemed high risk." (AIESyS Survey Respondent).

The country also still does not have an **established and coherent entrepreneurial ecosystem yet**. Although Namibia's Industrial Policy puts emphasis on entrepreneurship, the policy instruments and regulations that would incentivise and facilitate entrepreneurial activities are still not well formulated or implemented,

⁴¹ https://au.int/sites/default/files/documents/38122-doc-aio_3rd_edition_final_eng_repro.pdf

⁴² https://au.int/sites/default/files/documents/38122-doc-aio_3rd_edition_final_eng_repro.pdf

preventing the emergence of an ecosystem with different actors funding, supporting and connecting start-ups. As one respondent noted;

“The policy issues in Namibia (e.g. there is no policy for start-ups) The research component is non-existent, no incentive for this sector in particular” (AIESyS Survey Respondent).

And another echoed:

“In our country: (1) Political will for the Innovation Ecosystem to work smoothly ... there should be political will among the law makers (2) Systems and institutions should be designed in a way that supports innovative activities (3). Talent and good Ideas should be recognized and be supported to succeed within the country and world at large (4) Policies should be developed to enable the innovation ecosystem to function very well” (AIESyS Survey Respondent).

Meanwhile, **poor infrastructure**, such as a lack of computer equipment and limited internet connectivity was said to be a consistent challenge to the uptake of innovations at large scale. On the Global Innovation Index (GII) 2020⁴³, Namibia’s “infrastructure” was found to be poor compared to its income group, with its general infrastructure being especially weak.

3. Facilitation Mechanisms

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in Namibia’s innovation ecosystems

- Capacity-building support for the existing hubs and labs and promotion of ecosystem building hubs.
- Assist policymakers in formulating a new ecosystem building innovation policy that does not mostly focus on the supply side of R&D but also promote the demand for R&D and innovation.
- Support the public and private sector in designing tools and products that increase the accessibility of funding for entrepreneurial and innovative activities. These could be micro-finance products, competitive or conditional funding opportunities, and incentives for private investment.
 - *“Continued funding support by funding governments. Should the start-ups supported prove successful, it will encourage more entrepreneurship endeavours.” (AIESyS Survey Respondent)*
 - *“Keep fund and supporting them as they embark in delivering their mission and objectives” (AIESyS Survey Respondent)*
 - *“Seed Funding to Start-ups” (AIESyS Survey Respondent)*
- Support regional programmes which provide access to larger and more diverse markets to improve accessibility to different funding opportunities, more sophisticated support mechanisms and exposure to more powerful actors that can help with the scaling of innovations and small businesses.
 - *“Government should be enabler of innovation through creation of enabling environment for private, academic, NGO/CBO and individuals to drive*

⁴³ https://www.wipo.int/global_innovation_index/en/2020/

innovation. Databasing good practices create a working innovation ecosystem. Funding through invitation calls create new programmes and products for the ecosystem. Regional programmes benefit innovation ecosystem for lessor markets like Namibia” (AIESyS Survey)

- Strengthen the links between academia and industry by fostering collaborations between the two. This can be done by providing conditional funding to private sector to be used for knowledge or technology transfer from academia or supporting the STI and entrepreneurship-related activities of Namibia’s two large universities. Universities can also be provided with funding dedicated for collaboration with industrial firms.
- Strengthen collaboration between horizontal and vertical programmes that support STI to address the integration challenges.
- Strengthen the governance capabilities of the public sector with regards to adoption and scaling of innovations. Assisting policymakers in defining clear structures, roles, and functions in the context of adopting an innovation within the public sector would be especially beneficial.
- Deliver capacity building projects in the public sector to improve digital skills.

Case study / Example

Inclusive and Collaborative Local Tech Innovation Hub

Inclusive and Collaborative Local Tech Innovation Hub is the only tech innovation hub in Namibia. Their goal is to bring people and resources together to develop ICT innovations while also supporting people from marginalised backgrounds by building their skills and ensuring that they get a fair return on their contribution. The hub works with several stakeholders including private sector companies, parastatals, government entities, international and local NGOs, communities and innovators. The projects supported by the Hub have a social value and purpose such as the Homeless Application Project, People’s Primary School interactive tech library and a mobile app to address GBV, sexual health & HIV/AIDS. The Hub supports innovators through events for networking, mentorship, talent scouting and provision of investment and funding opportunities.

The Hub itself is a project by the Faculty of Computing and Informatics at the Namibia University of Science and technology (NUST) and was established with a two year seed funding by the Finnish Embassy in Namibia between 2017 and 2019. However, they want to be a self-sustaining entity to be able to keep on providing inclusive innovation services in Namibia and beyond, and therefore they need to find a more sustainable financial model than donations and grants. Moreover, the Hub currently doesn’t provide a physical working space and only functions as a network despite being situated within the innovation cluster at NUST. Unless these bottlenecks are addressed, the Hub is unlikely to survive, improve its services and further contribute to the innovation ecosystem in Namibia.

Source: <https://ictechhub.com/>

South Africa

Summary and recommendations on potential facilitation mechanisms / activities

South Africa exhibits an extensive and diversified mix of government-led/funded as well as stakeholder-led/funded innovation ecosystems and facilitation mechanisms. Private sector, NGOs, partnership support, and international support were marked as facilitators of the innovation ecosystem by various respondents. This dynamic environment has resulted in South Africa ranking 14th among the 37 upper middle-income group economies and 2nd among 26 economies in SSA. Moreover, compared to other economies in SSA, South Africa performs above average in all seven GII pillars.

The South African Business Innovation Survey, 2014-2016 highlighted that innovation was pervasive across all sectors, but especially in engineering and tech, manufacturing, and trade. More than two thirds (69.9%) of South African businesses were innovation-active, meaning that they took some scientific, technological, organisational, financial, or commercial steps towards the implementation of an innovation. They engaged in the four types of innovation measured in almost equal shares: product innovation (48.2%), organisational innovation (42.0%), marketing innovation (41.7%), and process innovation (34.6%)(HSRC, Department of Science and Innovation, and Department of Statistics 2020).

South Africa's Bioeconomy has been identified as a priority area for development in South Africa since the publication by the then Department of Science and Technology (DST) (which became the Department of Science and Innovation (DSI) in 2019) of the National Biotechnology Strategy (DST 2001), and the National Research and Development Strategy (DST 2002). These were followed by the 10-year Innovation Plan (DST 2008), which states that 'over the next decade South Africa must work to become a world leader in biotechnology' and, more recently, by the Bio-economy Strategy (DST 2013), which seeks to incorporate all sectors in the South African economy. Recent developments include the 2019 White Paper on ST&I⁴⁴ which identifies the 4th Industrial revolution and ST&I as key economic drivers; and on-going work by the DSI on a new decadal plan as part of the country's ST&I foresight process⁴⁵

1. Innovation Systems

Strengths

South Africa's innovation system boasts many strengths, among which are the following:

GII strengths for South Africa are found in six of the seven GII pillars: Institutions (55): the indicator Cost of redundancy dismissal (25) is a strength. Human capital &

⁴⁴

https://www.dst.gov.za/images/2019/WHITE_PAPER_ON_SCIENCE_AND_TECHNOLOGY_web.pdf

⁴⁵ <http://www.naci.org.za/STIForesight2018/>

research (70): the indicator Expenditure on education (13) is a strength. South Africa ranks 35th globally according to the quality of universities metric, with the University of Cape Town placing among the top 200 highest ranking universities in the world.

South Africa allocates a larger share of its GDP to the public funding of primary, secondary and post-school education and training than many comparative countries. However, while the literacy rate has risen and a much larger number of youths are gaining access to secondary education, very few attain tertiary education.

Market sophistication (15): has strengths in the sub-pillar Investment (14) and in the indicators Domestic credit to private sector (9), Ease of protecting minority investors (13), Market capitalization (1) and Domestic market scale (30). South Africa also has the most sophisticated financial market on the continent. South African start-ups benefit from the relatively mature status of the local ecosystem, which has active investors at most stages of the start-up lifecycle. Early-stage is well covered by an active angel investment scene incorporating a relatively high number of groups and individuals, as well as early-stage funds like E4E Africa. The “middle”, meanwhile, is accommodated by scale-up funds like Knife Capital, Kalon Venture Partners and CRE Venture Capital.

The total deal size for VC funding in 2020 in South African was \$156 (3rd after Kenya and Nigeria). However, South Africa came in 2nd by deal count with 32 deals in 2020. Moreover, SA was the 3rd highest destination for pre-seed and seed venture capital after Egypt and Nigeria (>\$56m; makes up 66% of VC funding in Africa) and top destination for series A (>200m; 23% of VC funding) and series D (>\$95m; 2% of VC funding) (Start-up list Africa 2020).

Business sophistication (50): shows strengths in the indicators University/industry research collaboration (30) and Intellectual property payments (13) Patents in force increased rapidly between 2013-19 from 54,220 to 76,936. On average there were 707.6 patent application from South African residents between 2013 and 2019 There was also a lot of patent application from non-residents and those abroad during the same time period, 6,492.9 and 1,256.5 respectively. It should be noted that there was a 13.7% decline in the number of patent applications from residents in 2018 to 2019. Data: (WIPO, 2020)

NOTE: When looking at South Africa’s IP payments it is important be aware of the nuances and the context and how this impacts the larger innovation system. Fix the Patent Laws Coalition has provided key insight into how SA’s patent regime is damaging to society at large. In their 2019 policy report⁴⁶, PLC flagged that South Africa’s intellectual property framework is heavily slanted in favour of large foreign pharmaceutical companies and against domestic industry and patients because many patents granted in South Africa are rejected in other countries for failing to meet patentability criteria - the criteria of novelty, inventiveness and usefulness, which are required for a patent to be granted (Fix the Patent Laws Campaign 2019).

⁴⁶ http://section27.org.za/wp-content/uploads/2019/11/Economic-Paper_Mythbusters_I.pdf
[Accessed:22.04.2021]

“The issue of mobile-phone money transfer has not taken off in South Africa as is the case elsewhere in Africa. This is largely because the **country has a fairly advanced banking system that is accessible to the majority of citizens**. However, there has been innovations in this space i.e. Cellphone banking that has seen banks closing some of their in-house banking services opting for online services i.e. international money transfers” (AIESyS survey).

Knowledge & technology outputs (62): the indicator New businesses (13) is a strength In the context of **COVID-19, South Africa has been keeping up with the international research**. According to the Activity Index, which characterises the relative research effort a country devotes to a given field of study, showed that South Africa produced 44 COVID-related publications in comparison to 5,410 publications globally, achieving an Activity Index is 1.01. An Activity Index of 1 indicates that the country’s research effort in the given field corresponds precisely to the world average. This is a sentiment that was echoed in our SA interview regarding how SA institutions, including HSRC, rapidly mobilised to support government policy and COVID-related innovation. This is particularly important from the South African perspective, where nearly 1.6 million people were infected with COVID-19 (as of 19 April, 2021⁴⁷), the highest infection rate on the continent. An estimated 2.5million small enterprises were also ordered to close due to lockdown, which is particularly significant given that SMEs contributed to 40% of GDP (Allen Mutono 2020). As of June 2020, there were more than 90 innovations directed at COVID-19 from South Africa alone (Bank, 2020).

Creative outputs (70): the indicator Global brand value (22) is a strength.

Gaps

Among the gaps in the innovation system are the following:

GII weaknesses for South Africa are found in all seven of the GII pillars: Institutions (55): exhibits weaknesses in the indicators Political and operational stability (92) and Ease of starting a business (107). During this same period, in which the Zuma administration ironically also created a Ministry for Small Business Development, the country experienced a precipitous decline in its international ranking on the World Bank’s Ease of Doing Business Index. In 2018, the country was ranked 82 out of 190 countries globally, compared to 32nd place in 2008. In terms of the most recent WB ratings, it has ranked particularly weakly in terms of the ability to start a new business (139th). It has however continued to score well in areas such as the protection of minority investor (13th) and the payment of taxes (54th) (World Bank Group, n.d.).

Human capital & research (70): has weaknesses in the sub-pillar Tertiary education (96) and in the indicators Pupil–teacher ratio (115) and Tertiary enrolment (91) The system’s dropout rate between the first year of schooling and the final grade of secondary education (60%) is exceptionally high. Schools that perform well are typically privately run or high-fee public schools in white neighbourhoods (The BTI Transformation Index, n.d.).

⁴⁷ <https://www.statista.com/statistics/1107993/coronavirus-cases-in-south-africa/>

Infrastructure (79): displays weaknesses in the indicator's Gross capital formation (112) and GDP per unit of energy use (109). Market sophistication (15): the indicator Microfinance gross loans (69) is a weakness. Business sophistication (50): the indicator FDI net inflows (112) is a weakness. Knowledge & technology outputs (62): the indicator Growth rate per worker (101) is a weakness Creative outputs (70): the indicator National feature films (98) is a weakness.

Bio-Tech: The National Biotechnology Strategy (2001) proposed the creation of biotechnology innovation centres (BICs), each of which should be associated with an incubator. Following its publication, three BICs were established, including BioPAD (covering the Pretoria/Johannesburg region) EcoBio (Kwazulu Natal) and Cape Biotech (covering the Western Cape region). In 2010, the BICs were incorporated the Technology Innovation Agency (TIA). The merging of pre-existing entities proved to be a challenge. Each entity had its own mandate and its own legal, structural and organizational background, resulting in conflict and infighting in the new organization.

“Science, as a foundational concept in culture, is not well established as it is relatively new and often associated with colonialism and exploitation. This will obviously take a lot of time to address, but shortcuts can be made, for example, through linking traditional knowledge systems with science” (AIESyS Survey)

Given South Africa's **long history of racial discrimination and the resulting impact on the distribution of economic resources, the country continues to be afflicted by high levels of discrimination and inequality** in the delivery of key resources, such as education. Moreover, “policy and institutional choices over the past 15 years have skewed the innovation system towards science, engineering and technology for the middle-class and upper middle-class parts of the economy and society” (Rasigan Maharajh, n.d.). The isolation brought on by ignited domestic-driven innovation by white SA, while the black majority was relegated to the fringe of South African society and being excluded from science and technology. The challenge for the post-apartheid SA (1994) was to reform the STI apparatus it inherited. In 1996, the ANC published a white paper stating that “the stimulation of a national system of innovation will be central to the empowerment of all South Africans as they seek to achieve social, political, economic and environmental goals.” (David Pilling, 2019). Meanwhile, the National Development Plan and Vision 2030 identifies the high domestic cost of broadband internet connectivity as an obstacle to STI.

2. Supporting Innovation Ecosystems

Strengths

Regarding support for innovation ecosystems, the following strengths were noted:

- **South Africa's commitment to its economy**

There are several state-run initiatives that can assist in expanding the incubation support available in South Africa, either by providing finance or helping out with advice. These include the Incubation Support Programme (ISP), the Small Enterprise Development Agency's (SEDA) Technology Programme (also known as STP) and the Small Enterprise Fund Agency (SEFA) (DTI, 2014). The ISP co-funds the establishment of new incubators in partnership with the private sector, as well as the

expansion of existing incubators. Support lasts for three years and amounts to R10 million per financial year. The ISP is an initiative of the then Department of Trade and Industry (the DTI) (now known as the Department of Trade Industry and Competition (the dtic), and a sub-programme of the Enterprise Investment Programme (EIP).

The STP is a programme of the dtic that aims to stimulate economic growth and development through a focus on technology-based business incubation. There are currently 42 STP incubators in the country operating across the biotechnology, mining, agro-processing, construction, jewellery, automotive, metals and renewable energy sectors. The STP aims to provide technology-transfer services to small enterprises and technology support to women-owned enterprises. The STP offers financial assistance in the form of a non-repayable grant of up to R600, 000 for programmes aimed at providing technology transfer to SMEs, particularly those that are women-owned.

SEFA provides direct loans to SMEs and co-operatives ranging from R50 000 to R5 million, as well as facilities (debt/equity) to intermediaries, joint ventures and partnerships to encourage on-lending to these SMEs and co-operatives.

Other funding agencies, programmes and incentives include the: National Empowerment Fund (NEF), Industrial Development Corporation (IDC), Black Business Supplier Development Programme, ISIVANDE Women's Fund, Support Programme for Industrial Innovation, Technology and Human Resources For Industry Program (THRIP), Technology Innovation Agency (TIA), and an R&D tax incentives scheme (administered through the DSI and SA Revenue Services (SARS): The section 11D Research and Development (R&D) tax incentive was introduced into the Income Tax Act, in 2006 to replace the previous R&D rule that existed in terms of section 11B. Section 11D now allows: (1) a deduction equal to 150% of expenditure incurred directly for R&D and (2) an accelerated depreciation deduction (that is, 50:30:20) for capital expenditure incurred on machinery or plant used for R&D.

Meanwhile, our survey respondents and document reviews highlighted a number of mechanisms and/or programmes that support cross-border innovation partnerships, among them:

- SANBio (Southern African Network for BioSciences)
- SADC Industrialization Strategy
- UK-South Africa Tech Hubs (also located in Kenya and Nigeria)
- The Council for Scientific and Industrial Research (CSIR) was commissioned to map connectivity in the country, a useful exercise critical to any government planning. They had mapped networks in 2013 for SA Connect on the basis of confidential data from operators, which had found that 90% people were geographically located within 10 km from a POP (point of presence – re: network connectivity). Updating the fibre and mobile networks could potentially fill an important information gap in trying to identify evidence-based policy intervention on infrastructure needs. (National Planning Commission 2020)
- **Bio-technology**

The 2001 National Biotechnology Strategy proposed the creation of biotechnology innovation centres (BICs), each of which should be associated with an incubator. Following its publication, a number of BICs were established, including BioPAD

(covering the Pretoria/Johannesburg region) and Cape Biotech (covering the Western Cape region). In 2010 the BICs were incorporated into the Technology Innovation Agency (TIA). The Cape Town-based Centre for Proteomic and Genomic Research (CPGR) was established, initially funded through the BICS and then TIA to provide support and services to South Africa's life science and biotech communities. In 2018, the CPGR entered a partnership with the Cape Innovation and Technology Initiative (CiTi) to create OneBio, a pan-African biotech incubator that will help bioentrepreneurs from across the continent commercialise and scale biotech start-ups.

TIA's Medical Device and Diagnostic Technology Innovation Cluster Programme (Med3ic) facilitates industry development through networking and stakeholder coordination. Med3ic is a knowledge and innovation integrator, helping to grow the industry by identifying key gaps and/or market failures, and partnering in the establishment of new services and infrastructure. Med3ic is also linked with the Global Health Innovation Accelerator established by the South African Medical Research Council (SAMRC) and the DSI and administered by the Strategic Health Innovation Partnership at the SAMRC. The programme offers extensive mentoring, training, access to investors, opportunities to showcase innovations to the media and the market, and a chance to access financial support for further technology development funding via the Agency's various other funding programmes and initiatives:

- Youth Technology Innovation Programme (YTIP)
- Seed Fund
- Technology Development Fund (TDF)
- Technology Commercialisation Development Fund (PCSF)
- Access to technology development infrastructure and expertise at tech. stations and platforms
- Access to CSIR Programmable Logic Controllers (PLC) software and training

Gaps

Among the gaps in innovation ecosystem support are the following:

Collaboration, sharing and interaction are key characteristics of an innovating country. Most of the case studies reveal that even when the research offers commercial potential, the success rate is limited by factors linked to the interrelationships between the participants in the process. Whether this breakdown results from a lack of entrepreneurial or business skills, internal competition as opposed to collaboration, or misalignment with markets, if these aspects are not understood and improvements made, the NSI will struggle to achieve the goals originally set. In fact, only 20.8% of innovation-active businesses reported collaboration activities as part of the development of their innovations. The most widely reported reasons to collaborate were accessing information, accessing R&D, accessing expertise, cost sharing, and accessing new markets (HSRC, DSI, and Department of Statistics 2020).

Barriers that innovation-active businesses identified as most important included:

- lack of funds from within the business or business group (31.5%) or from external sources (25.0%);
- the excessive cost of innovation (22.5%);
- lack of credit or private equity (24.8%);

- difficulty in accessing government grants (21.5%);
- uncertainty about demand for innovations (19.3%);
- market competition (16.4%);
- and lack of customer demand (8.6%).

Meanwhile, lack of “equipment and (usually) academic expertise”; domination by government, among others, were highlighted by one of our survey respondents as a key gap. (AIESyS Survey), resulting in some failures.

- **Failure example:** “Algal biodiesel technology - initiation costs too high, and thus despite probable viable opportunity, the opportunity cost for other investment projects was too high, and thus it was not realised.” (AIESyS Survey)
- “Govt has too strong a role in directing (paying for) innovation, based on govt needs. Not enough incentivization for industry to guide activities - not least because of the distrust govt has for industry.” (AIESyS Survey)
- “Public and private sector partnership are vital. In SA this remains a challenge, as the distortions created though Black Economic Empowerment affect sound business choices. Academics with good ideas cannot drive innovation - entrepreneurs are vital.” (AIESyS Survey)
- “There is this issue that country compete and use the term we want to protect our territorial sovereignty...I have seen people not warming up to ideas that have been brought in from South Africa because they are afraid that they will lose their sovereignty. Equally, I have seen things that can be pushed well from other neighbouring countries but if they don't get currency from SA, Kenya and to some extent Egypt and Nigeria no matter how good they are. There is a big issue of losing sovereignty and they fear Big Brother” (AIESyS Interview)

3. Facilitation Mechanisms

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in South Africa's innovation ecosystems

- **Regulations regarding new bioproducts**, and the mechanisms and bodies responsible for the enforcement of these regulations, should be reviewed to ensure that they are up to date and take new technological innovation into account, including but not limited to:
 - The Genetically Modified Organisms Act, 1997
 - The Medicines and Related Substances Control Act, 1965
 - National Environmental Management: Biodiversity Act, 2004
 - The National Health Act, 2003
 - The Intellectual Property Rights from Publicly Financed Research and Development Act, 2008
 - The Currency and Exchanges Act, 1933
 - The Consumer Protection Act, 2008
- **Promote and improve industry/university collaboration**
 - Establish strong relationships with key universities and research institutions in the region and promote the training of staff and students across different disciplines because the socio-economic aspects of technologies are as important as the science. An interview revealed the

importance of social sciences into tech and innovation for example, South Africa has been able to begin addressing vaccine hesitance and adapting government communications because of the work done by the Human Sciences Research Council (HSRC).

- **Deploy resources at District/Local Municipalities. Currently, South African Local Government Association (SALGA) has identified 4 local municipalities, for proof of concept.**
 - *Use the Gender lens for policy and verification of the key expected outcomes (AIESyS Survey)*
 - *“Further value chain assessments, identifying weaknesses or gaps, and the means of addressing them.” (AIESyS Survey)*
 - *“Coordinating activities around a focus” (AIESyS Survey)*
- Partnerships - providing global partnerships has been a massive value add for the ecosystem, i.e. Cape Town/Stockholm partnership formed by Business Sweden, Wesgro, City of Cape Town and Siliconcape. Access to funding - through empowering new angel investors, i.e. through the UK-South Africa Tech hub programme for South African, Kenyan and Nigerian investors. (AIESyS Survey)
- Countries that have substantially expanded their R&D activities often achieve higher GDP growth, as is the case for South Korea, Finland, Spain, and Austria. AIESyS Survey respondent suggested learning from best practices from such countries.
- Update all existing education-related policies and regulatory frameworks to be aligned with the requirements and skills needed for broad spectrum innovation.
- Demystify Innovation as a concept⁴⁸

“Illuminating conversation surrounding the [narrow] definition of innovation and what it means in the South African context during one of our interviews, provided an insight that is applicable to each country (i.e. a similar message was expressed in interviews in Botswana and Nigeria). Essentially, if we refer to the “Oslo Manual” (OECD, 2005) [broader] definition of innovation - innovation entails the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations(DSI and The Academy of Science of South Africa (ASSAf 2013)- this will allow people to capture non-ICT or tech driven innovations that affect the bottom of the pyramid: “We are all looking to be the next Bill Gates or Elon Musk but there are a lot of things and I am very inspired by bottom of the pyramid. I was driving out this weekend in rural Pretoria and people were innovating and making bricks for people in construction sites. It is an innovation to that place. They have never seen somebody moulding bricks and now they have got someone who knows”. “We have been driven by what I call a misunderstanding especially when people talk about 4IR they believe that everything will be automated...We don’t look at innovation as a continuum but instead ‘specifics’...I think that the South African innovation system is moving towards narrow views of innovation, indeed the entire Africa especially amongst what we call the elites. We are not capturing the masses. People are innovating in a way that is interesting” The interviewee used remittance as an example: “We have loads of people here in South Africa that are not from here and they need to send money home. [they can be charged] up to 20% there are so [many] informal ways of sending money right now that will charge you”

⁴⁸ Quotation box above

(AIESyS, 2021 interview quotes)."

Case study / example

Cape Town / Western Cape

Cape Town is one of the biggest tech and innovation ecosystems on the continent and the largest in South Africa. It is home to 60% of South African start-ups, one of the largest open access fibre networks in Africa and hosts the oldest tech incubator on the continent, Cape Innovation & Technology (WESGRO 2019). As part of its Integrated Development Plan 2017-2022, the City of Cape Town has identified innovation and data as drivers for growth and sustainability. They launched a Data Strategy in 2019.

Cape Town does not have a formal innovation strategy but public, private and international actors work closely together to foster innovation. Cape Town has developed partnerships to promote innovation capacity with other public agencies, private firms and NGOs.

Key ecosystem enablers

Public & Private Companies Enabling the Tech Sector

- WESGRO: the official tourism, trade and investment promotion
- Western Cape Government
- Invest Cape Town
- City of Cape Town
- Cape Innovation & Technology Initiative
- CiTi is home to BioCiti Labs, Africa's first Biotech Incubator Programme (inaugurated in 2019)
- OneBio Immersion Bootcamp

Funders include:

- Cape Innovation & Technology Initiative (CiTi)
- Centre for Proteomic and Genomic Research (CPGR)
- The Southern African Innovative Support (SAIS) (funded in SA by the governments of South Africa and Finland)
- Small Enterprise Development Agency (SEDA).
- The BioCiTi is being run in partnership with:
 - ✓ The Cape Innovation & Technology Initiative (CiTi) is a non-profit company with a vision to build a future-fit, inclusive society through innovation and technology. CiTi is the oldest known incubator in Africa and celebrates 20 years of existence this year
 - ✓ OneBio is an early-stage biotech investment fund
- The TechVillage is an innovation hub that helps entrepreneurs turn their ideas into sustainable businesses and, through the same process, enables corporates and other ecosystem partners to leverage innovation

Silicon Cape

- Silicon Cape is a non-profit organisation and an ecosystem enabler for tech-enabled start-ups in the boarder Cape Region of South Africa founded in October 2009
- Silicon Cape is a hub for tech entrepreneurs, developers, creatives, angel investors, and VC's. Through paid membership start-ups gain curated access to the ecosystem along with online resources, pitching support, and advocacy. Its community had grown to boast some 10,000 members.
- Naspers: The South African company, headquartered in Cape Town, is now recognised as one of the 10 largest tech investors in the world.
- Cape Town / Stockholm Connect (CSC) is a platform that will bring together companies, developers, customers, investors, entrepreneurs, and institutions from across South Africa and Sweden (launched Feb 2019)
- La French Tech: start-up ecosystem launched in 2016. It is backed by the French government and developed in partnership with the Small Enterprise Development Agency (SEDA) and the Technology Innovation Agency (TIA) to deploy capital mainly to underprivileged entrepreneurs in the Cape Town area.

Infrastructure

- Internet penetration of 63% and 715 free WiFi Zones
- 20+ Local International Accelerators and 25+ Co-Working Spaces, including, among others:
 - ✓ Khayelitsha Bandwidth Barn
 - ✓ Woodstock Bandwidth Barn
 - ✓ Rise Cape Town
 - ✓ Workshop 17
 - ✓ Work & Co
 - ✓ VeloCiTi
- Entrepreneurial Development Programmes
- Academia and Research:
 - ✓ Annually US\$3,89bn is spent in R&D within the South African university sector of which US\$207,76m is spent in the Western Cape(Invest Cape Town n.d.).
 - ✓ In a 50km radius there are 4 world-class universities, 2 globally recognised business schools, research councils, private & public coding schools
 - ✓ Stellenbosch University LaunchLab: an incubator aimed at building the next generation of sustainable, high-impact companies tackling the world's toughest challenges in Agri, Climate & Health with a heavy dose of engineering and data science. In partnership with Nedbank, LaunchLab facilitates valuable connections between start-ups and corporates
 - ✓ The Western Cape ecosystem is better developed with several higher education institutions that have highly effective Technology

Transfer Office's (TTO), and an emerging innovation specialist capability in the life sciences

Funding

- 56% of South African VC transactions are for companies headquartered in Cape Town (WESGRO 2019)
- Roughly 1/3 of the companies in the 2018 Endeavour Insight study received angel investment or venture funding, which is higher on average than the rates in comparable cities like Lagos, Nairobi, and Johannesburg (Endeavor Insight 2018).

Global Investors into The Cape Town Tech Sector

- Thomas Reuters
- Microsoft
- Google
- Oracle
- Panasonic
- Amazon Web Services
- SAP
- Hisense
- Barclays

Sources: <https://www.citi.org.za/>; <https://www.wesgro.co.za/corporate/home>

Zambia

Summary and recommendations on potential facilitation mechanisms / activities

Zambia's innovation ecosystem is currently in its nascent stage. Currently, the primary focus of this ecosystem has been within the areas of fintech and agriculture, with the aim to drive forth economic growth and the country's national development objectives, as outlined in Zambia Vision 2030 and the 7th National Development Plan 2017-2021.

Government entities driving forth innovation support in Zambia are namely those under the Ministry of Higher Education, including the National Institute for Scientific and Industrial Research (NISIR), National Science and Technology Council (NSTC), National Technology Business Centre (NTBC), and the National Remote Sensing Centre (NRSC). Notably, the NSTC is responsible for the implementation of the STI Policy and Implementation Plan 2020, whilst the NTBC is responsible for technology transfer and the commercialisation of research products, and is also Zambia's National Focal Point for the Southern Africa Innovation Support (SAIS) programme. Recent actions taken by these institutions to strengthen Zambia's innovation ecosystem include the NTBC's implementation of a National Innovation Initiative in 6 Zambian provinces in 2020, in partnership with UNDP's Accelerator Lab and ZICTA. Furthermore, the development of the STI Policy and Implementation Plan in 2020, which seeks to increase investments into innovation hubs, science and technology parks and technology transfer offices at universities, and other resources for innovators, signifies positive progress with regards to development of the national innovation ecosystem.

However, there remain some key shortcomings, including the lack of an incentive regime and regulatory factors to stimulate entrepreneurship, and the exclusion of the Ministry of Commerce, Trade and Industry, as well as the private sector as implementing institutions of this legislation. Limitations with regards to private sector involvement are important to acknowledge, in recognition that the development of the Zambia's innovation ecosystem is driven in large part by Zambia's technology hubs, the first and largest of which is BongoHive (launched in 2011). BongoHive, among other hubs such as Jacaranda Hub and WEAC, collaborate together alongside support initiatives to strengthen different aspects critical to the health of the ecosystem, including technology and skills development, and youth and women's participation.

The active role of these technology hubs intends to account for shortcomings with regards to the government's involvement in driving forth the national innovation ecosystem. For example, BongoHive has been working alongside national institutions such as the Central Bank, ZICTA (Zambia's ICT Regulator) and the Securities and Exchange Commission (capital markets regulator) to help them develop innovation strategies and regulatory frameworks that fill gaps in the current system with regards to what is needed by the entrepreneurs.

Progress must be made with regards to increasing synergies between key actors within the national innovation ecosystem and formalizing support through a cohesive legislative framework for a multi-sectoral and collaborative approach to innovation in Zambia. This will not only serve in driving economic development, but will also crucially

improve the country's standing as an attractive investment destination within the region.

1. Innovation Systems

Among the strengths of Zambia's innovation system are the following:

- **STI legislation is in place** in the form of the STI Policy and Implementation Plan, which was launched in December 2020. This legislation centres around increasing investments into “incubation centres” and “in the capacity of – and resources available to – innovators.”⁴⁹ It also **outlines the need for the establishment of “innovation hubs”, “innovation high tech centres,” and “science and technology parks”, as well as technology transfer offices in universities, and links with industry.**⁵⁰
- The Securities & Exchange Commission, Zambia, launched a Regulatory Sandbox for Capital Markets in March 2021⁵¹ to **support innovators.**
- Strong **entrepreneurial spirit and shifting public perceptions** about local innovators and the capacity to innovate. At the fundamental level, “individuals are innovative on their own. The key players required in an innovation system are all present in Zambia” (AIESyS Survey).

Gaps

The following are among the gaps, revolving around **incentives, policy implementation, collaboration and policy coherence:**

The newly introduced STI Policy and Implementation Plan lacks inclusion of considerations pertaining to the private sector, which is critical considering the prominent role of the private sector in driving innovation in Zambia. This includes:

- Lack of an “incentive regime” and “regulatory factors that affect entrepreneurs’ perceptions of risk and reward and thus their willingness to invest in growth.”⁵²
- Exclusion of the Ministry of Commerce, Trade and Industry, and the private sector as implementing institutions; only the Ministry of Higher Education and the National Science and Technology Council are named, preventing a multisectoral and collaborative approach to national innovation.
- “The STI policy is meant to be implemented by a varied stakeholder group but it is yet to be well implemented.” (AIESyS Survey)
- Insufficient innovation system governance and facilitation mechanisms¹⁴.

Currently, Zambia does not have a cohesive approach to innovation and entrepreneurship support, and this comes down to a lack of synergy between various levels of the innovation ecosystem, as well as the lack of a clear and cohesive framework for all sector to follow in order to reach common objectives.

- “We do what we can as individual institutions, but as a collaborative effort, I wouldn't say that the Zambian government has got its act together.”⁵³

⁴⁹ <https://openknowledge.worldbank.org/handle/10986/33806>

⁵⁰ <https://openknowledge.worldbank.org/handle/10986/33806>

⁵¹ <https://www.seczambia.org.zm/launch-of-regulatory-sandbox-for-capital-markets/>

⁵² <https://openknowledge.worldbank.org/handle/10986/33806>

⁵³ AIESyS interview

- “That lack of the collaborative effort at various levels, really hinders our growth as an ecosystem, and so that’s why, most recently – I think the past year or two – there’s been much more desire for us to work together at various levels”.⁵⁴
- “The progress that we’re making is incremental... it’s not as much as it could be if we collaborated and had a single goal in mind of course, as a country and in terms of how the institutions fall in line to meet that grand objective.”⁵⁵

Lessons Learnt Box

Failure example 1: “Local development of PPEs (face-masks) during Covid-19 outbreak. This was caused by lack of clear government policy to support these initiatives. A side from this, there was no regulatory framework to guide the manufacturing of these urgently and desperately needed equipment.” (AIESyS Survey)

Failure example 2: “Tack-and-trace system for COVID-19. This has failed because, the software was developed in no-native languages and people did not understand the instructions. In addition, the population was not made clearly/fully aware of the need and importance of this system.” (AIESyS Survey)

Failure example 3: “Graduates Entrepreneurship programmes” Reason: “Limited support and employee mindset” (AIESyS Survey)

2. Supporting Innovation Ecosystems

Strengths

The following strengths were noted regarding support to the innovation ecosystems:

- There are a **good range of technology hubs/innovation** support initiatives that focus on strengthening different aspects of the innovation ecosystem across sectors.
 - The ecosystem is not saturated as is the case in other countries, and therefore stakeholders are focused on being able to “fill a niche”, rather than duplicate what is already existing. Because Zambia is small, there are more checks and balances in this regard; “if you what to start something that – let’s say BongoHive is doing – is very apparent, you know to others, and they’ll be like hey, but why are you duplicating what others are doing? Why don’t you find your own space?”.⁵⁶
 - Prominent tech hubs include Jacaranda Hub (youth-focused), WEAC (women-focused), and BongoHive (tech-focused), which through their specialisations aim to collaborate together alongside other support initiatives that address different aspect of the ecosystem.⁵⁷
 - Key areas/sectors that are currently the focus of innovation support initiatives are namely fintech and agriculture.

⁵⁴ AIESyS interview

⁵⁵ AIESyS interview

⁵⁶ AIESyS interview

⁵⁷ AIESyS interview

- BongoHive, or Zambia’s “Entrepreneurial innovation lab” (AIESyS Survey), as well as other organisations such as UNCDF, play a key role in the national innovation ecosystem, accounting for shortcomings with regards to policy and government endorsement of innovation.
- Zambia’s innovation support initiatives/technology hubs operate according to a unique model whereby focus is not placed on providing a physical space for innovators. Whereas for other countries the concept of co-working is more mature, in Zambia, resources are encouraged to be directed to innovation programs and strategies themselves. Because of this tendency away from focusing on building co-working spaces, Zambian innovation support initiatives are more resilient to external shocks, and have largely avoided closure and challenges due to COVID-19.⁵⁸
 - General purpose technologies such as ICTs useful for linking up sectors and generating ecosystem support data.
 - Zambia is member to a range of regional unions/ networks that support innovation, including: African Union, Southern African Development Community, African Technology Policy Studies (ATPS) Network, AfriLabs, Southern Africa Innovation Support Programme, Southern African Venture Partnership (SAVP), AfricanBrains.
- International funders are actively investing in innovation in Zambia.
 - Two of the largest innovation ecosystem support programs/entities that were established as a result of international funding are the Accelerated Growth for SMEs (AGS) program (Finland-funded) and Prospero (UK-funded). The latter has the most money – “approximately 50-70 million” – and invest in a range of sector-specific programs, from tourism, to mining and agriculture.⁵⁹
 - Zambia’s Innovation Grant Program (IGP) - established through the Zambia Compact (an agreement between the Government of Zambia and the Millennium Challenge Corporation) – has a portfolio amount of USD 6 million to support innovations within water, sanitation, solid waste management, and the labour market, to “be replicated by the GOZ or private actors.”⁶⁰
 - Innovations Against Poverty programme - funded by the Swedish International Development Cooperation Agency (Sida), and managed by SNV in partnership with BoP Innovation Center (Netherlands) and Inclusive Business Sweden⁶¹ - offers grants between EUR 50,000 – 200,000 to private companies in Zambia with innovative ideas within “agriculture, WASH and/or renewable energy.”⁶²

Gaps

The following are among the gaps in support for innovation ecosystems:

⁵⁸ AIESyS interview

⁵⁹ AIESyS interview

⁶⁰ <https://www.mcc.gov/resources/story/section-zmb-star-report-innovation-program>

⁶¹ <https://snv.org/project/innovations-against-poverty-iap>

⁶² <https://snv.org/project/innovations-against-poverty-iap>

- **Access to innovation funding is difficult for Zambia** (as with other Southern African countries, besides South Africa). There are **challenges due to Zambia’s geographical position and the size of the market**; investors tend to focus on large markets including those in East, West and North Africa. This means that the innovation stakeholders of Zambia must “work twice as hard to be able to get the resource attention.”⁶³
- **Low level of internet access** and use (24% of the population in 2020)¹⁵
- Lack of **education and skills development** with regards to entrepreneurship and innovation is lacking; this is an issue more general to the SSA region as a whole. The TEVET Authority (TEVETA) Zambia is “trying to see how they can introduce innovation to the education system.”⁶⁴
- “Lack of active participation of some stakeholders such as start-ups and end users (the general public)” (AIESyS survey)
- “Activity duplication wastes resources and leaves lots of gaps where the resources are needed” (AIESyS Survey). **One of the interview participants however mentioned that a strength of Zambia’s ecosystem is that duplication of efforts is largely avoided due to the small size of the country and checks and balances in place among ecosystem actors (AIESyS Interview)**
- “Most of the innovation and socio-economic developments are mainly driven by NGOs. However, these end up resolving a particular problem in a particular region and within a particular/short-to medium-term period of time” (AIESyS Survey)

3. Facilitation Mechanisms

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in Zambia’s innovation ecosystems

- Amend the STI policy 2020, to include an incentive regime and enabling environment for private sector entities to increase investments in R&D.
- Improve governance structures, and connectivity between implementing bodies of the national STI policy, and expand implementing actors to include the Ministry of Commerce, Trade and Industry, and the private sector.
- Improve the strategic positioning of Zambia as an investment destination in the region, through promoting international understanding of the opportunities that the country provides; take lessons learned from Rwanda, another small market within the region that has been relatively successful in this regard.⁶⁵
- Accelerate efforts to increase inclusion of innovation in national education and training initiatives.
- Strengthen national infrastructure (physical and technological) - in particular must develop ICT infrastructure and increase technology adoption i.e. internet and phone use.
- “1. There is need for managerial capacity building of stakeholders in manufacturing sector. 2. Evidence-based alignment of business goals and market and societal demand is paramount “ (AIESyS Survey)

⁶³ AIESyS interview

⁶⁴ AIESyS interview

⁶⁵ AIESyS interview

Case study / example

BongoHive, Zambia

BongoHive is Zambia's first and largest technology and innovation hub, and is playing an active role in developing the country's innovation ecosystem. BongoHive now has about 23 partners, and is working with actors across different sectors within the innovation ecosystem to drive the development of innovation strategies, regulation and collaboration at all levels. For example, BongoHive now works with 4 or 5 of the largest banks in Zambia – including the Central Bank, the ZICTA (Zambia's ICT Regulator), and the Securities and Exchange Commission (capital markets regulator) to help create innovation strategies and regulatory frameworks that fill gaps in the current system with regards to what is needed by the entrepreneurs; "it's a co-creative effort that we have tried to do over the years."¹

This cross-cutting work has developed over the past 10 years since the establishment of BongoHive; "it's important to understand that in the past 10 years, it's moved from supporting entrepreneurs individuals, whether they are pre start-up, start-up, growth stage... to working in the ecosystem, both locally in Zambia and in the region to try to make sure that the entrepreneurs that we are supporting operate within an environment which is conducive for them."¹ The case of BongoHive illustrates the importance of innovation hubs in supporting innovative activities, and aiding in the targeted development of the ecosystem; due to their direct work with entrepreneurs, technology hubs have unique access to comprehensively understanding the needs of local innovators on the ground and how best to support their work.

To better aid technology hubs such as BongoHive in their work, it is important to address key challenges. The first is the challenge is the fact that Zambia is currently not an attractive market for investors. Furthermore, Zambia's "nascent ecosystem means that – particularly for start-ups – it's much more difficult to raise funding"... "and so the geographical positioning, attached to the track record and investor preferences, risk appetite – all those then culminate in [start-ups and hubs] not being able to get the right type of financing/ resource support that would be needed to do the work."¹ Another key challenge is the policy environment; Zambia is not as progressive as other countries in terms of start-up acts and other important legislation. Furthermore, there is not a "cohesive approach to entrepreneurship support in Zambia", and it was emphasized that though current progress is incremental, "it's not as much as it could be if we collaborated and had a single goal in mind."¹

Source: <https://bongohive.co.zm/>

Zimbabwe

Summary and recommendations on potential facilitation mechanisms / activities

Zimbabwe exhibits a mixture of government-led/funded as well as stakeholder-led/funded innovation ecosystems and facilitation mechanisms. In Southern African countries, aside from South Africa and Botswana, it has been noted that governments in general play a relatively small role in national innovation ecosystem development; this includes from the policy implementation and governance side, with development of innovation ecosystems primarily being driven by “the private sector” with “no major innovation being achieved from the government perspective.”⁶⁶ This is also true from a funding perspective, with lack of funding from governments being “a major issue as far as innovation is concerned”.⁶⁷

Currently, notable efforts are being made by the government and through research and academia to advance the innovation ecosystem in order to fulfil the country’s development agendas – Vision 2030 and the National Development Strategy 2021-2025 – as well as the national Science, Technology and Innovation Policy (2012). Significant focus has been placed on innovation activities within the agricultural sector. There has also been strong focus on educational reform, exemplified through the government’s introduction of Education 5.0 in 2018, which aims to promote innovation and industrialization. Through this framework, the country has commissioned the establishment of technology hubs at a number of universities, including the University of Zimbabwe, to provide researchers within these institutions a critical link with industry, as well as the opportunity to hone their skills and bring their ideas to market.

Limitations against the success of these initiatives, as well as the innovation ecosystem at large, includes the country’s regulatory environment – particularly when it comes to intellectual property regulations – as well as financing for innovation from the government and private sector. For progress to be achieved, it is important that efforts are focused on increasing synergies between the government, industry and academia, and establishing a strong regulatory environment that is conducive to innovation. This will allow Zimbabwe to tap into its strong human capital base, and its innovative potential. It is equally important to build a culture of innovation within the country, to increase collaboration across a broader range of sectors than is currently the case.

1. Innovation Systems

Strengths

Among the strengths of Zimbabwe’s innovation system is the country’s long history of involvement [in research](#) and currently, the existence of the country’s explicit **Science, Technology and Innovation Policy** in place as of 2002 and revised in 2012, with the

⁶⁶ AIESyS Interview

⁶⁷ AIESyS Interview

overall vision to “make science and technology an integral part of individual and national development.”⁶⁸ Six primary goals to guide all core activities include:

- Strengthen capacity development in STI;
- Learn and utilize emergent technologies to accelerate development;
- Accelerate commercialization of research results;
- Search for scientific solutions to global environmental challenges;
- Mobilize resources and popularize science and technology;
- Foster international collaboration in STI.

The country also has in place **policy formulation and implementation for skills training/development to promote ST&I**; government institutions focused on agriculture and equipped to facilitate R&D initiatives. These also provide research-based technologies, technical information and products to support agricultural sector. In support of the agriculture sector, the country’s **universities and agricultural colleges** produce agricultural graduates capable of delivering agricultural support services in practical farming, research, extension and farmer training. The country has **historical strengths** in generating, providing and promoting agricultural programmes that enhance competitive and economically viable productivity on a sustainable basis, through administration, extension, training, liaison, coordination and regulatory services.

Meanwhile, another strength noted was that “the Zimbabwe Higher Education system currently has five **innovation hubs based on a few selected state universities**. The innovation hubs can be sustained by involving more relevant industries and commerce and students from Universities, Polytechnics and Colleges. SMEs can also be involved to commercialize some of the innovations of commercial value.” (AIESyS Survey)

The country also has **strengths in the production of low-risk products**, that do not require production in a GMP-certified, or regulated manufacturing facility, current capabilities are there.

“Because of the lockdowns we were left in a situation where we had to, you know, sustain ourselves. We couldn’t rely on neighbouring countries because the borders were closed”, so basic resources began to be manufactured locally. “Even at the university [of Zimbabwe], one of the departments is now making hand sanitizers for commercial purposes” and “even other things such as masks”⁶⁹.

Gaps

The country faces many gaps and bottlenecks when it comes to **regulated innovative activities**. Examples given included that.

*For universities to manufacture products – for example, medical products – outside of university facilities, there are **funding, regulatory and policy issues**; “now that would be a different ballgame and it’s not something that we are prepared for at the moment.”⁷⁰*

⁶⁸ <https://www.healthresearchweb.org/files/Zimbawesciencetechpolicydocumentnew.pdf>

⁶⁹ Interview

⁷⁰ Interview

*There is a lot of innovation happening in Zimbabwe's informal sector, which is mainly driven by societal needs. Here, there are no IP issues and no regulatory oversight. "So in that sense, the inventor can make money out of their invention, but when you look at the regulated markets now – like pharmaceutical – now you're thinking I first need to meet the regulatory requirements before my product can be on the market."*⁷¹

Another gap is that government **institutions outside of agriculture are less equipped to carry out R&D initiatives**. This weakness is compounded by the fact that these Government institutions have **weak ability to support private sector** with regards to innovation and R&D due to lack of physical and human capital and no "means of assessing technological needs of industrial enterprise"⁷² or facilitating technology diffusion. Therefore, there is disconnect between the sectors. There is an overarching reality that public sector institutions (private sector as well) lack the "critical mass of researchers to trigger innovation"⁷³ as well as financial resources for R&D activity, which is compounded by "*lack of coordination and coherence among governance structures*"⁷⁴.

According to one survey respondent, the "adverse impact of these challenges has been experienced on the following national initiatives which are meant to support the innovation ecosystem": 1)National resource mobilisation programmes from domestic resources driven by the Government of Zimbabwe; 2)The establishment of the National Wealth and Innovation Fund; 3)Collaboration with all the development partners in STEM-related projects and programmes; 4)Public Private Partnerships (PPPs) in the proposed Special Economic Zones" (AIESyS Survey).

2. Supporting Innovation Ecosystems

Strengths

Regarding support for innovation ecosystems, the country has a number of notable strengths, which include the following:

- **Good education system and knowledge base.**
- *"The Research Council of Zimbabwe together with the Zimbabwe Academy of Sciences provide the scientific leadership on the innovation ecosystem. The monitoring and evaluation is done through the Office of the President and Cabinet which has a Monitoring and Evaluation Unit that works closely with the Research Council of Zimbabwe."* (AIESyS Survey). There are however that "*M&E systems for innovation ecosystems are very weak in situations where they exist. It's all about capacity.*" (AIESyS Survey)
- **Innovation Hubs** at two of Zimbabwe's largest universities: University of Zimbabwe, and the National University of Science and Technology.

Gaps

⁷¹ Interview

⁷² <https://oro.open.ac.uk/40722/9/Watkins.pdf> p. 12

⁷³ http://www.unesco.org/new/en/media-services/single-view/news/unesco_profiles_research_and_innovation_in_zimbabwe/

⁷⁴ http://www.unesco.org/new/en/media-services/single-view/news/unesco_profiles_research_and_innovation_in_zimbabwe/

The following are among the gaps that were highlighted in secondary and primary data:

- **Poor regulatory environment** for “transfer of new technologies to the business sector”⁷⁵
- Need for the **regeneration of Zimbabwe’s research and innovation culture**, including recognition for achievements in research and innovation.

Lessons Learnt Box

Failure example 1: “The Innovation and Commercialisation Fund initiative failed because of **lack of a proper financing framework** that properly identifies beneficiary and places them in innovation hubs to nurture their innovations before commercialisation” (AIESyS Survey)

Failure example 2: “Production of fuels from the Jatropha plant. Lack of **political will, policy inconsistency, limited technical capacity**” (AIESyS Survey)

- “**Lack of a proper financing mechanism** has seen many promising innovations suffering a stillbirth as formal banking institutions don’t have the risk appetite and subsequently relevant financial products required when dealing with innovations” (AIESyS Survey)
- “I have learnt from my wealth of experience from outside Africa that we should address these problems or issues in Zimbabwe: **Weakness or non-existence of an environment advantageous for research**; Deficiency of a budget dedicated to research; **Not rewarding status of the researchers**; **Rough evaluation of the impact of research on development.**” (AIESyS Survey)
- **Funding of innovation** is one of the biggest gaps in Southern African countries such as Zimbabwe, and is one of the primary reasons “for failure of innovation in countries.”⁷⁶
- “The lack of proper financing mechanisms needs to be addressed. The development of **markets for innovations** is important as this will complete the innovation loop and help attract investors to the local and regional innovation ecosystem”. (AIESyS Survey)
- “Capacity building is regarded as a cost than investment, brain drain, **industry-academia linkages are very weak**” (AIESyS Survey).
- “Lack of **consensus on importance of innovations**” (AIESyS Survey).

3. Facilitation mechanisms

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in Zimbabwe’s innovation ecosystems:

- Need for better coordination mechanism between sectors for knowledge and technology transfer.
- Introduction of mechanism for better synergy with and between the government

⁷⁵ http://www.unesco.org/new/en/media-services/single-view/news/unesco_profiles_research_and_innovation_in_zimbabwe/

⁷⁶ AIESyS Interview

- and private sector with regards to innovation, R&D and new technologies.
- Introduction of mechanism for better synergy between research/academia and the public and private sectors, to address need for increased research capacity within institutions.
 - Incentivize and build the capacity of science academies to play a more active role in the innovation system, in order to strengthen the gaps between research and policy.
 - *“Private sector linkages are critical to create markets for innovations from institutional innovation hubs in universities”* (AIESyS Survey)
 - Re-establish science and research journals (such as Zimbabwe Science News, which was shut down), and online platforms, to increase access to research and innovation ideas.⁷⁷
 - R&D capacity building strategies for government ministries.
 - Improve innovation funding from the private sector.
 - *“Availability of venture capital for start-ups is key to stimulate growth”*. (AIESyS Survey)
 - *“Increase number of venture capitalists”*. (AIESyS Survey)
 - *“Promoting commercialization of Research & Development (R&D) effort through robust Intellectual Property Right mechanisms. R&D has great potential to ignite and nurture innovations.”* (AIESyS Survey)
 - *“Lobbying Governments and the Private Sector to seriously invest in innovations.”* (AIESyS Survey)
 - *“Capacity Building and partnerships are key in the knowledge generation and commercialization of the innovations. These strengths are of primordial importance in the following national scientific priority areas: 1. Post-harvest technologies 2. Small scale mining/mineral value addition/bio mining 3. Clean water alternatives 4. Tiles technologies from mining waste 5. Cyber security systems 6. Defence technologies (double use technologies, drones, puma vehicle, land mine detectors, etc.)”* (AIESyS survey)
 - *“Enhanced capacity building will enable innovation systems to handle the various other challenges such funding, access to markets and access to information.”* (AIESyS survey)
 - *“In all these initiatives, excellence, innovation and leadership are the critical success factors. “That set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process are important. As such it is a system of interconnected institutions purposed to create, store and transfer the knowledge, skills and artefacts which define new technologies”. There is, therefore, a need to strengthen the National Science, Technology and Innovation System of Zimbabwe.”* (AIESyS Survey)
 - *“It’s important to have infrastructure like innovation hubs - State financial support is important in the early stages to kick start innovation systems”* (AIESyS Survey)
 - *“Most of developmental interventions revolve on political will. The same will unlock value in the other system actors and components. Innovation and*

⁷⁷ <https://www.ed.ac.uk/edinburgh-infectious-diseases/news-events/news-archive/a-roadmap-to-revitalise-research-and-innovation-in>

Commercialisation Fund was never prioritized due to lack of appreciation on the contribution of innovation to socio-economic development.” (AIESyS Survey)

- Must establish a comprehensive framework for the innovation system, presenting clear definitions and identifying national gaps that need to be addressed.
- Capitalize on the presence of regional actors such as UNESCO Southern Africa to:
 - Coordinate national multisectoral efforts as well as cross-border innovation activities/initiatives;
 - Better understand their innovation ecosystem through country profiling, data, and tools provided by the organization.⁷⁸
- Take lessons learned from similar markets, such as Rwanda, on how to drive forth innovation.⁷⁹
- “The building of platforms for different stakeholders to interface and share experiences and proffer solutions for common challenges” (AIESyS Survey)
- “A. It is envisaged that the national programme would: make Zimbabwe's innovation system truly international, by supporting partnerships, collaboration and foreign investment in Zimbabwean R&D; build a culture of innovation and new ideas by strengthening investment in creativity and knowledge generation; accelerate the take up of new technology, so Zimbabwean firms can access the best ideas from around Zimbabwe and the rest of the world; focus incentives for business R&D to promote global competitiveness, delivering the best outcomes for exports and economic growth; and Enable resource mobilisation for the specific national innovations and industrialisation programmes which are STEM-related.” (AIESyS Survey)
- “Special attention should be given to the following sectors of the economy: 1.Agriculture 2.Mining 3.ICT 4.Research and Development 5.Manuf acturing 6.Construction 7.Human capital development 8.Health and social services 9.Defence and security” (AIESyS Survey)

Case study / example

University of Zimbabwe Innovation Hub

This recently launched hub was established as an incubator for researchers at the university who are “at the first stages of their research” and are looking to “commercialise whatever product they have been working on.”¹ This is intended to be a place for researchers to “hone in their entrepreneurial skills”¹, gain support, and to be linked with industries in order to facilitate the commercialization process. This hub - along with other innovation hubs established at universities - is part of Education 5.0, a model launched by the Zimbabwean Government in 2018 “to promote innovation and industrialization in pursuit of home grown and research-based solutions to the country’s socio-economic needs.”¹

⁷⁸ AIESyS Interview

⁷⁹ AIESyS Interview

According to a participant from University of Zimbabwe, the hub is currently not tied to any particular themes, and has “just been trying to support people from different departments, and based on what is there.”¹ However, there are a few bottlenecks as to how the hub is functioning, particularly with regards to blurred lines around intellectual property regulations; “and that actually affects so many things, because then the inventors are not willing to take the ideas to the hub, where they are not guaranteed a robust intellectual property framework.”¹ Furthermore, issues around investment are also constraining factors against the success of the hub; according to the University of Zimbabwe participant, the UZ innovation hub has attempted to reach out to industry for investment and support, who have not been “very forthcoming” and are “not really responding in a very encouraging way.”¹ This lack of buy-in from local industry actors may be an indicator that the hub should accelerate efforts to cast a wider net to other actors regionally or internationally for additional support, to ensure that the needs of local innovators are met in order to bring their ideas to market.

Source: http://www.mhtestd.gov.zw/?page_id=3540; www.uz.ac.zw

Western Africa

Cameroon

Summary and recommendations on potential facilitation mechanisms / activities

The majority of innovation ecosystems and facilitation mechanisms in Cameroon are private sector-led with support from international actors. The epicentre of Cameroon's innovation ecosystem is Silicon Mountain, in Buea in the south. Silicon Mountain is the headquarters of the country's largest innovation hub/incubator ActivSpaces and is home to numerous start-ups and a community of entrepreneurs. In 2019, a new tech hub Silicon River, in Yaoundé, was announced by the Cameroonian government. It will be modelled after Silicon Mountain and received an estimated 1.92 billion CFA francs (\$ 20.6 million) from the Ministry of Scientific Research and Innovation's budget.

The Global Innovation Index shows Cameroon performed better in innovation outputs than innovation inputs in 2020. However, Cameroon ranked 120th in innovation inputs, which was lower than both 2019 and 2018. Similarly, Cameroon's rank for innovation outputs was lower in 2020 than in 2019 and 2018, at 119th. Cameroon also scores below average for its income group in all pillars. Cameroon ranks above the SSA average in three out of the seven GII pillars: Human capital & research, Business sophistication and Knowledge & technology outputs, ranking 41st in the number of graduates in science & engineering in the GII.

There is still progress to be made. Cameroon performed below average, in comparison to other SSA countries, in four of the seven GII pillars: Institutions, Infrastructure, Market sophistication and Creative outputs. There appears to be little government support and policy that is directly geared toward fostering an innovation ecosystem. Additionally, corruption and political tensions, particularly, the Anglophone Crisis, have stifled innovation in Cameroon.

1. Innovation Systems

Strengths

GII strengths for Cameroon are found in six of the seven GII pillars: human capital & research (103): the indicator Graduates in science & engineering (41) reveals a strength. Infrastructure (117): demonstrates strength in the indicator Gross capital formation GDP (29). Market sophistication (123): shows strength in the indicator Microfinance gross loans (28). Business sophistication (100): displays strengths in the indicators Firms offering formal training (35), University/industry research collaboration (71) and ICT services imports (67). Knowledge & technology outputs (94): reveals strengths in the indicators Scientific & technical articles (65), Growth rate of PPP (64) and ICT services exports (57). Creative outputs (123): the indicator Cultural & creative services exports (59) demonstrates a strength.

Gaps

GII weaknesses for Cameroon are found in six of the seven GII pillars:

Institutions (113): exhibits weakness in the indicator Rule of law (125). Human capital & research (103): shows weaknesses in the indicators Global R&D companies (42) and QS university ranking (77). Infrastructure (117): displays weaknesses in the sub-pillar Information & communication technologies (121) and in the indicator ICT use (125). Market sophistication (123): shows weaknesses in the sub-pillar Trade, competition, and market scale (125) and in the indicators Ease of protecting minority investors (123) and Applied tariff rate (127). Business sophistication (100): the indicator Intellectual property payments (109) reveals a weakness. Creative outputs (123): has weaknesses in the sub-pillar Intangible assets (122) and in the indicators Global brand value (80), Creative goods exports (123) and Wikipedia edits (115)

2. Supporting Innovation Ecosystems

Innovation Systems & Supporting Innovation Ecosystems

Weaknesses in the innovation ecosystem support are underpinned by **a difficult operating environment in the country due to conflict. There are other challenges too in the areas of funding, transparency and accountability, skills and coordination.**

Cameroon performed below average, in comparison to other SSA countries, in four of the seven GII pillars: Institutions, Infrastructure, Market sophistication and Creative outputs. The Global Innovation Index marked **Cameroon's political environment as an income group weakness**, meaning that Cameroon ranked lower than most countries in the lower middle-income group economies. The Bertelsmann Transformation Index (2020) describes Cameroon as an autocracy with a façade of democratic republican institutions, stating that “deficiencies in terms of democracy and rule of law are deep-rooted and are an inherent element of the political architecture on which [President] Paul Biya’s rule rests....According to recent Afrobarometer surveys, over 50% of Cameroonians believe that Cameroon is non-democratic” (The BTI Transformation Index, n.d.).

The Global Innovation Index also found that Cameroon’s institutions exhibit weakness in the Rule of Law indicator, coming in at 125. Cameroon also ranked 149/180 on the Corruption Perception Index in 2020. This position has been supported by the literature and the stakeholder interview. A 2012 empirical study found that bribe payment impacts negatively on the rate of growth of outputs of SMEs across various industries in Cameroon. A 1% increase in bribe payment leads to 1.179 fall in firm performance. Additionally, in firms with frequent contact with public officials there was a negative impact on sales’ growth, while there was no concrete explanation given, the author suggested that it was most likely due to having to pay more bribes. Bribery and corruption result in financial inefficiencies as firms are forced to incur a number of unproductive costs (Gbetnkom, 2012). One of our study respondents concurred:

“Where governments could normally intervene [to facilitate innovation], corruption makes it very difficult” (AIESyS Interview)

Moreover, stability in the country is impacted by the Boko Haram insurgency in the Far North and the Anglophone Crisis in the North West and South West (NWSW), which in turn have affected livelihoods, innovation and have substantially curtailed the country's economic output, forcing the government to officially classify these regions as in "economic depression". According to the International Organisation for Migration (IOM) Displacement Tracking Matrix (Round 17, February 2019), conflict is the cause of displacement for 94% of 442,683 people displaced in the Far North Region (Julius Tabe et al., 2018). Moreover, 2019 figures also show that approximately 680,000 Cameroonians are now displaced inside the country due to the Anglophone Crisis, which began in 2016, in the NWSW regions. 52,000 additional people have sought refuge in neighbouring Nigeria while most of the displacement are within NWSW and mainly in the same divisions (UN Office for the Coordination of Humanitarian Affairs, 2019).

The Anglophone Crisis has negatively impacted innovation in the South West of the country, which hosts Silicon Mountain, the epicentre of Cameroon's innovation ecosystem. A UN Secretary-General's reports on the Government shutdown the internet in Southern Cameroons, from 17 January to 20 April 2017 and on 30 September 2017, demonstrated that the shutdown not only infringed on the right to free speech and political exercise, but it also harmed SMEs and start-ups across Southern Cameroon and were more pronounced in Buea (where Silicon Mountain is located). Internet connectivity is Silicon Mountain's blood supply. The French NGO Internet Without Borders estimated that the first internet blackout, which lasted 93 days, in 2017 cost Cameroon's economy nearly USD 3.2 million (Welle (www.dw.com), 2017)⁸⁰. Considering the fact that the conflict is still ongoing continues **disruptions to innovation** in Silicon Mountain should be expected.

ActivSpaces, the country's biggest innovation hub, which is headquartered in Buea, discussed the impacts of and adapting to the internet shutdown during our interview:

"Buea in Silicon Mountain was kind of like this epicentre of technology, and all the early birds of technology and Cameroon came out of there. Most of these guys are just leaving [because of the conflict]"

"We actually, I don't know, if you are much on Twitter but [an internet refugee zone was created], just at the border where there was internet and no internet. We actually opened a space there during [the shutdown]. So, instead of leaving Buea, to come all the way Douala to access the internet, [people just had to make the] journey halfway [to] have internet. So, [ActivSpaces] actually rented [a] house for a couple of months and put the internet."

"A lot of people moved out of that region. Most even left the country. And [since] the conflict is actually continuing [we call Mondays Ghost Town". "Nobody in Buea works on Monday. So, [our] staff, for example, we know they don't work

⁸⁰ Note: Judith Nwana, a US-based Cameroonian human rights activist with a background in telecommunications, told Al Jazeera that the first shutdown alone cost the country at least \$38m (Ritzen, 2018)

so all our meetings are [on] Tuesdays [so we can start] the week with them.”
(AIESyS Interview)

The regulatory environment needs to be improved to facilitate and support innovation. Cameroon does not have an explicit policy or strategy on STI. It is important to highlight that our survey respondent differs from our interviewee regarding the government’s role in supporting the innovation ecosystem.

Development related policies can be found in two major documents – la Vision du développement du Cameroun à l’horizon 2035 (ENG: Vision 2035) and le Document de Stratégie pour la Croissance et l’Emploi (DSCE) (ENG: 2010-2020 Growth and Employment Strategy Paper - GESP). STI is not integrated into DSCE, instead it is briefly mentioned. Moreover, there are no sectoral STI policies, but the concept is integrated into le Document de Stratégie du secteur de l’Education et de la Formation via two commitments: (1) the development of Higher Education with the goal of strengthening the science and technology sector and (2) promoting R&D in academia (Cameroon Policy Analysis and Research Centre, 2016). This commitment and the follow through explain why the percentage of graduates in science and science & engineering (41) was marked as a strength in the GII.

Infrastructure:

Infrastructure (117): displays weaknesses in the sub-pillar Information & communication technologies⁸¹ (121) and in the indicator ICT use (125).

Cameroon also has a National Policy for the Development of Information and Communication Technologies (2007). The policy outlined the following:

- a training programme for state personnel working in ICTs
- measures to enhance the legal, regulatory and institutional framework governing ICTs, in order to provide a competitive environment for companies offering electronic communications services, catalyse innovation and promote service diversification and cost reduction;
- an upgrade of the telecommunications network, such as fibre-optic cables.

The policy has spawned the following initiatives to promote the deployment of ICTs, among others (IST-Africa, 2012):

- the Ministry of Scientific Research and Innovation has issued an action plan for an information and knowledge society
- the Ministry of Higher Education has implemented an ICT development programme in tertiary institutions
- the Ministry of Secondary Education has built multimedia resource centres at secondary schools

Although ICT was officially introduced in schools in Cameroon in 2001, the literature, survey and interview show that **progress, in terms of digital infrastructure has been limited**. GII, displays weaknesses in the Infrastructure sub-pillar Information & communication technologies, ranking at 121, and in the indicator ICT use, ranking at 125. Despite the 2007 policy scholars have argued that there is a lack of a clear vision and an ICT policy guiding the use and teaching of ICTs in Cameroon primary and

⁸¹ Due to connectivity and power supply issues, for example: the AIESyS interview session had to take place out of their office because they had no access to power.

secondary schools. A 2016 study stated that the lack of School ICT policies, the non-existence of an ICT integration plan and the reliance on sponsors and donors have also affected effective ICT integration in the classroom (Nsolly and Charlotte, 2016).

The survey respondents marked inadequate/limited digital infrastructure as a high challenge on the innovation ecosystem. Additionally, in secondary schools, between 2003 and 2010, there were no qualified teachers except part-timers who were either graduate students in Computer Sciences or teachers of other disciplines like Mathematics, Physics, etc. who had little or no knowledge in Computer Science pedagogy. Fouda et al. (2013) reveal that since the 2010-2011 academic year, Higher Teacher Training colleges train 300 Computer Science and ICT teachers to cater for a student population of more than 1,200,000; a ratio of 1 teacher for 400 students. Presently, more and more teachers are trained in Computer Science and ICT pedagogy. This means that by 2015, Cameroon was boasting of 1,000 Computer Science and ICT secondary school teachers.

Market sophistication

Market sophistication (123): shows weaknesses in the sub-pillar Trade, competition, and market scale (125) and in the indicators Ease of protecting minority investors (123) and Applied tariff rate (127)

- The business association Groupement Interpatronal du Cameroun (GICAM) continues to press the government to simplify procedures. Private companies can act freely in principle, but in reality, they encounter barriers to development (The BTI Transformation Index, n.d.).

“I was going to start a [£30,000 fund] with three friends but to create a fund it's going to cost us 200,000 pounds to create a 30,000 pound fund where we want to support entrepreneurs with seed money of 5000 pounds to 7000 pounds but it's going to cost this is madness” (AIESyS Interview)

Business sophistication (100): the indicator Intellectual property payments (109) reveals a weakness. WIPO data shows that on average 27.4 patent filings were made by residents between 2010-19. This is drastically lower than the average number of patents 434.8 filled from abroad (WIPO, 2021)

In the World Bank's Doing Business Report 2020, Cameroon still ranks 167 out of 190 countries, which is one place lower than in 2019. In the Starting a Business category Cameroon ranked 104 out of the 190. Starting Business measures the number of procedures, time, cost and paid-in minimum capital requirement for a small- to medium-sized limited liability company to start up and formally operate in each economy's largest business city.

The IMF notes that while Cameroon's financial system is the largest in CEMAC, it remains shallow and is highly concentrated. The four largest banks account for 59% of total bank assets, and Yaoundé and Douala generate about 90% of all bank credits and deposits. By and large, banking services are poorly developed and not readily available outside of major urban areas, or to small retailers and enterprises. (The BTI Transformation Index, n.d.).

“Our interviewee stated that the financing challenge is exacerbated by the fact that: “banks don’t finance innovation they’re not really not equipped to finance innovation this way in the field” (AIESyS Interview)

Education

- The literature echoes our interviewee concerns about education being a key challenge due to the **curriculum being ill adapted to the 21st century**.
- Secondary data findings suggested that teachers are not sufficiently prepared in training to take charge of the 21st century classroom, classrooms are ill-adapted to technologies, and the fact that content of the curriculum impedes implementation. Based on the findings, it is recommended that a reform of the teacher training process be done so as to orientate teachers and their teaching towards the technologically driven 21st century classroom (Lawyer, 2019).
- In mid-2019, UNICEF estimated that at least 74 schools had been destroyed in the two regions since the crisis began in late 2016. 37 By November 2019, the organisation estimated that 90% of public primary schools (more than 4,100) and 77% of public secondary schools (744) were closed. As of January 2020, nearly 900,000 children in the Anglophone regions of Cameroon have been impacted by the crisis and do not have access to education, which is nearly double the original number reported in January 2019 (Akame et al., 2021)

Strengths

- Cameroon sits above the SSA average in three out of the seven GII pillars: Human capital & research, Business sophistication and Knowledge & technology outputs
- Development of the higher education sector with the view to strengthening STI and STEM broadly
- ICT infrastructure commitments through the ministries of science and research; higher education and secondary education

Regulation:

- Currently, start-ups do not need to pay taxes for the first five year
- The government organises yearly hackathons to rewards the best and innovative solution
- Les Journées d’Excellence de la Recherche Scientifique et de l’Innovation au Cameroun (JERSIC)
- Although micro-finance institutions and mobile money meet small-scale saving and borrowing needs, as of 2018, only 10% of Cameroonians had a bank account.

3. Facilitation Mechanisms

- The AIESyS Survey and our interview revealed that international support has been critical in enabling innovation in Cameroon, as the case study will show below.
- Additionally, the survey showed that collaborative workspaces, networking opportunities, access to funds, managerial capacities were critical for enabling the innovation. The importance place on funding on creating an enabling environment was high unanimously. Regulation, partnerships, access to information and ideas and capacity building was split between a high and medium importance.

- A respondent recommended that local initiative should receive diaspora support for a better improvement of innovation in the ecosystem via funding and experience exchanges
- It was also recommended for there to be collaboration between local hubs and leading innovative hubs abroad
- Survey respondents cited innovation city a key enabler of innovation in Cameroon, which should be supported and scaled up (see ActivSpaces Case Study)

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in Cameroon's innovation ecosystems

- Create and implement a national Science, Technology and Innovation policy:
- Promote a shared vision and technology integration plan amongst key agencies and ministries
- Promote harmonisation and transparency between key agencies and ministries. For example, the management of education is decentralised under five ministries and they operate in silos:
 - I. Ministry of Basic Education (MINEDUB): in charge of nursery, primary and teacher training education
 - II. The Ministry of Secondary Education (MINESEC) is in charge of general and technical secondary education
 - III. The Ministry of Higher Education (MINESUP) is in charge of University and professional higher education
 - IV. The Ministry of Employment and Vocational Training (MINEFP) is in charge of vocational training for all school leavers to ease their integration into the social and professional world
 - V. The Ministry of sports and physical education (MINSEP): is in charge of all youths sporting activities.
- Create larger scale of awareness through media campaigns and radio on the importance of STI, Education and Female participation in STEM:
 - For example: partner major media personalities or singers with women in STEM.
- Update the national curriculum to account
- Promote greater collaboration between Government/Policymakers, Industry & Academic/research institutions
- Conflict resolution in NWSW region
- International partnerships for skills training and funding

Case study / example

ACTIVSPACES



Name: ActivSpaces

Industry: Technology Hub and Incubator; NGO

Location: Headquartered in Buea but they also have an office in Douala

Founded: 2009

Website: <https://www.activspaces.com>

ActivSpaces has over 30 hubs in the country.

Current Funding Partners:

- **Indigo Trust (since 2012):** funds organisations using digital technologies to improve transparency and accountability in SSA.
- **AppsTech:** is a leading global provider of enterprise application solutions founded by renowned and successful Tech Woman Rebecca Enonchong. Since 2013, AppsTech has covered the rent and utility expenses of our Douala Space – worth 1.2 million CFA monthly
- **Mashav:** Israel's Agency for International Development Cooperation
- **Organisation Internationale de la Francophonie (OIF) (2015):** generally known as the Francophonie is an international organization representing countries and regions where French is a lingua franca or customary language, where a significant proportion of the population are francophones (French speakers), or where there is a notable affiliation with French culture.

Past Funding Partners:

- **Open Society Initiative for West Africa (OSIWA):** In 2016, ActivSpaces was one of the beneficiaries of the significant additional support provided by OSIWA to [The Fund for Tech Innovation Hubs in SSA](#) – a program initiated by Indigo Trust.
- **Salesforce Foundation:** In 2015, ActivSpaces benefited from a small grant from Salesforce Foundation towards promoting the growth of tech communities in Cameroon.
- **Google:** In 2013, ActivSpaces received grant from Google to assist in setting up our Tech Space in Douala. This same Space has been used to host many GDG related events.
- **Microsoft:** In 2014, ActivSpaces received grant from Microsoft to promote tech entrepreneurship and skill building in Douala.

Examples of projects and initiatives:

In the past 10 years, ActivSpaces has worked with over 500 entrepreneurs and they've organized events that have reached over 10,000 to 20,000

- Digital marketing training programme, in partnership with German organisation, LeapFrog
- Hackathon in Douala in partnership with GIZ
- ActivSpaces works with local Google Developer Groups (GDG) to promote growth tech and help upskill their tech community
- Entrepreneur Support Programme: working with 20 women to improve their businesses, and increase digitalization
- Start-up Incubator Program: current cohort of 16 entrepreneurs (only one woman). Past and present start-ups can be found here: <https://www.activspaces.com/programs/incubator/startups/>

- ActivSpaces Community Program: This program is for individuals, groups and organizations involved in the promotion and advancement of tech and tech entrepreneurship through public education, training, skill development and business creation.
- Co-working space
- Used 3d design to build content for training farmers that are working in cotton production
- Camertech innovation hubs

Our survey findings, and as highlighted in this case study, obtaining a good mix between domestic and international support and facilitation of innovation ecosystems is key for Cameroon

Ghana

Summary and recommendations on potential facilitation mechanisms / activities

Ghana's innovation ecosystem is facilitated by good governmental support for SME development and private sector growth. The government's successful policies on digitalisation provide an exemplary framework for the adoption and scaling of innovations in other sectors. The innovation ecosystems also enjoy collaborations and interactions amongst themselves. However, these ecosystems suffer from agenda-setting by external funders and a lack of coordination limiting their collaborative potential to address local needs. Poor integration of innovations into existing structures also impedes the uptake of innovative solutions.

Ghana benefits from the political will for developing a national STI system, which is supported by a policy framework with a systematic approach including sector-specific policies and management strategies for STI activities. Ghana's linkages with international partners also attract initiatives and projects to the country supporting innovation ecosystems. Still, the country suffers from governance and coordination challenges due to a lack of implementation strategies. This leads to poor implementation of policy goals such as the involvement of the private sector as partners and financial contributors. Governmental involvement for innovative activities in the private sector and civil society is also weak manifesting itself as poor support and funding opportunities.

1. Innovation Systems

Strengths

Ghana's innovation system exhibits a number of strengths which include **political will for developing a national STI system**. Ghana's efforts include the review of the national STI policy in 2009 which led to the publication of the 2017 STI policy, followed by the development of a **National STI Baseline Study** in 2016, creation of the National Entrepreneurship and Innovation Programme in 2017 and establishment of a National STI Advisory Apex Body, National Research Funding Programme and the Ghana Innovation and Research Commercialization (GIRC-Centre) in 2018 (see details in Case Study). There is also the consideration of the establishment of a National STI Fund. The policy framework for the development of a national STI system has a **systematic approach**. The National Science, Technology and Innovation Policy (2017-2020) includes **sector-specific policies and measures to apply STI**, management strategies including the promotion, strengthening and measurement of STI, and mechanisms for financing STI development.

The country hosts **hubs well known by international partners and capable of attracting** projects and initiatives. The recent developments in Ghana's national STI system, which has led to more **linkages and collaborative activities** with international partners, has contributed to Ghana's image and ability to attract more initiatives and projects to take place in the country. International innovation networks and hubs such as Impact Hub, Seedstars and Mest now have chapters in Ghana and

play key roles in the country's innovation ecosystem channelling more initiatives and partners to the ecosystem as well as providing access to the international arena.

Gaps

Among the innovation system gaps are the *governance and coordination challenges* emanating from lack of an **implementation strategy** for the National Science, Technology and Innovation Policy (2017-2020). As noted by some of the survey respondents:

“Implementation of policies, coordination particularly between govt, the private sector and other stakeholders ... Monitoring and Evaluation of STI is also weak” (AIESyS Survey Respondent).

The involvement of the private sector as indispensable partners and financial contributors in the national innovation policy is highlighted; however, the policy instruments **enabling and incentivising** this is not clearly set out, which can be attributed to the lack of an implementation strategy. According to survey respondents, this results in the following:

“[inadequate] government support and strong private sector partnership” (AIESyS Survey), and, “Funding is limited ... need venture capital and seed money for start-ups” (AIESyS Survey)

Although there are efforts by the Government to develop a national innovation framework and support the development of industry (e.g. recent establishment of the GIRC-Centre), **governmental support regarding funding and incentives for innovative activities in the private sector and civil society remains weak**. As one of the interviewees noted “There's a lot going on the ground, yeah, but there's less support from the governments” (AIESyS Interview). The stakeholder mapping (in Output 1) of various innovation ecosystems also demonstrates a lack of government involvement and support in the funding and implementation of projects in the Water Innovations Ecosystem or the Impact Hub Accra, while there are closer links between these ecosystems and academia as well as industry.

The higher **education system is not well attuned to the Ghanaian context** and consequently produces and delivers knowledge that is not necessarily transferable or relevant to the country's needs. This situation manifests itself as lower numbers of university graduates than expected innovating by taking advantage of their educational backgrounds, as one interviewee noted:

*“We have a lot of educational institutions that are churning out information not necessarily applicable in the Ghana system. What happens then is that when it comes to the issue of innovation, **you find a lot of the innovators are not necessarily those who have gained experience from education**” (AIESyS Interview).*

The creation the GIRC-Centre has the potential for strengthening Ghana's innovation system through its coordination mandate (see Case Study).

2. Supporting Innovation Ecosystems

Strengths

Regarding support for innovation ecosystems, Ghana boasts **good governmental support for SME development**. For example, the National Entrepreneurship & Innovation Programme aims to provide an integrated national support for start-ups and small businesses; the Rural Enterprises Programme seeks to **upscale and mainstream a district-based micro and small enterprise support system**; and Business Resource Centres, 37 of which have already been set up⁸², to provide business advisory services in numerous districts. This government support has resulted in contribution of SMEs to economic development through “*networking and market-focused incubation/acceleration*” (AIESyS Survey Respondent).

There is also support from the Government to fuel the **growth of the private sector**. Relevant support programmes include the **Industrial Parks and Special Economic Zones Project** which provides infrastructure and incentives to foster development, economic activities and industrial cluster formations for networking and spill over effects; Free Zones Programme which aims to promote economic development in Ghana; One District One Factory Initiative which creates the necessary conducive environment for the businesses to access funding from financial institutions and other support services to establish factories. As one respondent noted:

“through governments policy and intervention on digitalisation (when government provides coordinating support, funding to implementors, and development of policies) ... innovations are accelerated” (AIESyS Survey Respondent)

The policy framework, development and implementation strategy for digitalisation can provide a **basis for decision-making regarding the introduction, adoption and scaling of innovations** in other sectors. The government should play a facilitatory role.

“Let people get on with it - with government stepping in to scale up, The ZipLine Drones for medical deliveries is an example. Let home-grown solutions emerge rather than always imposing foreign solutions” (AIESyS Survey Respondent)

The Impact Hub Accra is an example of how the ecosystem is also very well **connected to other entrepreneurial ecosystems**, which leads to collaborations. As mentioned in the “Innovation Systems Strengths” section, there are multiple international/regional actors in the country providing access to other ecosystems. It’s common for these actors to collaborate on various initiatives and projects taking place on the ground which allows overlaps and interactions between different ecosystems. Meanwhile, “the role of the **youth particularly their participation in innovation hubs**” and “**support from civil society**” were also highlighted as positive factors in support of the innovation ecosystems (AIESyS Survey Respondent).

⁸² <https://allafrica.com/stories/202009150232.html>

Gaps

A number of gaps still exist, and these include the following examples which relate to **accountability, lack of information, economic challenges and limited digital bandwidth**:

*“The RLG company in Ghana was a model for Ghanaian innovations to grow but woefully **failed as a result of political engagements** surrounding its operations.” (AIESyS Survey Respondent)*

*“**Hard to find market information**, government could make e.g. business registration easier” (AIESyS Survey Respondent)*

*“Although uptake of innovations are high, the **willingness to pay for some of these innovations makes it challenging**. Capacity of professionals are very low, limited exposure of talents makes it that their perspectives and ideas are also very limited” (AIESyS Survey Respondent)*

*“In some instances **digital innovations are not properly tested** because of a lack of bandwidth” (AIESyS Survey Respondent)*

Innovation hubs are likely to be funded by external donors which leads to hubs following **agendas set by these external actors**. This leads to projects and initiatives supported by these hubs not addressing the immediate needs of the country.

*“There's a lot going on in the **private space, but less going on in the governmental space or in the policy space**. So what we are finding out is that most of these innovation hubs have not been created to churn out the best results internally, but have been motivated to follow a certain course by external donors. Which then means that for most of these hubs' direction [...] is usually coming from external factors because they want you to use the funds they provide for a specific response.” (AIESyS Interview)*

Innovative activities were also said to be too focused on **transferring innovations and finding ways of assimilating external innovations** to make them work in the Ghanaian context instead of supporting local innovations solving local problems.

*“I still think it'll take a while for **government to appreciate the innovative capacities of our country** because we're still focused on absorptive capacity where we're looking at external motivations and how to assimilate the learnings here [...].” (AIESyS Interview).*

*“Innovation activities often fail in this country because of a **lack of understanding about potential markets** and whether the idea will be taken up.” (AIESyS Survey Respondent).*

“governmental support for innovation is mostly focused on supporting entrepreneurship and small business instead of supporting “bigger” ideas that can leapfrog Ghana” (AIESyS Interview).

Meanwhile, lack of coordination within the innovation ecosystem was highlighted as a gap that hinders potential collaborations, partly due to lack of governmental

support and direction-setting in the industry. There was also no continuity or follow-up for some of the activities, for example *“hackathons and pitch events (hardly any follow up)”* (AIESyS Survey Respondent). Relatedly, the **integration of innovations** into existing structures isn't very effective causing problems and inefficiencies in the services provided. This leads to mismatches between expectations and what the end-users experience resulting in scepticism in innovations, which in turn impedes the uptake of innovative solutions (AIESyS Interview).

3. Facilitation Mechanisms

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in Ghana's innovation ecosystems

- Assist policymakers to formulate policies that integrate the role of innovation hubs into the national innovation system. These policies should especially focus on coordination and agenda-setting for the hubs to foster collaborations and improve the relevancy of the solutions produced to the local context.
 - *“With government policy that strengthens the reputation and role of innovation hubs.”* (AIESyS Survey)
 - *“Drawing the innovation hubs into the discussion on policies affecting innovation”* (AIESyS Survey)
- As a policy instrument the following can be implemented as suggested by a participant: *“Creation of an integrated platform that will serve as a central market place for interaction, sourcing, funding and networking across local and cross border stakeholder engagement in the ecosystems in Ghana and Africa at large.”* (AIESyS Survey)
- Capacity building support for both the public and private sector to enable them successfully implement and integrate innovations within existing structures.
 - *“Capacity building”* (AIESyS Survey)
- Work with policymakers to create an implementation plan for the national policy for effective coordination and collaboration between the government, academia, industry and civil society at local, national and regional levels.
 - *“strengthen that concept enabling to expand and become the coordinator for innovation”* (AIESyS Survey)
 - *“Policy has and will always remain as the central driving force for growing innovation ecosystems. As such, Government's continuous and deliberate commitment to driving disruptive development of the ecosystem is a key strength and should be strengthened”* (AIESyS Survey).
 - *“Yes, access to markets and partnerships will help businesses grow (more than funding)”* (AIESyS Survey)
- Strengthen the capacity of the innovation hubs through impact assessments and best practices.
 - *“More customer focus in entrepreneurship support and focus on governance and compliance for access to finance”* (AIESyS Survey).
 - *“I don't think the examples I've given are perfect, but the key is to engage with grassroots innovators and to remember that there isn't a standard type of innovator”* (AIESyS Survey).

Case study / example 1

Economy Booster Programme by Impact Hub Accra, Ghana

The Economy Booster Programme delivered by the Impact Hub Accra was “designed to support impact-driven entrepreneurs with both advanced and early-stage ventures, start-ups, non-profit organizations and initiatives based in Ghana and Nigeria that are contributing to the country’s post-pandemic economic recovery”.¹ The programme had 3 stages: application (1 month), incubation (2 months), acceleration (4 months). Along with the Impact Hub, the organisers of the programme included the German government’s Federal Ministry for Economic Cooperation and Development (BMZ) and Lab of Tomorrow, a Ghanaian organisation supported by the German government. The programme offered its selected applicants the following¹:

- Business coaching,
- Senior expert advisory and consulting services,
- Connection with potential investors,
- Personal development and technical skills training,
- Peer support from other participants,
- Impact Hub's global community membership.

The programme was very successful in raising awareness and interest in business support services receiving a 29% increase in the number of applicants joining the programme. In addition to the attractiveness of services that provided good support and access to local and global networks for potential partnerships, investors and assistance, showing resilience against the effects of COVID-19 made a good example for encouraging entrepreneurs to get involved. It showed that the hub was capable of being able to continue delivering successful services during difficult times and that the hub could help entrepreneurs develop these capabilities for their own businesses. The hub was also able to identify the needs of the entrepreneurs that were more specific to the Ghanaian context and address these needs.

The hub’s resilience against the impacts of COVID on funding mechanisms was due to their consistent and strong relationships built between funders, other local hubs, and the rest of the innovation system. The hub also identified that some applicants had a lower degree of understanding about technology, the application system and what it meant to be on such a programme. Being aware of these needs, the hub made sure to provide in depth face to face support, taking all the necessary precautions for COVID and providing 3 different channels to participants just to support them on that front. The community created by the hub through online platforms also proved to be effective at supporting entrepreneurs beyond the programme as entrepreneurs continued to receive content relating to innovation systems and innovation entrepreneurship. The hub itself also benefited from designing a stringent impact framework that allowed them to understand what impact they were making by the services we were providing. This impact assessment was crucial to them as their support doesn’t involve direct financial support but focuses on support for the entrepreneurial journey such as finding the right partners.

Mechanisms that have facilitated the success and activities of the hub

- Global and local partnerships
- Knowledge exchange between experts and innovators
- Community building through online platforms and networks
- International knowledge and financial resources
- Timely and relevant programmes to society's needs - mission-oriented programmes

Source: <https://accra.impacthub.net/about-us/>

Case study / example 2

Strengthening Coordination in the National Innovation Ecosystem: The GIRC-Centre, Ghana

The Ghana Innovation and Research Commercialization (GIRC-Centre) was created in 2018 under the auspices of the Ministry of Environment, Science, Technology and Innovation (MESTI). This followed approval of the national STI Policy in 2017. The GIRC-Centre's mission includes coordinating, funding and incentivising (including tax incentives) actors with the aim of supporting research and innovation (R&I) initiatives. The creation of the GIRC-Centre was mainly underpinned by the following factors, among others:

- The linkage between government, industry and academia was minimal, leading to lack of facilitation for knowledge production, diffusion and use.
- Ghana is being positioned as Africa's home for emerging technologies. For example, Twitter is establishing its first physical office on the African continent in Ghana, and this follows Google's Artificial Intelligence (AI) office already established in Ghana.
- Translating research output into useful knowledge and innovation required an active R&I ecosystem, yet it was apparent that there was little coordination, funding, and incentives to support innovation initiatives.

MESTI and the GIRC-centre are currently working on a law to legitimise the work of the Centre. Once enacted, the law would grant the GIRC-Centre authority and convening power for coordination of all STI actors in Ghana. This would also ensure continuity of the GIRC-Centre's as well as national activities, programme and strategies on R&I beyond government timelines and related political system dynamics.

The GIRC-Centre strategy on technology for national-level innovation ecosystem

The GIRC-Centre has proposed 10 thematic Strategic Technology Areas for national development, namely: 1) Agriculture and food processing; 2) Environment; 3) Sanitation; 4) Waste management and waste recycling; 5) Manufacturing: with the aim to address the need for capacity to design basic tools locally, to minimise import which is presently at nearly 100%; 6) Information and Communications Technology (ICT): For digital transformation i.e ICT supporting all

other sectors; 7) Energy: focusing on renewable energy and moving away from fossil fuel energy, 9) Pharmaceutical industry; 8) Mining: Ghana is rich in minerals and needs technology to harness and do value-addition to the resources. Additionally, there is need to end illegal mining of minerals and other natural resources; and 10) Oil and gas: Ghana needs technology to harness these natural resources in sustainable manner.

Master Plan for Ghana's STI System: potential for changing the innovation ecosystems support landscape

One of the GIRC-Centre's current flagship projects is the Master Plan for Ghana's Science Technology and Innovation (STI) system. The Master Plan is currently being developed by the Government of Ghana in collaboration with the Korean International Cooperation Agency. It is expected that the Master Plan will be completed and ready for operationalisation in the next three years. Part of the Master Plan will include the creation, coordination and facilitation of eight proposed 'Strategic Technology Centres – a series of well-equipped physical facilities where businesses, scientists and engineers will work together to pilot, innovate and scale up research outputs that were identified to have market potential across the county'⁸³. The proposal for the aforementioned strategic technology centres has already been developed. In addition to this, the GIRC-Centre is championing establishment of a National STI Fund⁸⁴ – the proposal for which is currently before Parliament for ratification. The aim is to increase Ghana's budget allocation to R&D as a percentage of GDP, which is currently less than AU commitment of 1%.

Sources: AIESyS Interview (May 2021) and [MESTI](#)

⁸³ <https://mesti.gov.gh/ghana-concretise-innovation-research-commercialisation-centre/>

[Accessed: 05.05.2021]

⁸⁴ <https://borgenproject.org/tag/girc-centre/>

[Accessed: 05.05.2021]

Nigeria

Summary and recommendations on potential facilitation mechanisms / activities

While Nigeria exhibits a mixture of government-led/ funded as well as stakeholder-led/funded innovation ecosystems and facilitation mechanisms, its innovation ecosystem appears to be primarily private sector driven, with some federal and government state support. Currently, Nigeria has several STI policies that posit the diversification of the economy as central to reducing its dependency on the oil and gas sector. However, it appears that the innovation ecosystems noted above, have been largely driven by both industry and foreign investors & donors. In some cases, while STI policies encourage the need for more public-private partnerships and investments in varied sectors, it does not necessarily translate into practice.

On the same note, regulations and policies that have been implemented are sometimes contradictory to the visions and strategic goals outlined within the STI policies. This includes the most recent ban on cryptocurrency, despite the emphasis placed within the National Digital Economy Policy and Strategy, to harness digital technologies for economic growth. However, it should be noted that some innovation ecosystems highlight governmental support via collaborations and partnerships.

1. Innovation Systems

Strengths

The following are the strengths of Nigeria's innovation system that we draw from primary and secondary data:

- “Over the years, the practice of innovation activities has brought the following **benefits to the economy** 1) It contributes to the economic growth 2) It increases productivity 3) Increased competitiveness 4) improved brand recognition and value. 5) Increases partnerships and relationships 6) increased turnover and improved profitability” (AIESyS Survey Respondent)
- “High influx of great innovations and advancement of **innovation in companies** as more investments are going on” (AIESyS Survey Respondent).
- We see innovation as **a tool for development** especially technological innovation as a tool for development and try to understand what the barriers and inhibitors to innovation are and how we can address them” (AIESyS Interview).
- **Partnership is key!** Connecting with other hubs and key stakeholders has been immensely helpful (AIESyS Survey Respondent)

On GII Nigeria has high scores in business sophistication, scoring above average for the lower middle-income group. In addition, Business sophistication (75): demonstrates strengths in the indicators Knowledge-intensive employment (51) and Firms offering formal training (48). For Market sophistication (102): the country displays strengths in the sub-pillar Trade, competition, and market scale (58) and in the indicators Ease of getting credit (14), Ease of protecting minority investors (27), Intensity of local competition (66) and Domestic market scale (23).

The country also enjoys **access to international and regional funding for technological innovation** and the presence of varied technology and innovation hubs with significant business sophistication, funding and partnerships. Equally, they focus on strengthening varied focal areas with a dominance of ICT related innovation. **STI policies are in place including: National Science, Technology & Innovation Roadmap 2030.**

Gaps

Among the gaps is the **persistence of inadequate political will and policies** to consistently support and guide innovation

“Gokada and Opay are examples of some innovation solutions have failed in the country due to government policies” (AIESyS Survey Respondent)

“I think the first issue is the mindset and this whole idea of political will” (AIESyS Interview)

Gender imbalance in the different sectors involved in innovation is also a major gap.

*“In terms of gender in the innovation space, I think that it’s still lagging. And it’s lagging because when you look at some of the stats I’ve seen in terms of **women in tech and women in FinTech** and that whole concept, it’s still lagging, and that stems from again, this issue about how do we engage women in STEM? And how do we continue to see that, you know, we actually can, you know, role models. So, there’s been initiatives that, you know, we’ve March is a good month to sort of reflect on a lot of these things, because it’s the month we celebrate the International Women’s Day” (AIESyS Interview).*

*“So, when we look at the **tech ecosystem and the innovation ecosystem, in general, you find out that there is gender gap.** So, some people are sort of trying to work and build that too. And I’m not sure what the supply pipelines are. And I’m not sure if they’re sort of adequately being sponsored towards getting their products into the market, or even getting into the conversations in associations like ours in terms of the FinTech Association of Nigeria, also doing a bit more to try to engage and embed women into the ecosystem. So, they’re doing deliberate measures in terms of when we’re voting in or building out committees and boards and groups and things. How many women do we have? Because it’s an important that not just even just from a gender perspective, even from an age diversity perspective, as well, because you want representation from all from all types of voices in general? (AIESyS Interview).*

2. Supporting Innovation Ecosystems

Strengths

Efforts to provide a **more enabling environment**, maintaining quality customer relationship and **encouraging diversification** of products emerged in our primary data as some of the factors strengthening innovation ecosystems in Nigeria and other African countries. As one respondent noted:

“There has been remarkable **growth in innovation and the entrepreneurship** development across Africa. This can be further sustained through more **collaborations amongst innovation hubs** /develop a community that can stand as a huge support for innovators, early-stage start-ups. Also policies need to be innovation/entrepreneur friendly, supporting the scaling of successful programs” (AIESyS Survey Respondent)

Gaps

Deliberate mechanisms for facilitation of innovation ecosystems were said to be still lacking:

*“There’s no deliberate mechanism for managing and treating innovation in general. I will take that from the general view of science innovation as a whole because while we see some successes in some tech start-ups and some of the tech ecosystems, we also need to sort of broaden it and understand what the whole science innovation ecosystem looks like. How do we think about going from the idea to the prototype all the way to getting the intellectual property protection all the way to scale in the innovation? This, alongside getting the right types of funding in general. So, from that general perspective, I think we still have **a lot of work to do in terms of even understanding the whole innovation and the tech entrepreneurship ecosystem** and how we can further harness and develop, to build innovation within that timeframe”* (AIESyS Interview).

Collaboration and knowledge sharing among universities were also highlighted as issues needing attention.

*“And also, how do we build **innovation networks across universities** as well, right, in terms of ensuring that there’s that plan, public private partnership, ecosystem and knowledge sharing and exchange?”* (AIESyS Interview).

*“I think **access to funding** is always important. Also **networking amongst hubs** throughout Nigeria can ensure that they are working collaboratively to support start-ups/SMEs well”* (AIESyS Survey Respondent).

In the backdrop of perceived **misalignments between the education system and research**, among other, facilitation, alignment and funding of university research (R&D) and innovation were also highlighted:

*“Okay, so the challenge is a lot of our universities have also been mismanaged from this whole **knowledge building perspective**. So, you find out that a lot of the innovations are happening outside of the university halls, and outside of campuses. And so, you find that you have people who are just doing their own thing, and they might just hit a, you know, hit like, you know, get lucky. And that’s how they make it. But unfortunately, we do. Again, it’s always about, you know, **in a lot of structured innovation system**”* (AIESyS Interview).

*The other thing we also need to deal with is even from a university perspective in being able to sort of have **seed investments in some of these innovations**, start-ups that start up on campus, because this is also another*

*way that you can even fund some of the activities of the university. In that sense, it's really about just how do we **rethink and restructure institutions** to ensure that we can actually look at this as a whole value chain (AIESyS Interview).*

3. Facilitation Mechanisms

Below are **some recommendations** for harnessing or building strengths to address gaps and explore opportunities in Nigeria's innovation ecosystems

- Facilitation of cross collaboration among varied innovation ecosystem actors. In particular, collaboration between universities and the private sector.
- Support gender mainstreaming in STI policies.
- Support policy makers and decision makers in refining and planning long-term policies that incorporates R&D and innovation.
- Capacity building to support innovation actors across the value chain.
- Awareness raising and education on intellectual property rights for innovators.
- Develop monitoring and evaluation frameworks for the innovation ecosystem.
- Support the streamlining of policies developed by the ministry of science and technology & ministry of digital communications and economy.
- Support collaboration between horizontal and vertical programmes that support STI to address the integration challenges.
- Strengthen the innovation value chain through developing governance capabilities and scalability of innovation.

Case study / example 1

Lagos Innovation Ecosystem

Lagos innovation ecosystem has experienced remarkable growth stemming from the favourable reception of the government, foreign and local investors and business organisations. Investment in technology infrastructure in various locations, particularly in Yaba, Lagos State, has given rise to its own Silicon Valley, the "Yabacon Valley", which has attracted more than 20 start-ups and incubators, such as Paga, Andela, Delivery Science, INITS, CC Hub, iDEA Hub, etc. However, despite the success of the Lagos ecosystem, gaps continue to exist within the space which have hampered its further development. They include:

- Lack of stringent and weak enforcement of existing intellectual property laws.
- Dearth of good technical talent; mainly engineering and programming talent.
- Limited number of angel investors – current actors in the space are more institutional venture capitalists than angel investors.
- Limited IT infrastructure to satisfy the need.
- Inability of start-ups to grow and scale quickly. – due to lack of investment and ability to quickly develop product/market fit.
- Impact less significant outside of key locations such as Yaba (in Lagos)

Source: <https://lagosinnovates.ng/>

Case study / example 2

Young Innovators Nigeria (YIN)

Young Innovators of Nigeria Social Organization (YIN) is a social impact organization focused on IT innovations and research, mobile technology businesses, innovation trends, in particular, indigenous technology to foster national development. YIN's mission is to bridge the skills and entrepreneurial gap among Nigeria youths in the area of information and communication technology (ICT) and relevant crafts towards enterprise development. A critical part of their objective is to drive and develop the capacity of Tech start-ups and create an ecosystem for technology entrepreneurship.

Key Projects

- Quarterly Capacity building for Females in IT (DJANGO Girls)
- Annual NACOSS National Hackathon Competition Nasarawa State
- Youth Innovation and Entrepreneurship Platform
- TechX Innovation Hub Enugu and ICT Ecosystem Development
- Hack weekends
- Agritech Hub Benue –Agri-Preneurship Programe
- Participation in Gulf Information Technology Exhibition (GITEX) Dubai
- Member Local Organizing Committee e-Nigeria
- Abuja Hardware & Software Development Lab
- e-Protect Biogas and Integrated Agriculture Initiative (eBIA)

Mechanisms facilitating interactions [are these recommendations? Or enablers?]

- STI Policies: This includes the National Science, Technology and Innovation Policy, 2011 and the National Science, Technology and Innovation Roadmap.
- The Framework for the Nigerian National System of Innovation which articulates the relationship across the federal, sectoral, regional, state, and local innovation councils.
- Industry associations including the Nigeria Computer Society

Source: <https://www.yinigeria.com.ng/>

Cross-border and system-wide recommendations

Facilitating cross-border work

The section below provides a summary of the recommendations drawn from survey and interview respondents around facilitating cross-border work (further details are in appendices and the AIESyS Data Summary).

Recommendations for facilitating cross-border work

- **Funding** - increased and targeted funding especially for directed and / or translational research, translating university research, and supporting higher risk investments. Regional innovation funds, regional funding calls, competitions and summits bringing together academia, industry and government and/or NGOs were also suggested by a number of respondents.
- **Knowledge exchange** - exchange programmes, regional projects and a better understanding of the knowledge flows within innovation ecosystems were highlighted.
- **Indigenous and local knowledge** - knowledge-based innovation is very relevant in bridging the divide between science and 'accepted' local knowledge systems, and also (variably) highly popular. Linking with traditional knowledge systems could be a key route for supporting relevant and impactful innovation.
- **Governance, support and leadership** – recognising the importance of leadership, corporate and public sector good governance was highlighted. A number of respondents noted that innovation should be supported at the highest levels of Government support through relevant and deliberate policies
- **Leveraging existing bodies and networks** - the Southern African Development Community (SADC) and the African Union (AU) were mentioned explicitly as key networks to engage with. Output 2 captures a full list of programmes that support cross-border innovation partnerships, collated from survey and interview responses.

Recommendations for FCDO

The section below provides a summary of the recommendations drawn from survey and interview data around the role that FCDO can play in supporting innovation ecosystems (further details available in appendices and AIESyS Data Summary).

Recommendations for FCDO

- **Regionally focused programmes** - curate programmes in which countries are part of a bigger cohort, but allowed to develop and mainstream different elements into their own programmes.
- **Stakeholder engagement** – work with stakeholders directly and in a timely manner, potentially through desks / satellite offices in countries in which FCDO operates; and work to identify reputable and experienced in-country partners who can build-in sustainability from the start.
- **Capacity building** – support development of local capacity, to have functional components of the innovation ecosystems that are properly integrated and supported.
- **Cultural sensitivity** – deeply appreciate differences in values and approaches, and ensure that innovation can be supported / approached appropriately. Support needs to be more enabling communally and socially, with more collaborative handholding and guidance.
- **Education** - bring together different generations of innovators in understanding the opportunities and challenges facing them and reinforcing the idea that innovation is the key to economic development.
- **Understanding innovation ecosystems** - provide help in collecting and documenting evidence to inform government innovation policies at national, sectoral and regional (within country) levels.
- **Partnerships and governance** – understand how the Private Sector can work to leverage and enable Government, Academia and Development Partners and vice versa. The African Continental Free Trade Area agreement and cross border growth of African start-ups across Africa was flagged as potentially key not just for innovation but development across the continent.

General recommendations

The section below provides general recommendations derived from survey and interview responses, which complement and expand those provided in the preceding sections include:

Recommendations from AIESyS

- **Research** – further research in to the nature of innovation ecosystems could explore more nuanced questions regarding the dynamics of different stakeholders, flows of knowledge and resources and develop a more detail pictured of the opportunities and challenges for these ecosystems at and beyond country level.
- **Thematic diversification** – digital technologies are strongly represented and seen as key to some of the strongest country-level innovation ecosystems, but strong innovation ecosystems exist across other topical areas including agriculture, health and medical, sustainability and climate change and engineering. There are, therefore, a diversity of topical areas well positioned for facilitation.
- **Portfolios of support** – enabling factors for strong innovation ecosystems are seen by AIESyS respondents as being quite equally spread across government / public sector support, private / business sector support and international support, providing further impetus for those wishing to support ecosystem development to work in meaningfully bringing together a range of different actors in ecosystem facilitation.
- **Innovation ecosystem literacy** – literacy around innovation in general and innovation ecosystems in particular was seen as limited, with familiar examples mostly centred around hubs and clusters. There was a clearly expressed desire by some respondents to improve general literacy around what innovation is and what it can provide in terms of personal, community and country-level development
- **Performance indicators** – attracting partnerships, addressing societal needs and creating new products were seen as highly important indicators of the performance of an innovation ecosystem. Further engagements might explore if and how performance indicators are being set and how well these map on to a range of development outcomes over space and time.
- **Ecosystem actors** – A wide range of ecosystem actors were identified as valuable, including government / policymakers, industry / entrepreneur, spin-off and collaborative space organisation as the most ‘important’ and research institutions, development finance and international development organisations also seen as critical. These insights could help FCDO orient itself across the network of actors and validates the view that development finance and international development organisations are valuable actors in this space.
- **Supporting environment** – funding, access to markets and partnerships were flagged as important parts of the supporting environment for innovation ecosystems, which could provide key points of focus for future work in ecosystem facilitation. These were followed by, regulation, access to information and good ideas and capacity building.
- **Monitoring, Evaluation and Learning (MEL)** – MEL activities were relatively limited, as reported in survey and interview responses, and those that exist were

mostly described as 'dispersed, autonomous, multi-stakeholder' arrangements. This suggests a gap in MEL activities, or at least a lack of clear knowledge around if and where these kinds of activities are taking place. This could be a key future area in encouraging MEL to explore and expand effective ecosystem facilitation.

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AFRICAN INNOVATION ECOSYSTEMS STUDY (AIESYS)

Output 2



Output 2: APPENDICES

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Appendix 1 – AIESyS survey instrument

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Page 1

Scoping study and mapping of innovation ecosystem development and support initiatives in Southern and Western Africa

Background

Innovation is crucial for increasing productivity, economic growth and advancing livelihoods. Increasingly, governments and many other stakeholders are focusing on innovation policy as key to economic development. Innovation starts with a good idea, but necessarily includes the creation of new products, tools or processes that are tested and taken up and used by their target audiences. All of the different players involved in this process - such as governments, research organisations, businesses, activities and products - can be described as an “innovation ecosystem”. Like ecosystems in nature, “innovation ecosystems” are complex, dynamic and continually evolving. This study seeks to support the development of these important ecosystems by learning from the real-world experiences of those working within them.

This study

The UK government’s Foreign, Commonwealth and Development Office (FCDO) has commissioned University College London (UCL) and University of Rwanda to carry out this study which seeks to provide:

1. a synthesis of innovation ecosystem development and support initiatives in 10 African countries: South Africa, Angola, Botswana, Namibia, Malawi, Zambia and Zimbabwe in Southern Africa; and Nigeria, Ghana and Cameroon in West Africa;
2. a plan about how to improve ecosystem facilitation efforts across multiple national and regional stakeholders.

The primary recipients of the work will be the FCDO’s Research and Evidence Department, represented by its Africa Research and Innovation Hubs in West and Southern Africa in support of the design, implementation and review of innovation support programming across the regions. Other beneficiaries are UK Government staff, other donors, researchers, business organisations, private sector and other commercial entities engaged in different aspects of innovation development.

Purpose of this survey

This survey seeks to gather views and experiences from a wide range of people involved in innovation ecosystems across Southern and West Africa. Responses will help to identify strengths and weaknesses and opportunities, to inform recommendations for future support of innovation ecosystems.

As a key stakeholder and authoritative voice on issues of innovation and innovation ecosystems, we are hereby seeking your valuable contribution. The survey consists of multiple choice and written questions and should take no more than 15-20 minutes to complete. All responses will be anonymous.

Section 1: Respondent Details

1.1 Country (select from drop-down list)

- Afghanistan
- Albania
- Algeria
- Andorra
- Angola
- Anguilla
- Antigua & Barbuda
- Argentina
- Armenia
- Australia
- Austria
- Azerbaijan
- Bahamas
- Bahrain
- Bangladesh
- Barbados
- Belarus
- Belgium
- Belize
- Benin
- Bermuda
- Bhutan
- Bolivia
- Bosnia & Herzegovina
- Botswana
- Brazil
- Brunei Darussalam
- Bulgaria
- Burkina Faso
- Burundi
- Cambodia
- Cameroon
- Canada
- Cape Verde
- Cayman Islands
- Central African Republic
- Chad
- Chile
- China
- China - Hong Kong / Macau
- Colombia
- Comoros
- Congo
- Democratic Republic of (DRC)
- Costa Rica
- Croatia
- Cuba
- Cyprus
- Czech Republic
- Denmark
- Djibouti
- Dominica
- Dominican Republic
- Ecuador
- Egypt
- El Salvador
- Equatorial Guinea
- Eritrea
- Estonia
- Eswatini
- Ethiopia
- Fiji
- Finland
- France
- French Guiana
- Gabon
- Gambia Republic of The
- Georgia
- Germany

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- Ghana
- Great Britain
- Greece
- Grenada
- Guadeloupe
- Guatemala
- Guinea
- Guinea-Bissau
- Guyana
- Haiti
- Honduras
- Hungary
- Iceland
- India
- Indonesia
- Iran
- Iraq
- Israel and the Occupied Territories
- Italy
- Ivory Coast (Cote d'Ivoire)
- Jamaica
- Japan
- Jordan
- Kazakhstan
- Kenya
- Korea Democratic Republic of (North Korea)
- Korea Republic of (South Korea)
- Kosovo
- Kuwait
- Kyrgyz Republic (Kyrgyzstan)
- Laos
- Latvia
- Lebanon
- Lesotho
- Liberia
- Libya
- Liechtenstein
- Lithuania
- Luxembourg
- Madagascar
- Malawi
- Malaysia
- Maldives
- Mali
- Malta
- Martinique
- Mauritania
- Mauritius
- Mayotte
- Mexico
- Republic of
- Monaco
- Mongolia
- Montenegro
- Montserrat
- Morocco
- Mozambique
- Myanmar/Burma
- Namibia
- Nepal
- Netherlands
- New Zealand
- Nicaragua
- Niger
- Nigeria
- North Macedonia, Republic of
- Norway
- Oman
- Pacific Islands
- Pakistan
- Panama

- Papua New Guinea
- Paraguay
- Peru
- Philippines
- Poland
- Portugal
- Puerto Rico
- Qatar
- Reunion
- Romania
- Russian Federation
- Rwanda
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines
- Samoa
- Sao Tome and Principe
- Saudi Arabia
- Senegal
- Serbia
- Seychelles
- Sierra Leone
- Singapore
- Slovak Republic (Slovakia)
- Slovenia
- Solomon Islands
- Somalia
- South Africa
- South Sudan
- Spain
- Sri Lanka
- Sudan
- Suriname
- Sweden
- Switzerland
- Syria
- Tajikistan
- Tanzania
- Thailand
- Timor Leste
- Togo
- Trinidad & Tobago
- Tunisia
- Turkey
- Turkmenistan
- Turks & Caicos Islands
- Uganda
- Ukraine
- United Arab Emirates
- United States of America (USA)
- Uruguay
- Uzbekistan
- Venezuela
- Vietnam
- Virgin Islands (UK)
- Virgin Islands (US)
- Yemen
- Zambia
- Zimbabwe

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1.2 Stakeholder category (multiple choice - select the one that most applies)

- Government/Policy maker
- Industry/Entrepreneur/ Spin-Off
- Academic/research institution
- Think Tank or other Advisory Body
- Development Finance Institution
- International Development Organisation
- Collaborative Space Organisation (e.g. Tech Hub, Incubator, Cluster)
- Non-profit organisation (e.g. NGO, Community-based Organisation or Other Civil Society Body)
- Regional/Continental Organisation
- Other (please specify)

Other (please specify)

1.3 Sector / Topical Area (multiple choice - select as many as apply)

- Digital
- Physical sciences
- Engineering
- Environment / Sustainability
- Health / Medical
- Social
- Agriculture
- Climate change
- Entrepreneurship/Knowledge-based business development
- Other (please specify)

Other (please specify)

Section 2: Innovation in your country

2.1 In your view, which sectors or thematic areas in your country have the strongest innovation ecosystems? (multiple choice - select as many as apply)

- Digital
- Physical sciences
- Engineering
- Environment / Sustainability
- Health / Medical
- Social
- Agriculture
- Climate change
- Entrepreneurship/Knowledge-based business development
- Other (please specify)

Other (please specify) _____

2.2 What factors have enabled this? (multiple choice - select as many as apply)

- Government/public sector support
- Private/business sector support
- International support
- Non-profit support
- Partnership support
- Other (please specify)

Other (please specify) _____

2.3 On a scale low, medium and high, how important are the following as strengths of an innovation ecosystem?

	Low	Medium	High
Collaborative work-spaces	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to funding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Managerial capacities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Entrepreneurial capabilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Networking opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digital infrastructure (e.g. good and reliable internet)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sectoral policies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National innovation policy and regulatory systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to markets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other technologies (please specify) _____

Other (please specify) _____

3.1 Please indicate examples of any successful innovation ecosystems that you are familiar with in your country

- Innovation hub
- Innovation cluster
- Innovation city
- Other (please specify)

Other (please specify)

3.2 Please indicate the reasons why you believe they have been successful

- Raising funding
- Attracting partnerships
- Creating new products
- Addressing societal need (social or economic)
- Professionalism
- Maturity and capabilities of actors
- Diversity of services/business models
- Other (please specify)

Other (please specify)

Section 4: Ways to build on existing strengths in the ecosystem

4.1 Please suggest one or two ways that you think the successful examples you described in the previous question can be sustained or built upon?

4.2 Which actors are key for sustaining or building on these strengths? (multiple choice - select as many as apply)

- Government/Policy maker
- Industry/Entrepreneur/ Spin-Off
- Academic/research institution
- Think Tank or other Advisory Body
- Development Finance Institution
- International Development Organisation
- Collaborative Space Organisation (e.g. Tech Hub, Incubator, Cluster)
- Non-profit organisation (e.g. NGO, Community-based Organisation or Other Civil Society Body)
- Regional/Continental Organisation
- Other (please specify)

Other (please specify)

Section 5: Challenges, gaps and blockages in the innovation ecosystem

5.1 Please share one or two examples of innovation activities you are aware of that have failed in your country, and why they failed.

5.2 On a scale ranging from low, moderate and high, how significant are the following as challenges, gaps and blockages in your country's innovation ecosystems?

	Low	Medium	High
Government support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor system connectedness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited uptake of innovations by stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor resource pooling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Activity duplication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Capacity limitations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information asymmetry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inadequate/limited digital infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

5.3 Please give one or two examples of the impact of these challenges on the innovation ecosystem

Section 6: Ways to address challenges, gaps and blockages

6.1 How important on a scale from low, medium to high are the following as ways of addressing the challenges?

	Low	Medium	High
Regulation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Partnerships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to markets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to information and good ideas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Capacity building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-monetary incentives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify) _____

6.2 Can any of the strengths you have identified help to balance these challenges?

Section 7: Monitoring and evaluation on the roles of innovation ecosystems in the economy

7.1 Is there a mechanism for monitoring and evaluating the role of innovation ecosystems in your country?

- Yes
 No
 Unsure

7.2 If you responded 'yes' to 7.1, please specify and explain how this mechanism works e.g., who is involved, who is responsible, how this connects with the broader national economy

7.3 How would you characterise the governance and accountability mechanisms for innovation ecosystems in your country? (multiple choice - select as many as apply)

- Centrally-controlled by government
 Dispersed, autonomous multi-stakeholder arrangements
 Hybrid mechanisms

Section 8: Learning from experience

8.1 What are some of the key lessons (good practice) from your country regarding innovation and socio-economic development?

8.2 Please share any relevant examples of good practice that you are aware of from other countries for improving their innovation ecosystems?

Section 9: Beyond national innovation ecosystems

9.1 What mechanisms and/or programmes are you aware of, that support cross-border innovation partnerships?

9.2 Can you suggest other mechanisms that could facilitate cross-border innovation?

Section 10: Final thoughts

10.1 What message would you like to send to FCDO, and others working to support innovation ecosystems, about what they can do to catalyse, manage and enhance the functioning of the ecosystems.

10.2 Finally, what issues do you think have not being adequately addressed regarding innovation ecosystems in (a) your country and (b) region?

Appendix 2 – Summary data from AIESyS survey

Insights from AIESyS survey. Opened: March 9th 2021 Closed: April 1st 2021.

Please note that all free text responses are report as expressed by respondents and have not been edited for spelling, grammar etc.

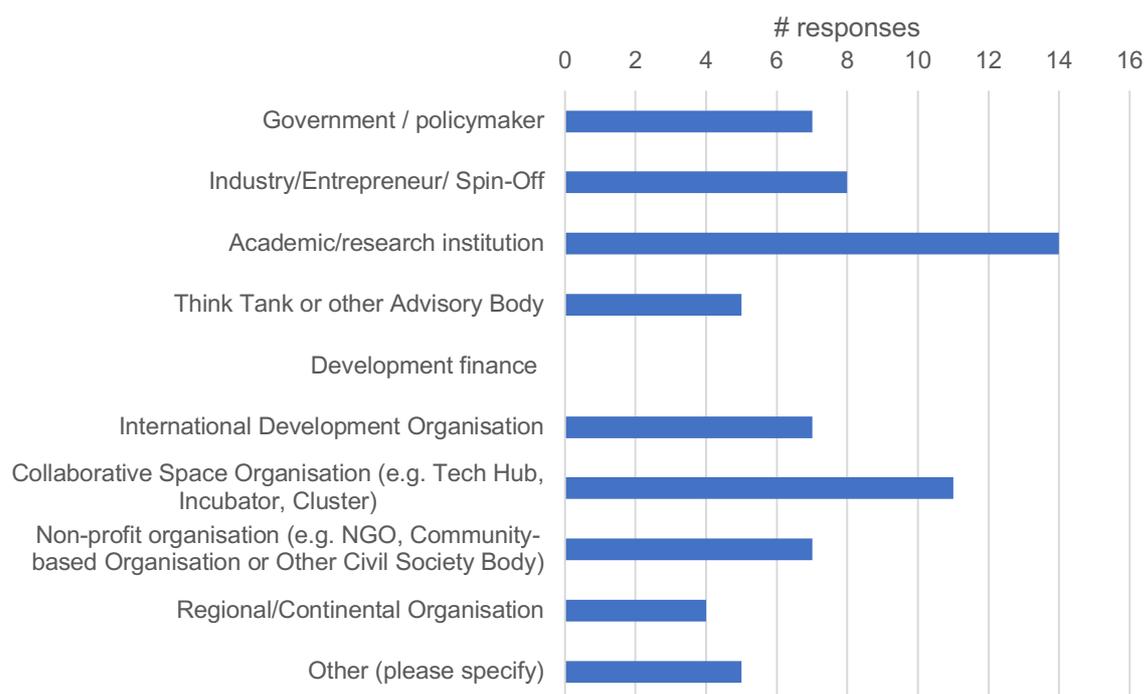
Full versions of the raw free text responses for Questions 4.1, 5.1, 5.3, 6.2, 8.1, 8.2, 9.1, 9.2, 10.1, 10.2 can be found in the AIESyS project data files.

RESPONDENT DETAILS

1.1 Country

COUNTRY	RESPONSES
Angola	4
Botswana	3
Cameroon	3
Ghana	13
Malawi	9
Namibia	6
Nigeria	6
South Africa	11
Zambia	4
Zimbabwe	9
TOTAL	68

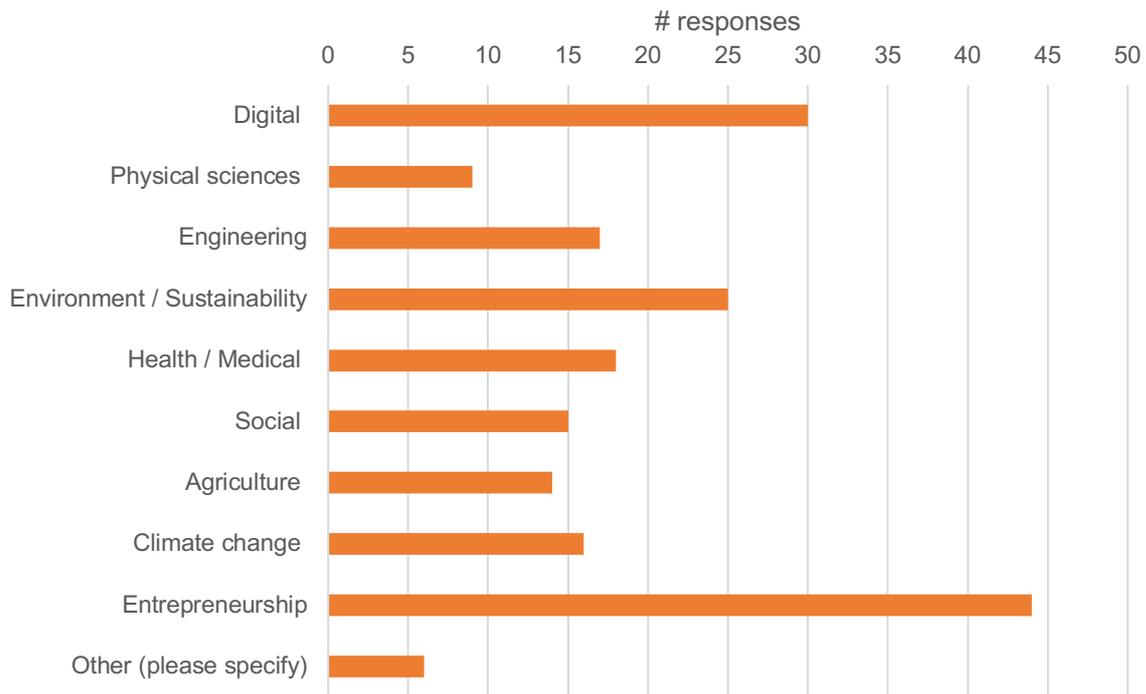
1.2 Stakeholder category



Other stakeholders include:

- Knowledge broker
- Statutory Body established by an Act of Parliament
- Regional/Continental Organisation and Collaborative Space Organisation (e.g. Tech Hub, Incubator, Cluster)
- Innovation Management Consultant
- Impact / Venture capital investor

1.3 Sector / Topical Area (multiple choice - select as many as apply)



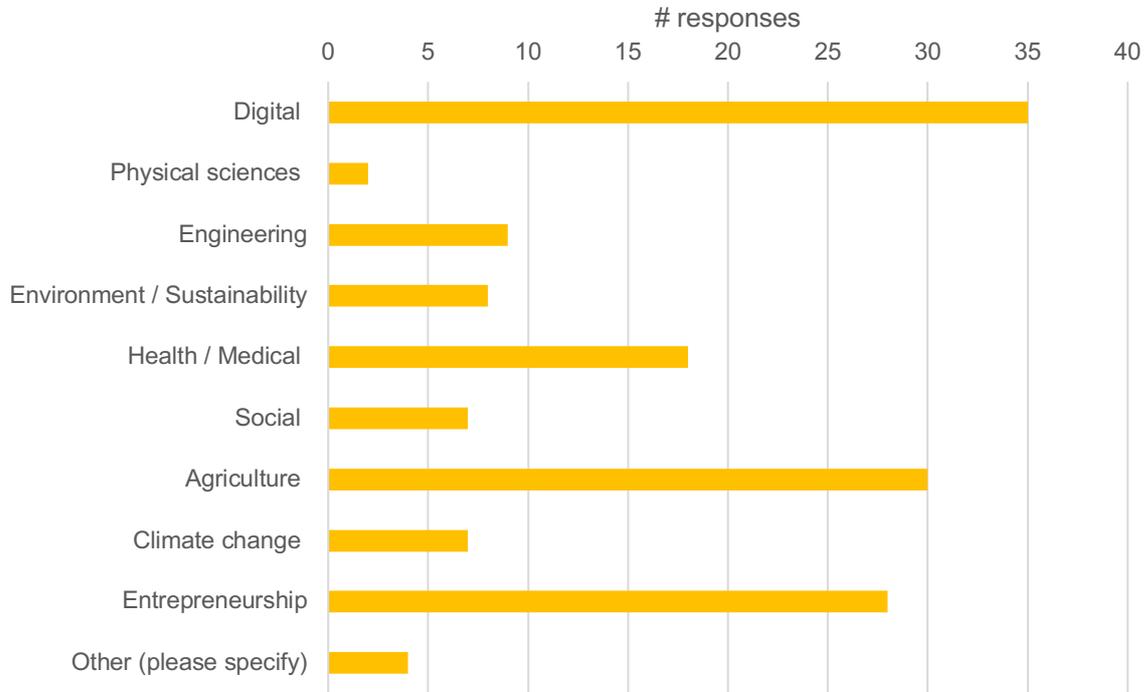
Other sectors include:

- Start-up
- Social aspects of Science, Technology and Innovation
- Financial
- innovation enablement
- Education and Training
- Postdoctoral grants
- Business climate development

STRENGTHS

SECTION 2-3: INNOVATION IN YOUR COUNTRY

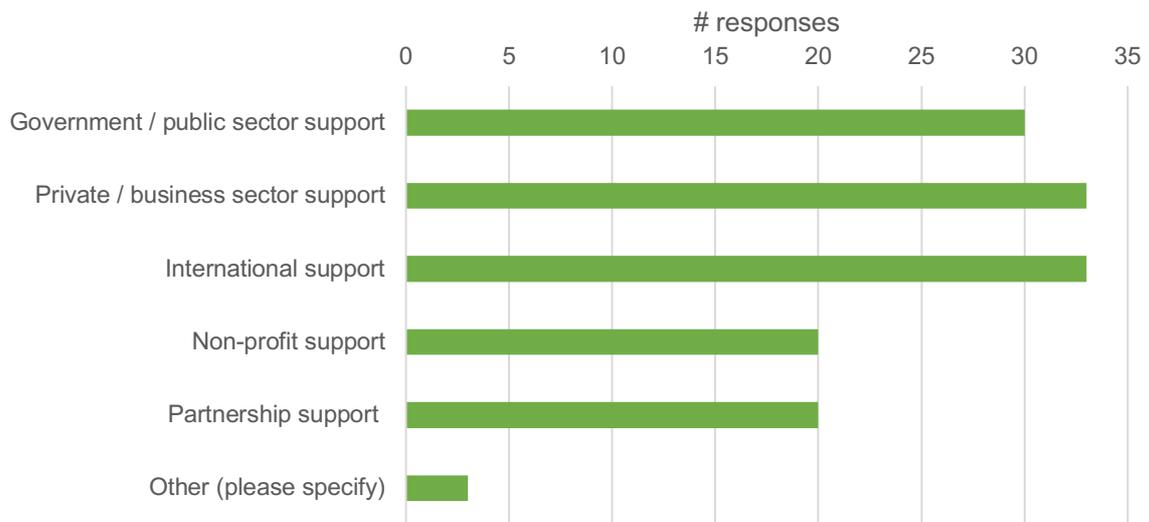
2.1 In your view, which sectors or thematic areas in your country have the strongest innovation ecosystems? (multiple choice - select as many as apply)



Other sectors / thematic areas include:

- Manufacturing
- Start-up
- Financial

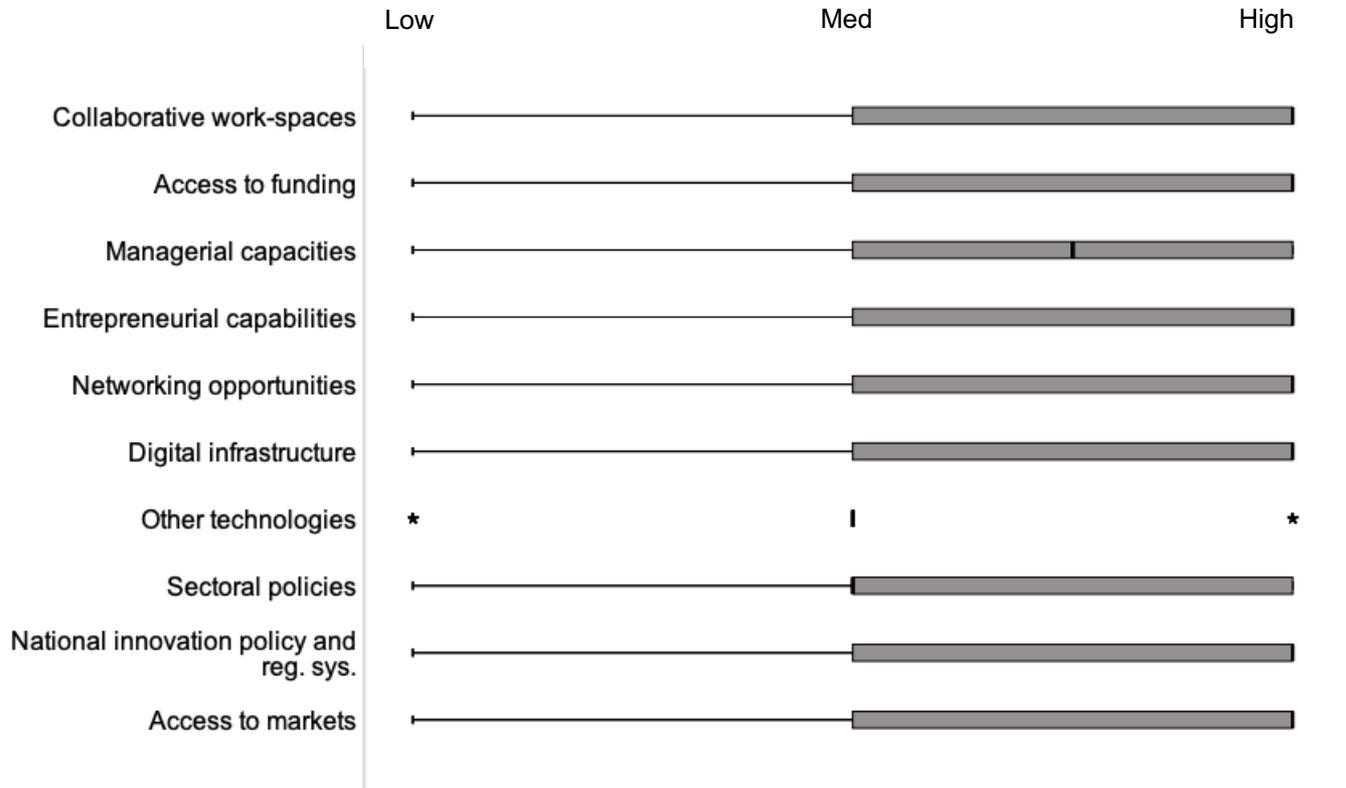
2.2 What factors have enabled this? (multiple choice - select as many as apply)



Other factors include:

- Individual drive
- Government Individuals
- Sectors with potential to growth

2.3 On a scale low, medium and high, how important are the following as strengths of an innovation ecosystem?



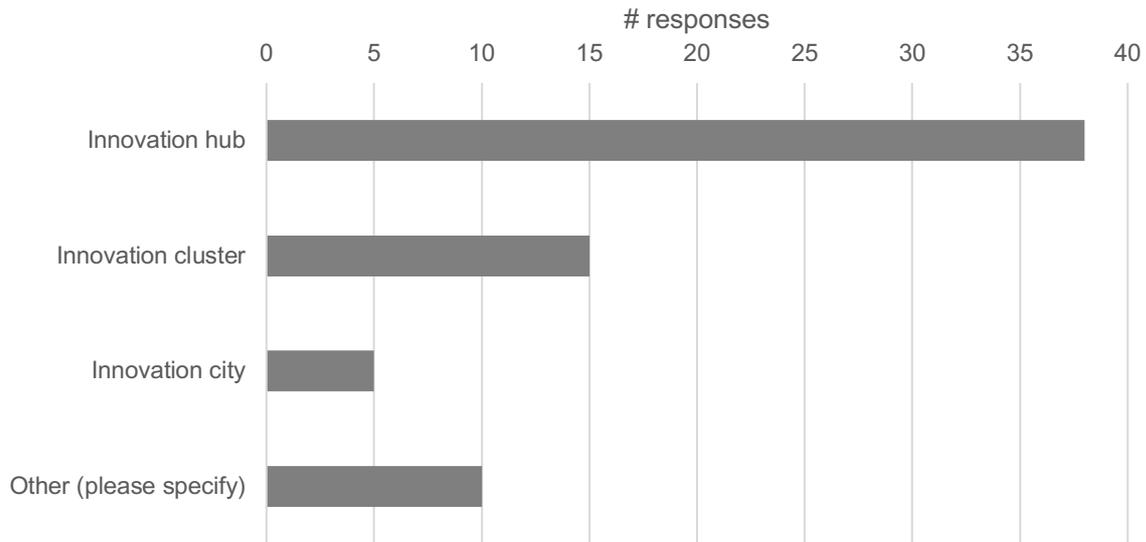
Other technologies include:

- Appropriate technologies
- equipment and (usually) academic expertise
- Prototyping and testing facilities
- Indigenous knowledge tech

Other factors include:

- Government involvement
- Access to qualified labour force
- Strong research institutions
- Non-financial support
- Access to capacity building and education
- Conducive business environment i.e. not repressive
- Gender lens
- Peer & Mentorship networks
- Support from civil society

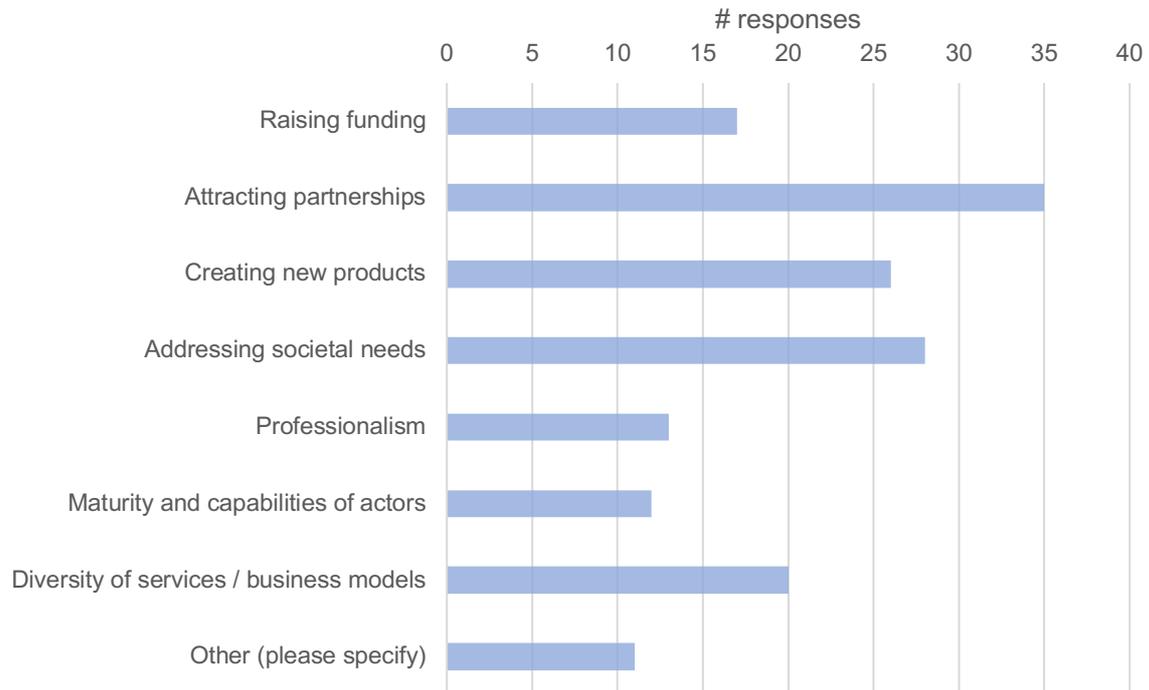
3.1 Please indicate examples of any successful innovation ecosystems that you are familiar with in your country



Other ecosystems include:

- Entrepreneurial innovation hub
- Emerging Digital Start-ups
- Network in a value chain approach
- Development organization initiative - Agri space
- Informal sector
- Universities
- Private/Government partnerships
- African Drone and Data Academy
- Value chain actors
- These are all still in infancy stages.
- (3 responses noted 'none' / 'none successful')

3.2 Please indicate the reasons why you believe they have been successful



Other reasons include:

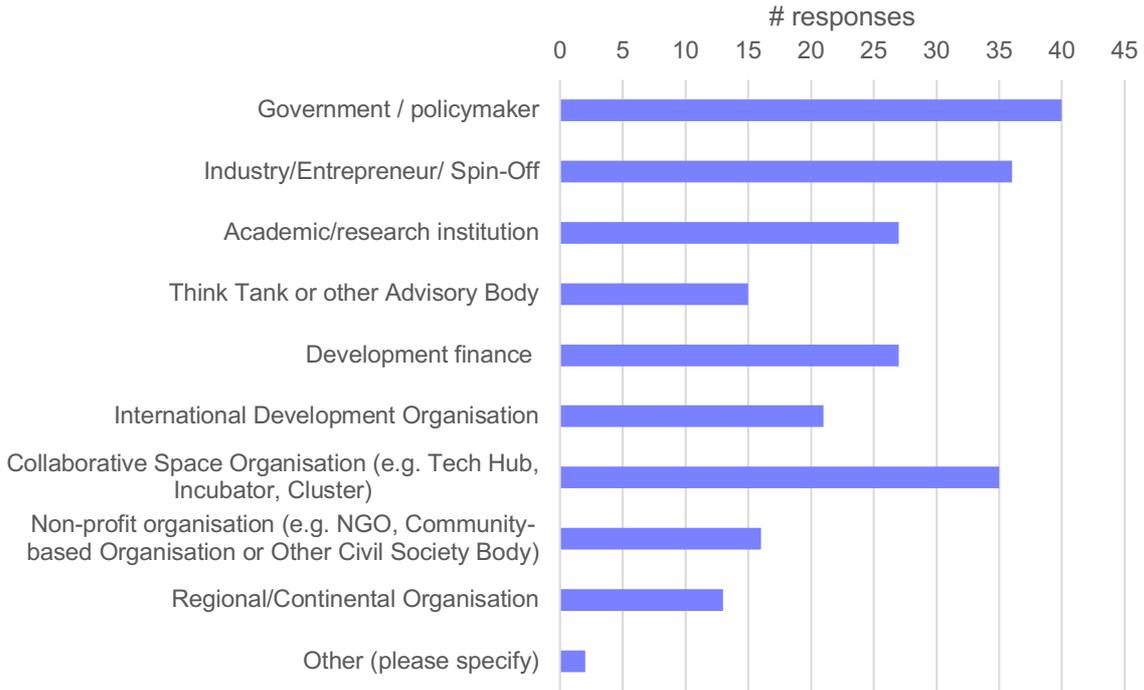
- Supported by external donor funding
- Networking and market-focused incubation/acceleration
- brings together actors
- government support
- Coordinating activities around a focus
- Stems approach to addressing challenges
- Accessing markets for innovators
- Attracting partnerships
- Raising start-ups
- They are all still in infancy stages.
- (2 responses noted 'none')

SECTION 4: WAYS TO BUILD ON EXISTING STRENGTHS IN THE ECOSYSTEM

4.1 Please suggest one or two ways that you think the successful examples you described in the previous question can be sustained or built upon?

(See full raw data in project data files)

**4.2 Which actors are key for sustaining or building on these strengths?
(multiple choice - select as many as apply)**



Other actors include:

- WIPO, ARIPO
- Philanthropist

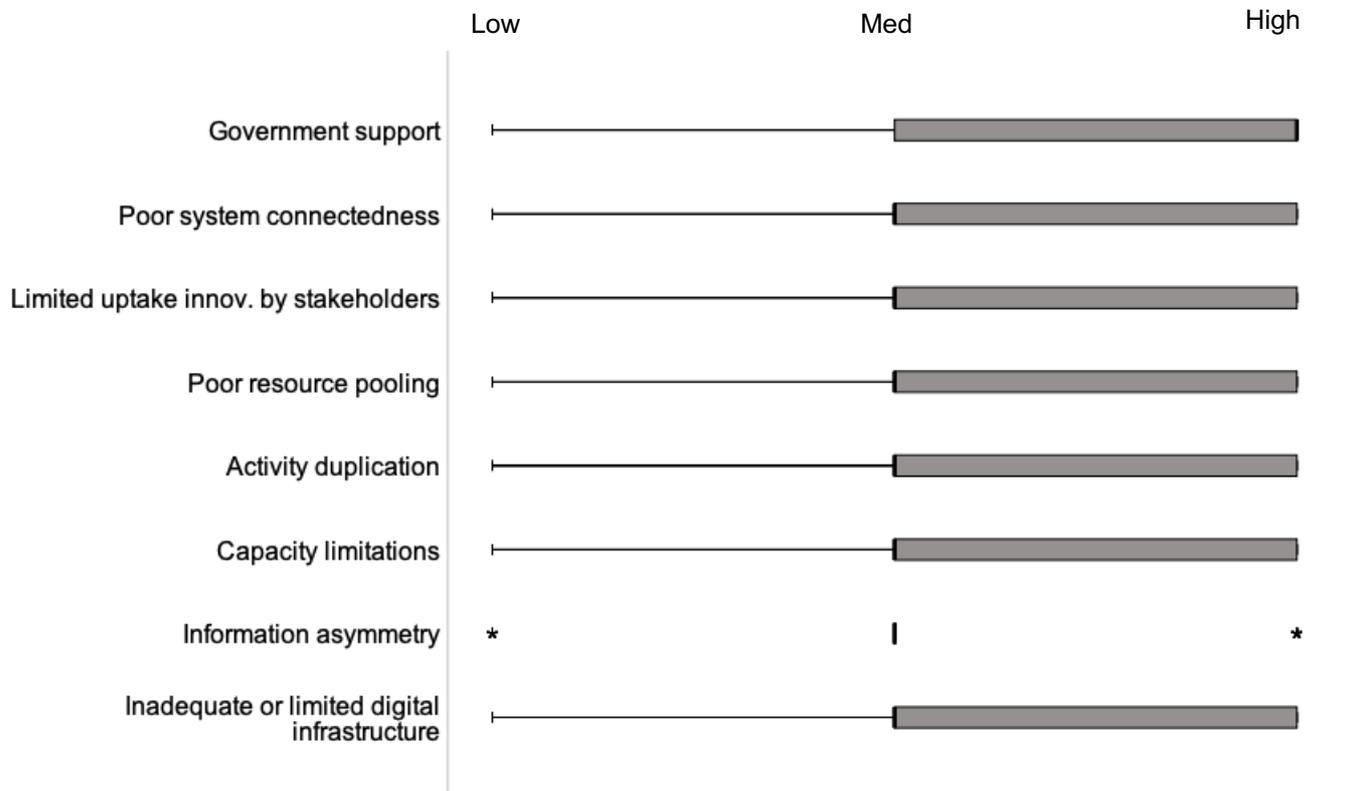
WEAKNESSES

SECTION 5: CHALLENGES, GAPS AND BLOCKAGES IN THE INNOVATION ECOSYSTEM

5.1 Please share one or two examples of innovation activities you are aware of that have failed in your country, and why they failed.

(See full raw data in project data files)

5.2 On a scale ranging from low, moderate and high, how significant are the following as challenges, gaps and blockages in your country's innovation ecosystems?



Other challenges, gaps, blockages include:

- Willingness to pay
- Lack of local capacity
- Corruption

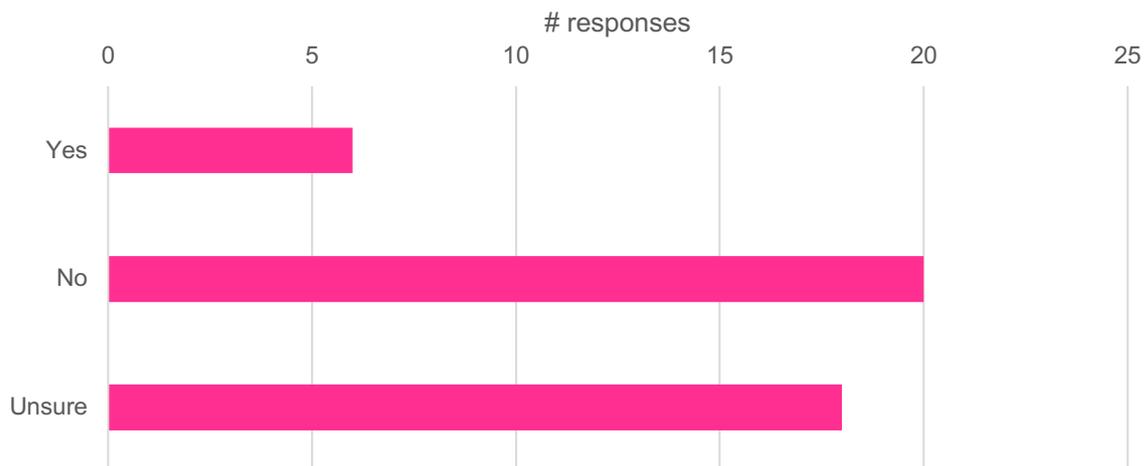
5.3 Please give one or two examples of the impact of these challenges on the innovation ecosystem

(See full raw data in project data files)

MONITORING, EVALUATION AND LEARNING

SECTION 7: MONITORING AND EVALUATION ON THE ROLES OF INNOVATION ECOSYSTEMS IN THE ECONOMY

7.1 Is there a mechanism for monitoring and evaluating the role of innovation ecosystems in your country?

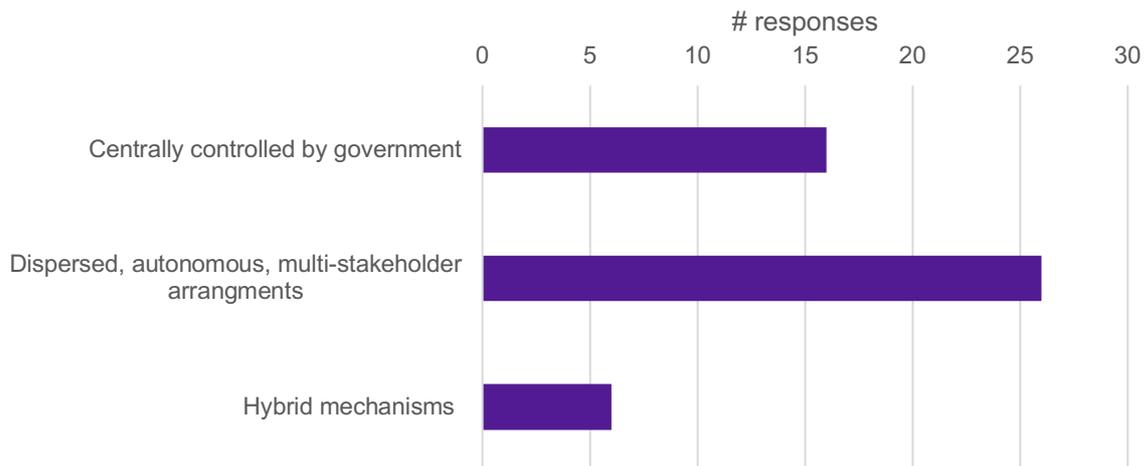


7.2 If you responded 'yes' to 7.1, please specify and explain how this mechanism works e.g., who is involved, who is responsible, how this connects with the broader national economy

- The Research Council of Zimbabwe together with the Zimbabwe Academy of Sciences provide the scientific leadership on the innovation ecosystem. The monitoring and evaluation is done through the Office of the President and Cabinet which has a Monitoring and Evaluation Unit that works closely with the Research Council of Zimbabwe.
- The STI policy is meant to be implemented by a varied stakeholder group but it is yet to be well implemented
- M&E systems for innovation ecosystems are very weak in situations where they exist. Its all about capacity.
- Through the design, compilation and management of the m&e tool on the national ecosystem, the department of research, science & tech (drst) should be able to be abreast of all national science & engineering activities nationally, thus be able to design & implement necessary policies and strategies for these activities to benefit the country's progression to a knowledge based economy. Lack of skilled human resources (the government doesnt retain skilled labour well due to low pay) has negatively impacted on this noble mandate of the drst.
- This is something that needs to be measured. There's very little monitoring and tracking currently taking place.
- This is too dynamic and complex to accurately and holistically monitor

- Incubation Governance and Project Management Program initiated by the Department of Trade and Industry and the University of Pretoria. This is an annual program, open invitation to incubator and incubates to share a 'Community of Best Practices the Africa Agribusiness Incubator Network (AAIN)-SA is part of COHORT 3 and its office is the Incubator of WOMEN in Livestock/Farming/Agribusiness (an initiative of the African Union)
- Monitoring and Evaluation of STI is weak
- There is no role clarity of players in the ecosystem, replication of efforts.
- Information for the World Economic Forum
- Developing innovative solution can help:
 - saving money
 - saving time
 - making things faster
 - creating jobs
 - generated revenue
 - etc.

7.3 How would you characterise the governance and accountability mechanisms for innovation ecosystems in your country? (multiple choice - select as many as apply)



EXAMPLES AND RECOMMENDATIONS

SECTION 8: LEARNING FROM EXPERIENCE

8.1 What are some of the key lessons (good practice) from your country regarding innovation and socio-economic development?

(See full raw data in project data files)

8.2 Please share any relevant examples of good practice that you are aware of from other countries for improving their innovation ecosystems?

(See full raw data in project data files)

SECTION 9: BEYOND NATIONAL INNOVATION ECOSYSTEMS

9.1 What mechanisms and/or programmes are you aware of, that support cross-border innovation partnerships?

Mechanisms and/or programmes that support cross-border innovation partnerships

- Orange Corners (an African & middle east network of innovation Hubs)
- Afrilabs
- Afric'Innov
- diffusion cross-border replication project WorldBank
- Sahara Sparks
- Seedstar
- Southern African Research and Innovation Management Association (SARIMA) - regional membership organisation that supports best-practices in R&I management
- The Southern Africa Innovation Support Programme
- The Southern Africa Startup Awards
- The South Africa Innovation Summit
- SANBio (Southern African Network for BioSciences)
- SADC Industrialization Strategy
- The African Union's African Scientific Research and Innovation Council (ASRIC)
- Research Africa Network (RAN)
- The National Association of Science Academies of Africa (NASAC)
- African Academy of Sciences
- The Science Granting Councils Initiative
- “Mechanisms that exists currently include Afrilabs, which Wennovation Hub is a founding member. Through this mechanism, African innovation centers can collaborate and share resources across borders. In addition to this, we have been organizers of cross border innovation programs like the Next Economy Program, which is run across multiple African countries. In 2016, supported by Crosswise Works, we organized the Food Connection Challenge in Nigeria and Benin Republic. We also oversaw CTA Agrihack West Africa which specific focus on improving the culture of fish farming. The winning solutions were transitioned into ICT4Ag Start-ups with the help of seed funds” (AIESyS survey)
- “The SADC Science and Technology Initiative has provided a platform for cross border initiative through programmes like SANBIO, Cyber-Infrastructure Programme amongst others” (AIESyS survey)

Possible / future

- The InterAcademy Partnership, the global consortium of the world' academies of science.
- Joint Research Chairs to address problems of common interest in aspects like Cybersecurity, Climate Change, Agriculture, Mining
- Horizon 2020

9.2 Can you suggest other mechanisms that could facilitate cross-border innovation?

- Through the use of the existing regional bodies like SADC, Africa Union
- Regional innovation funds; open regional markets, trade policies and practices; regional exchange programs (virtual?) for peer-to-peer learning; regional innovation programs/projects
- Government support through relevant and deliberate policies
- Importance of leadership, corporate and good governance, increased funding for research, especially directed/translational research - cannot expect outcomes/impact without the early "at risk" investment Understanding of the risk profile of innovation by actors and planning accordingly (sector specific)
- Regional Funding Calls Regional Innovation Competitions Regional Innovation Ecosystem Builders Summits
- Multi-National company support and adoption of local solutions across their groups cross border.
- Innovation should be supported at the highest level, meaning that there should be a political will from the government to implement proper innovation systems in the country.
- We are still working to increase the innovation support for people in universities. So far, not much success has been made in fostering innovation from the universities. Thus, funding targeted at consistent programs with and in universities to facilitate innovation will better position cross border innovation in the region.
- Research remains critical in supporting innovation in Africa. The reason why it is critical is that to develop innovative solutions, innovators need to be armed with more data and insights to innovate appropriately. While start-up success probability is very low across the world, it is worse in Africa where there are more risks, exacerbated by lack of data.
- New system of funding is also required to allow innovators more options beyond the high risk loans and largely inaccessible investment funding. While new investment options are becoming available, too many African startups still have to fight for the little that is available.
- In Africa, Indigenous Knowledge -based innovation is very relevant in bridging the divide between science and 'accepted' local knowledge systems, and also (variably) highly popular.
- Science, as a foundational concept in culture, is not well established as it is relatively new and often associated with colonialism and exploitation. This will obviously take a lot of time to address, but shortcuts can be made, for example, through linking traditional knowledge systems with science.
- 1. Creation of regional innovation challenge programmes bringing together academia, industry and government and/or NGO together.
- a. How does knowledge flow within a given innovation ecosystem? Who determines the direction of this knowledge and do they do this? b. What is/should be the role of embassies/diplomatic representations developing/facilitating innovation ecosystems?
- Funding for innovation remains a huge challenge. Private sector involvement is very low and public funds are insufficient to fund innovation

SECTION 10: FINAL THOUGHTS

10.1 What message would you like to send to FCDO, and others working to support innovation ecosystems, about what they can do to catalyse, manage and enhance the functioning of the ecosystems.

- Set up desk or satellite offices in countries you target. Programmes should be regionally focused with countries allowed to mainstream their programmes thereof. Simplify conditions as supports from organisation such as them does end up not making impact as everything is diluted into routine administration.
- Engage the key stakeholders and engage with them directly to support the start-up/entrepreneurial ecosystem.
- I would suggest that the FCDO should develop programmes that bring different generations together to understand the innovation ecosystems. Further, education systems should be geared into realizing that innovation is the key to economic development.
- Be quick to implement and engage players in the ecosystem
- In-country buy-in and ownership of initiatives is key - but identify reputable and experienced in-country partners who can build-in sustainability from the start
- Ensure clear activities, milestones, deliverables & criteria and accountability (RACI matrix) are defined upfront before funding, with activity-based budgeting - then minimize bureaucracy - monitor and evaluate based on agreed-on milestones and deliverables
- Open Market
- FCDO can enable more partnerships across the innovation ecosystem to make it easier for actors.
- FCDO may also look into the African Continental Free Trade Area agreement, and explore more ways to improve cross border growth of African start-ups across Africa. Scaling across Africa is still very difficult due to the countries barriers and poor financial infrastructure that makes transfer of money difficult. These areas are key in enabling not just innovation but development across the continent.
- Need to be aware that (to generalize horribly) that a western-type culture traits of efficiency and personal responsibility, frustration with inefficiency, etc are replaced with culture values that are different, and hence innovation needs to be supported / approached differently. Support needs to be more enabling communally and socially, with more collaborative handholding and guidance.
- Help in collecting and documenting evidence to inform government innovation policies at national, sectoral and regional (within country) levels
- The critical success factors for the successful knowledge generation, exploitation and commercialisation of priority scientific projects were identified as: High level sponsorship Resources Skills Project management Teamwork Excellence Convergence of mindset
- The development of local capacity to have functional components of the innovation ecosystems that are properly integrated and supported by an appropriate policy framework is critical. Fostering international collaborations will ensure adaptation of international best practices
- Need to make use of diplomacy to eradicate the silo mentality prevailing in most innovation ecosystem. The FCDO can make use of the Private Sector for it to

lobby the other system actors like Government, Academia and Development Partners.

10.2 Finally, what issues do you think have not being adequately addressed regarding innovation ecosystems in (a) your country and (b) region?

(See full raw data in project data files)

Appendix 3 – Semi-structured interview questions

[Check understanding of project, consent and timing]

- Please introduce yourself
- Tell us a bit about your institution and its role in the country-level innovation ecosystem
- Are there any notable points in the history of your role / institution with respect to the ecosystem (e.g. when, why, how did it start)?
- What are the main current strengths of your role / institution?
- Have you seen any particular impacts (your inst. And the system) in the short term from the COVID-19 pandemic?
- From your perspective, how does the innovation ecosystem look now (i.e. diversity and number of actors, has it changed, is it changing)? (can be at country level, regional, national etc.)
- What are the notable themes / topics in the innovation ecosystem at country level?
- What challenges are you encountering in promoting and developing innovation?
- What do you see as key methods / levers to address these challenges?
- What impacts has your role / institution had in the ecosystem that you are most proud of?
- From your experience and perspective, what do you see as possible causes of ecosystem failure?
- Is there anything else you would like to add that we haven't covered in the interview?